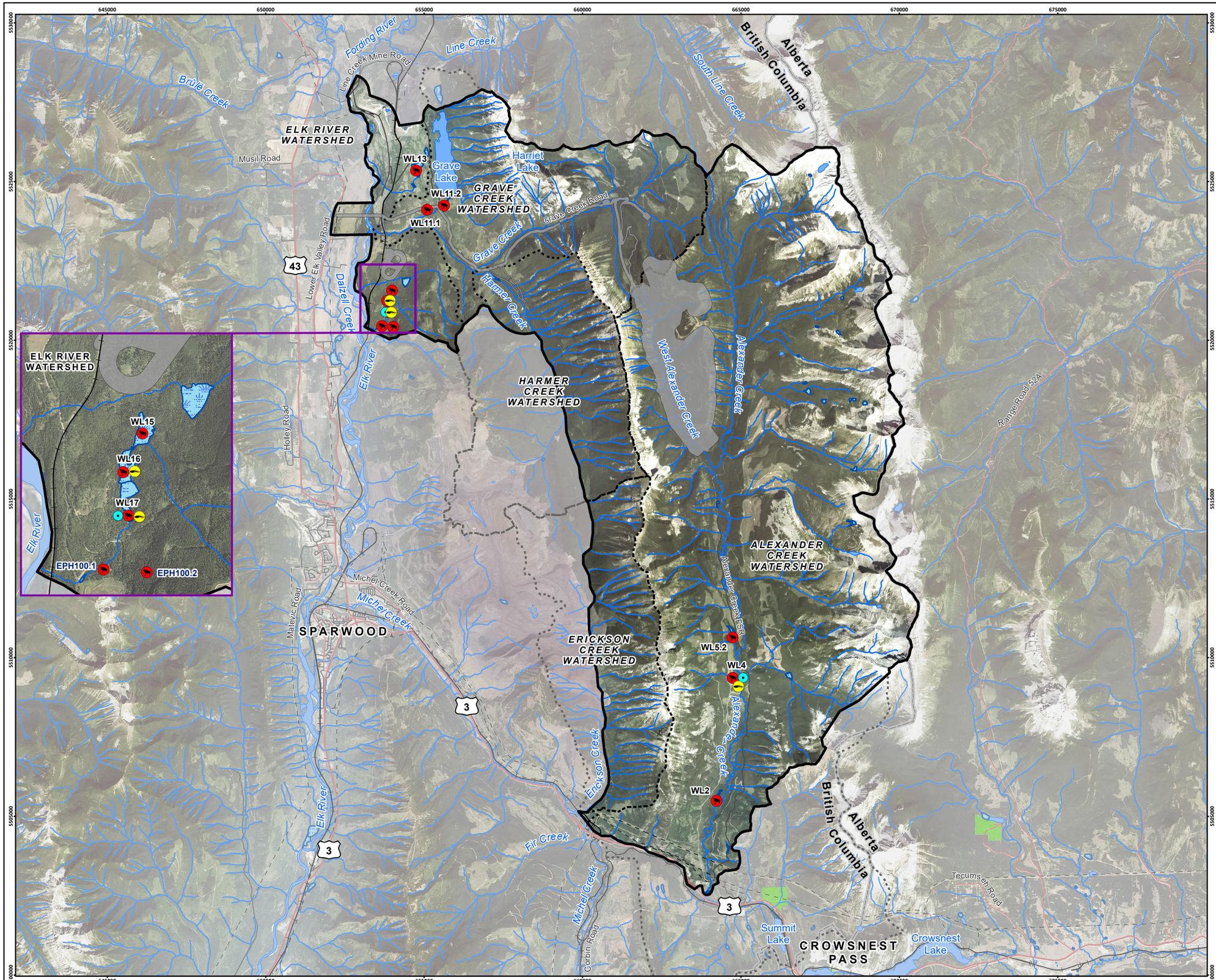

Crown Mountain Coking Coal Project

Figure 15.8-4
Columbia Spotted Frog Survey Observations

LEGEND

- Adult
- Tadpole
- Egg Mass
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Watershed
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2.5 5
Kilometres

N W E S

Scale 1:115,000

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

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

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Concentrations of selenium in all amphibian egg samples collected were below the B.C. MOE (2014) guidelines for bird eggs and the U.S. EPA (2016) guideline for fish. No exceedances of Elk Valley reference concentrations for chromium or vanadium (Windward Environmental et al., 2014) were observed in the amphibian egg samples, as all samples were below the detection limit.

In co-located water samples collected at the amphibian tissue sampling locations, no exceedances of the long-term B.C. Water Quality Guideline (WQGs) or the short-term Canadian Council of Ministers of Environment's (CCME) Canadian Water Quality Guideline (CWQG) were recorded, where guidelines exist. Exceedances were observed at wetland survey site WL4 in the Alexander Creek watershed and at site WL17 in the Elk River watershed. Total iron exceeded the long-term CWQG at site WL4, and the long-term CWQG for ammonium, total fluoride, and total iron and the short-term B.C. WQG for dissolved iron were exceeded at site WL17. Water quality targets specific to the *Elk Valley Water Quality Plan* were not exceeded.

15.8.2.3 Modelling

15.8.2.3.1 Methods

Habitat availability and distribution was quantified using habitat suitability models. Habitat suitability was predicted from occupancy models (western toad) and resource selection function models (Columbia spotted frog) developed using field observations and 28 environmental predictor variables. Variables selected for modelling were chosen based on *a priori* knowledge of factors influencing species survival and reproduction. Variables seek to account for variations of food resources, prey capture, reproduction habitat, movement, security and thermal habitat, and anthropogenic disturbance. As both western toad and Columbia spotted frog populations have specialized overwintering/hibernation habitat requirements, and amphibian location data can only be collected during the spring and summer seasons, the amphibian models are only designed to represent the spring-summer distribution of western toad and Columbia spotted frog. Additional details on habitat variables and modelling methods are provided in Appendix 15-C.

The models were used to predict the occupancy (probability of occurrence) across the Terrestrial LSA and Birds, Bats, and Amphibians RSA using the model coefficients and the mapped environmental variables for each amphibian VC. The resulting map data show probability of occurrence and are interpreted as a measure of habitat suitability. Values (from 0-1) were grouped in to six classes (i.e., very high, high, moderate, low, very low, and unclassified), for summary purposes.

15.8.2.3.2 Results

Western Toad

Habitat Use

The overall estimate of western toad occurrence was 0.46, or western toad may potentially use approximately 46% of the Terrestrial LSA. Western toads showed strong selection for aquatic and riparian habitats and were associated with woodland habitats. There was a weak avoidance of coal mining areas.

Habitat Suitability

Approximately 165 ha of the Project footprint (13%) was predicted as very high or high habitat quality for western toad (Table 15.8-3). Quality habitats for western toad within the Project footprint are located in the southern quarter of the Project footprint in the area surrounding the Alexander Creek drainage and in the Grave Creek area at lower elevations (Figure 15.8-5). Approximately 5,562 ha of the Terrestrial LSA (23%) was predicted as very high or high habitat quality for western toad. Areas of quality habitat for western toad within the Terrestrial LSA are primarily located in the Alexander Creek drainage, Grave Creek Canyon, Grave Prairie, and southwest of the base of Sheep Mountain (Figure 15.8-5).

Table 15.8-3: Western Toad Habitat Suitability in the Project Footprint, Terrestrial LSA, and Birds, Bats, and Amphibians RSA

Habitat Quality Rating	Amount of Habitat in the Project Footprint		Amount of Habitat in the Terrestrial LSA		Amount of Habitat in the Birds, Bats, and Amphibians RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of LSA	Area (ha)	% of Birds, Bats, and Amphibians RSA
Very High (0.8-1)	53	4	2,821	12	152,530	12
High (0.6-0.8)	113	9	2,741	11	295,498	23
Moderate (0.4-0.6)	94	7	3,266	13	271,566	22
Low (0.2-0.4)	158	12	4,822	20	280,472	22
Very Low (0-0.2)	865	67	10,571	44	261,738	21
Unclassified	0	0	0	0	0	0

Columbia Spotted Frog

Habitat Use

Columbia spotted frogs showed strong selection for all running water features, but were most associated with streams; they were also strongly associated with early seral forests and strongly avoided steep terrain. They had a weak association with higher elevations and strongly avoided rugged landscapes.

Habitat Suitability

Approximately 39 ha of the Project footprint (3%) was predicted as very high or high habitat quality for Columbia spotted frog (Table 15.8-4). Quality habitats for Columbia spotted frog within the Project footprint are located in the southern quarter of the Project footprint in the area surrounding the Alexander Creek drainage and in the Grave Creek area at lower elevations (Figure 15.8-6). Approximately 1,262 ha of the Terrestrial LSA (6%) was predicted as very high or high habitat quality for Columbia spotted frog. Areas of quality habitat for Columbia spotted frog within the Terrestrial LSA are primarily located in the Alexander Creek drainage and connecting streams, Grave Creek Canyon, and Grave Prairie (Figure 15.8-6).

Crown Mountain Coking Coal Project

Figure 15.8-5
Western Toad Habitat Spring-Summer Suitability in the Terrestrial Local Study Area

LEGEND

Habitat Suitability

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

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

- British Columbia/Alberta Border

0 2 4
Kilometres

Scale 1:85,000

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

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

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Crown Mountain Coking Coal Project

Figure 15.8-6
Columbia Spotted Frog Spring-Summer Habitat Suitability in the Terrestrial Local Study Area

LEGEND

Habitat Suitability

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

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

- British Columbia/Alberta Border

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Kilometres

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

Table 15.8-4: Columbia Spotted Frog Habitat Suitability in the Project Footprint, Terrestrial LSA, and Birds, Bats, and Amphibians RSA

Habitat Quality Rating	Amount of Habitat in the Project Footprint		Amount of Habitat in the Terrestrial LSA		Amount of Habitat in the Birds, Bats, and Amphibians RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of LSA	Area (ha)	% of Birds, Bats, and Amphibians RSA
Very High (0.8-0.1)	15	1	622	3	30,845	2
High (0.6-0.8)	24	2	640	3	37,102	3
Moderate (0.4-0.6)	41	3	987	4	58,161	5
Low (0.2-0.4)	82	6	1,643	7	97,115	8
Very Low (0-0.2)	1,121	87	20,330	84	1,039,949	82

15.8.3 Project Effects Assessment

15.8.3.1 Thresholds for Determining Significance of Residual Effects

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

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

- Causes the non-permitted contravention of any of the prohibitions stated in Sections 32 to 36 of the *Species at Risk Act* including injury, harassment, or mortality of an amphibian species at risk;
- Results in the non-permitted loss of critical habitat for an amphibian species at risk; or
- Causes a decline in abundance or change in distribution of its population such that the population will not be sustainable in the Birds, Bats, and Amphibians RSA.

15.8.3.2 Project Effects

Potential effects on western toad habitat availability and distribution and known occurrence and abundance may occur as a result of Project activities associated with mine development. Potential effects on wildlife are discussed with respect to changes at both the individual level (i.e., behaviour, physiological condition, survival) and the population level (i.e., population size, distribution, mortality rate). Since potential effects at the population level are of greater importance than at the individual level, the assessment primarily focuses on the effects to local populations. The assessment focuses only on planned

activities within the designed scope of the Project. Effects related to unplanned events (e.g., collisions, spills, equipment malfunctions, accidents) are presented in Chapter 21.

The Human and Ecological Health Assessment (Chapter 22) includes an analysis of the effects of potential contaminants of concern on select wildlife species and species groups. As initially described in Section 15.8.1, the AIR (EAO, 2018) identified amphibians within the RSA (as represented by Columbia spotted frog) as a VC under aquatic health. Aquatic health is assessed as part of the Human and Ecological Health Assessment. The aquatic health components included in the human and ecological health assessment are waterbirds, benthic invertebrates, fish species and amphibians. The assessment of residual project effects and cumulative effects to the aquatic health components was summarized for all aquatic health components combined. Since amphibians are a specific VC under aquatic health, it is important for conformity to the AIR that an effects assessment specifically for amphibian health be included. Project and cumulative effects to amphibian health are therefore included in this section. The assessment of potential effects to amphibian health provided in this section is based entirely on the Human and Ecological Health Assessment and no new information is provided, with the exception of the characterization of residual Project and cumulative effects that are specifically tailored to amphibian health.

Potential effects to western toad are interrelated with other assessment disciplines and components that represent pathways to effects on amphibians, including:

- Groundwater Assessment (Chapter 9);
- Surface Water Quantity Assessment (Chapter 10);
- Surface Water Quality Assessment (Chapter 11);
- Landscapes and Ecosystems Assessment (Chapter 13); and
- Human and Ecological Health Assessment (Chapter 22).

15.8.3.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect amphibian VCs. Key Project activities that are expected to interact with western toad and/or Columbia spotted frog with a potential for adverse effects are presented in Table 15.8-5. Specific details on Project activities and components are discussed in Chapter 3.

Many Project activities have the potential to interact with amphibians. The key interactions resulting in potential significant adverse effect or significant concern (indicated as level III in Table 15.8-5) are primarily those involving habitat loss or alteration. Many of the potential adverse effects that are not key but require mitigation (indicated as level II) are related to the potential for increased mortality. Project activities with no or negligible predicted interactions with western toad and Columbia spotted frog are:

- Stockpiling of wood waste in Operations to be used for reclamation;
- Construction activities that do not generate dust and no potential for water runoff;
- Labour (hiring and training);
- Construction waste materials;
- Construction and operation of the explosives factory;
- Sewage treatment;

Table 15.8-5: Project-Amphibian Interaction Matrix and Ranking

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

Project Phase	Project Component	Description of Activities	Western Toad	Amphibians within the RSA
	Linear Infrastructure	Installation of the powerline	II	I
		Installation of the natural gas line	II	I
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road	I	I
	Coal Handling Process Plant Construction	Excavating and pouring of foundation	I	I
		Transportation of materials and personnel to site	II	I
		Constructing of the Coal Handling Process Plant (CHPP)	I	I
		Commissioning of the CHPP	I	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations	II	I
		Transportation of materials to site	II	I
		Construction of workshop / mine dry	I	I
		Equipment wash bay and heavy equipment parking	I	I
		Administration, first aid, and mine dry building	I	I
		Diesel tank farm	I	I
		Warehouse	I	I
		Potable water system	I	I
		Septic system	I	I
		Water supply pipelines from Grave Creek and West Alexander Creek	I	I
		Commissioning of the facilities	I	I
	Explosives Factory Construction	Construction of the explosives factory	I	I
	Rail Loadout Construction	Excavation and preparation of the rail bed	II	I
		Excavation and preparation of foundation stockpiling and coal handling systems	II	I
		Transportation of materials and personnel to site	II	I

Project Phase	Project Component	Description of Activities	Western Toad	Amphibians within the RSA
	Labour	Construction of rail loadout	I	I
		Connection to the CP Fording Sub-line	I	I
		Commissioning of the rail loadout	I	I
		Hiring of personnel for the mine, CHPP operations, administration, and coal haul	I	I
		Training of personnel	I	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility	I	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	I
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks	I	I
		Wash facility to decontaminate the bulk explosive delivery trucks	I	I
		Storage of explosives (detonators and boosters)	I	I
	Fuel Storage	Receiving bulk fuel deliveries	I	I
		On-site storage of fuel	I	I
		Dispensing fuel	I	I
		Transferring fuel to on-site delivery trucks	I	I
	Mine Roads Development	Building roads from material sourced on-site	II	I
		Progressive clearing	II	I
	Mining	Removal of unconsolidated material	I	I
		Loading, hauling, and stockpiling of soil	II	I
		Drilling and loading of blastholes	I	I
		Detonating the explosives	I	I

Project Phase	Project Component	Description of Activities	Western Toad	Amphibians within the RSA
		Loading, hauling, and dumping of mine rock	I	I
		Loading, hauling, and stockpiling of coal	II	I
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5)	I	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15)	I	I
		Backup reservoir in Grave Creek as a secondary source of process make-up water	II	I
	Coal Processing	Run of mine coal sizing	I	I
		Washing coal	I	I
		Mechanical and thermal drying of coal	I	I
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities)	I	I
		Conveying clean coal	I	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities	I	I
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4	III	I
		Management of the Main Sediment Pond discharge	II	III
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I	I
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	I	I

Project Phase	Project Component	Description of Activities	Western Toad	Amphibians within the RSA
	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities	I	I
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility	I	I
	Removal of Linear Infrastructure	Removal of the powerline	I	I
		Removal of the natural gas line	I	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I	I
	Monitoring	Reclamation monitoring	I	I
		Geotechnical monitoring	I	I
		Aquatic effects monitoring	I	I
	Water Management	Management of the Main Sediment Pond discharge	II	III
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met	II	III
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use	I	I
	Rail Line	The rail line will remain as a permanent feature	I	I
	Monitoring	Reclamation monitoring	I	I
		Geotechnical monitoring	I	I
		Aquatic effects monitoring	I	I

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

- Progressive reclamation;
- Dismantling and removal of infrastructure;
- Monitoring activities;
- Use of the Branch C Road after closure; and
- The inactive rail line during Post-Closure.

15.8.3.2.2 Overview of Potential Effects

Potential effects of the Project on wildlife and wildlife habitat VCs were identified through working group meetings, consultation, review of other developments in the region, through mitigation included with BMPs, scientific literature, and using technical expertise/professional opinion. Potential effects of the Project on western toad and Columbia spotted frog were identified and categorized as:

- Habitat loss and degradation;
- Sensory disturbance;
- Increased mortality risk; and
- Amphibian health.

Sensory disturbance was not included as a potential effect on western toad and Columbia spotted frog. Amphibians are generally highly vocal species that rely on acoustic communication during breeding. Documented effects of noise on amphibians have primarily been related to acoustic interference with communication. Data that address how anthropogenic noise affect the spatial distribution of breeding ponds, production and propagation of amphibian males' vocal signals, and detection and discrimination of these signals by females are inconsistent (Simmons and Narins, 2018). Amphibians may respond to anthropogenic noise using many of the same strategies that they use to deal with biotic and abiotic noise. In addition, the western toads present in the Terrestrial LSA are suspected to be part of a non-calling population west of the Rocky Mountains, although this was not confirmed during the baseline studies. Interference of Project noise with western toad breeding are therefore not expected. For these reasons, the effect of sensory disturbance was not considered further for either western toad or Columbia spotted frog.

The health effects of amphibian exposure to contaminants of potential concern is described in Chapter 22 and is therefore not repeated here.

The rationale and a description of habitat loss and degradation and increased mortality risk for western toad and Columbia spotted frog is summarized in Table 15.8-6.

Table 15.8-6: Potential Effects on Western Toad and Columbia Spotted Frog

Potential Effect	Rationale for Selection of Environmental Effect
Habitat Loss and Degradation	Project components and activities may cause habitat loss and degradation for western toad and Columbia spotted frog. Habitat loss and degradation includes the loss or reduction in value of western toad and Columbia spotted frog summer breeding areas (e.g., wetlands, ephemeral seeps, and temporary pools), post-breeding dispersal corridors, foraging habitats, and winter hibernacula. Habitat loss and degradation may occur from clearing of forest cover, clearing and grubbing of wetlands and riparian areas, loss or alteration of surface and groundwater

Potential Effect	Rationale for Selection of Environmental Effect
Increased Mortality Risk	flow that may alter surface water area or vegetation species composition, introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Project components and activities have the potential to cause increased mortality risk to individual western toads and Columbia spotted frogs during vegetation clearing, mine rock placement, and collisions with vehicles. Increased mortality risk may also occur during decommissioning of the sediment ponds and the Grave Creek Reservoir if water is drained if and when occupied by western toad and/or Columbia spotted frog. Changes to surface water quality associated with leaching of constituents from mine rock and mining areas (e.g., road surfaces, coal stockpiles) could affect western toad and Columbia spotted frog survival and reproduction.
Amphibian Health	The Project has the potential to emit chemical contaminants to the environment through controlled or uncontrolled emission such as permitted effluent discharge, surface water runoff, fugitive dust, and emissions from vehicle traffic or other direct facility emissions. These emissions in turn have the potential to alter environmental quality of local and regional landscapes which could potentially expose amphibians to chemical emissions from the Project.

15.8.3.2.3 Discussion of Potential Effects

The potential effects (i.e., habitat loss and degradation and increased mortality risk) for western toad and Columbia spotted frog are discussed in the context of each Project phase below.

Habitat Loss and Degradation

The Project footprint overlaps with habitat for western toad and Columbia spotted frog. Approximately 165 ha of the Project footprint (13%) was predicted as very high or high habitat suitability for western toad summer breeding, post-breeding dispersal corridors, and foraging habitats (see Section 15.8.2.3.2). The highest habitat suitability areas are located at the south end of the mine site footprint and in the Grave Creek area at lower elevations.

It is unknown if western toad breeding habitats are present within the Project footprint as no western toad egg masses or tadpoles were found in the Terrestrial LSA during baseline surveys. Western toads were found in several wetlands and a few ephemeral areas, as well as in some forested areas away from waterbodies. Three of those locations were within the Project footprint. Adult western toads can travel up to 6 km from their breeding sites to their foraging sites in the summer, and toadlets are known to migrate up to 2.7 km from their breeding habitats upon hatching.

Approximately 39 ha of the Project footprint (3%) was predicted as very high or high habitat suitability for summer breeding, post-breeding dispersal corridors, and foraging habitat for Columbia spotted frog (see Section 15.8.2.3.2). The highest habitat suitability areas are located at the south end of the mine site footprint and in the Grave Creek area at lower elevations.

It is unknown if Columbia spotted frog breeding habitats are present with the Project footprint, as no Columbia spotted egg masses or tadpoles were observed within the Project footprint during baseline

surveys; however, tadpoles and egg masses were observed in the Terrestrial LSA south of the Project footprint in the Alexander Creek drainage and south of the rail loadout. No Columbia spotted frog were observed within the Project footprint. Though movements of up to 6.5 km have been recorded, Columbia spotted frog generally stay in wetlands and along streams within 1 km of their breeding pond (Bull and Hayes, 2001; Pilliod et al., 2002)

Construction and Pre-Production

Clearing and grubbing for Project components in Construction and Pre-Production in high and very high suitability habitat include the upgrade to the Grave Creek Road and the construction of the service corridor at low elevations and the rail loadout. Approximately 0.67 ha of wetland will be lost by clearing and grubbing for the office/shop complex, Mine Rock Storage Facility, and the East Pit. These wetlands could provide suitable habitat, though repeated surveys found no evidence of western toad or Columbia spotted frog breeding at these locations. Furthermore, the habitat models predict very low habitat suitability for both species in the majority of the mine site footprint.

Changes to water flow in Grave Creek and West Alexander Creek could affect the presence or permanency of pools that may represent suitable breeding habitat. The Grave Creek Reservoir is proposed to be constructed during the Construction and Pre-Production phase and will result in changes to flows in Grave Creek. Water flows in West Alexander Creek downstream of the Project footprint will also be reduced, potentially affecting suitable western toad breeding habitat and Columbia spotted frog breeding, foraging, and overwintering habitat downstream of the Construction and Pre-Production footprint.

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

Operations

Habitat loss and degradation will occur during Operations as a result of progressive clearing of the pits, Mine Rock Storage Facility, construction of mine roads, and clearing for the construction of the Main Sediment Pond. Loss of areas predicted to be high and very high habitat suitability for both species will only occur when mine development progresses toward the far southern end of the Project footprint.

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

Reclamation and Closure

There will be no new loss or degradation of habitat for western toad and Columbia spotted frog during Reclamation and Closure, as all activities with the potential to result in habitat loss or degradation will be completed prior to initiating mine closure.

Post-Closure

There will be no additional loss or degradation of habitat for western toad and Columbia spotted frog during Post-Closure, as all activities with the potential to result in habitat loss or degradation will be completed prior to mine closure.

Increased Mortality Risk

Project components and activities have the greatest potential to cause increased mortality risk for individual western toads and Columbia spotted frogs during vegetation clearing and grubbing, mine rock placement, and through collisions with vehicles.

Both species inhabit a variety of aquatic and terrestrial environments throughout their lifecycle, including margins of ponds and streams, wetlands, and ephemeral pools for breeding, riparian areas along streams, and upland sites such as forests, meadows, shrub lands, or subalpine or alpine meadows for post-breeding and hibernation. The potential for increased mortality risk therefore exists in most areas and throughout the year. The majority of clearing and grubbing will be in the mine site footprint, which is predominantly low habitat suitability for both western toad and Columbia spotted frog.

Collisions with vehicles have greatest potential to occur when amphibian VCs migrate to breeding habitats in the spring and disperse from breeding areas, likely in June and July.

Construction and Pre-Production

The greatest potential for increased mortality risk during this phase will be during clearing and grubbing at low elevations for the upgrade to Grave Creek Road and the construction of the service corridor and the rail loadout, where habitat suitability in the footprint is highest for both species. Increased direct mortality from vehicle collisions may also occur from increased road traffic beyond existing levels.

Operations

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

Reclamation and Closure

The potential for increased mortality risk will be reduced in Reclamation and Closure, as there will be no further clearing and grubbing and vehicle traffic will decline.

Post-Closure

The risk direct mortality due to vehicle collisions will be minimal during the Post-Closure phase as Project-related vehicle traffic will occur only occasionally during monitoring and maintenance activities. The Main Sediment Pond may provide suitable habitat for western toad breeding or Columbia spotted frog breeding, foraging, or overwintering. If the Main Sediment Pond is colonized by either species, direct mortality may occur during decommissioning when water is drained.

Amphibian Health

Effluent discharge from the Project site is predicted to have a measurable effect on surface water quality and as such this contaminant exposure pathway is of primary importance to the overall quantitative environmental risk assessment and is the basis for the aquatic health risk assessment that includes amphibians. Amphibian exposure to contaminants has the potentrial to occur in any Project phase.

15.8.3.2.4 Transboundary Effects

Western toads can migrate up to 7 km from breeding ponds (Davis, 2000). Although most Columbia spotted frog migrate less than 2 km between breeding and foraging sites, individuals have been recorded to migrate up to 7.5 km (Pilliod et al., 2002). Transboundary movements of both western toads and Columbia spotted frog within the Terrestrial LSA between B.C. and Alberta via the Continental Divide, approximately 5 km from the Project, are therefore possible. Project effects on western toad and Columbia spotted frog will be confined to the Project footprint and potentially minimally outside the footprint in the Terrestrial LSA. Effects on western toad and Columbia spotted frog populations outside of B.C. or on federal land (the closest of which is located approximately 20 km from the Project; Chapter 1, Section 1.3.3) are unlikely to occur. Transboundary movements of amphibians from the Birds, Bats, and Amphibians RSA to the U.S.A. are not expected, given the distance to that border.

15.8.3.3 Mitigation Measures

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

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

Many of the measures to mitigate impacts to western toad and Columbia spotted frog are part of protocols described in the following management plans:

- Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13);
- Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1);
- Ecological Restoration Plan (Chapter 33, Section 33.4.1.3);
- Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4);
- Site Water Management Plan (Chapter 33, Section 33.4.1.8);
- Spill Prevention, Control, and Countermeasures Plan (Chapter 33, Section 33.4.1.10); and
- Traffic Control Plan (includes access management; Chapter 33, Section 33.4.2.4).

The following subsections describe mitigation for potential Project effects on western toad and Columbia spotted frog.

15.8.3.3.1 Mitigation Measures for Habitat Loss and Degradation

Amphibian VC habitat loss and degradation will occur primarily through:

- Loss from clearing and grubbing;
- Degradation through dust deposition, spread of invasive species, and sedimentation from surface water; and
- Potential degradation of breeding habitat from reduction of surface water flows.

Measures to mitigate the impact of western toad and Columbia spotted frog habitat loss and degradation include:

- Minimizing disturbance and encroachment into natural vegetation, to the extent feasible, by clearing and grubbing only what is required for Construction and Pre-Production activities and progressive development of pits and the mine rock storage facility;
- Clearing vegetation only in the year (or prior year) in which the area will be required for construction or operation to minimize the extent of cleared vegetation, to the extent possible;
- Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities;
- Progressively reclaiming areas, as described in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3) and Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6), as soon as possible to restore habitat for western toad and Columbia spotted frog;
- The Ecological Restoration Plan (Chapter 33, Section 33.4.1.3) includes compensation for direct losses of wetland ecosystems and associated wetland function that provide potential breeding habitat for western toad and potential breeding, foraging, and overwintering habitat for Columbia spotted frog;
- Implementation of the Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4) to reduce the potential for sedimentation of riparian, wetland, and aquatic habitats used by western toad and Columbia spotted frog;
- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to reduce deposition of dust of vegetation that can affect plant vigour; and
- Implementation of the Site Water Management Plan (Chapter 33, Section 33.4.1.8) which will minimize downstream impacts to breeding habitat through:
    - Controlling outflows from water management facilities to maintain streamflow conditions in the receiving watercourses to the extent possible, particularly during low flow conditions;
    - Limiting surface water withdrawals to minimize impacts on streamflows; and
    - Decommissioning and reclaiming water management facilities to restore natural streamflow conditions in the receiving watercourses to the extent possible.

Ecological restoration is the primary mitigation for habitat loss and degradation. The reclamation of the Project footprint aims to restore the pre-existing landscapes and uses, including a vegetation mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands and riparian areas, and habitat capability for key wildlife species (among other goals). Revegetation (restoration) activities will begin during the Operations phase, soon after stable topography is created within the mine footprint, and will proceed progressively as the area of stable topography grows

during the Operations phase. Revegetation is planned to start in Year 6 of Operations, with other revegetation taking place in Years 8, 10, 11, and 15 of Operations and continuing into the Reclamation and Closure phase. Approximately 790 ha in seven ecosystem types are planned for reclamation within the Project footprint. Ten hectares of wetland habitat will be created to offset wetland losses and will provide habitat for amphibians. Watercourses within the pits and Mine Rock Storage Facility areas will not be restored, though these areas provide only limited amphibian habitat. Further details on ecological restoration can be found in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3).

The mitigation measures described above will contribute to minimizing the effects of habitat loss and degradation on western toad and Columbia spotted frog with high effectiveness. These measures will not eliminate all effects, and there will be a residual effect of habitat loss and degradation on western toad and Columbia spotted frog as a result of the Project.

15.8.3.3.2 Mitigation Measures for Increased Mortality Risk

Direct mortality risk for amphibian VCs will primarily occur through vegetation clearing and grubbing, mine rock placement, and collisions with vehicles. Measures to mitigate the impact of increased mortality risk include:

- Conduct surveys of suitable amphibian breeding habitat prior to clearing, grubbing, and deposition of mine rock and, if amphibians are found, conduct a salvage program to avoid amphibian mortality;
- A wildlife education program (as described in the Wildlife Management and Monitoring Plan, Chapter 33, Section 33.4.1.13) will be developed to raise awareness of requirements and commitments to avoid wildlife and protect wildlife and wildlife habitat;
- Management of vehicle traffic and access contributes to minimization of direct mortality during all Project phases. Traffic related measures are documented in the Traffic Control Plan (Chapter 33, Section 33.4.2.4) and include:
  - Speed limits will be clearly marked and signed on all Project access roads. Lower speed limits will be set where monitoring and wildlife observation records indicate a high-risk area for animal-vehicle collisions (e.g., at identified wildlife crossings);
  - Additional road signs will be posted for wildlife crossings, speed limit changes, advisory corner speeds, areas with limited visibility, and other potential road hazards;
  - Wildlife will be given the right-of-way on all Project roads;
  - Wildlife sightings and incidents will be reported to the site supervisor as soon as possible;
  - Project traffic will be minimized to the greatest extent practicable;
  - Site workers will travel on crews buses to limit road traffic;
  - Where possible, roads will be designed with clear lines of sight to increase the ability of drivers to see wildlife or other hazards; and
  - Vegetation along Project roadsides will be mowed/brushed as necessary for visibility of wildlife and to reduce the risk of wildlife-vehicle collisions; and
- Measures will be implemented to minimize potential Project effects on western toad and Columbia spotted frog movement corridors, if any are identified; measures will include signage along Project roads to warn vehicle operators of the potential to encounter wildlife.

The mitigation measures described above are expected to contribute to avoidance and minimization of increased mortality risk for western toad and Columbia spotted frog with high effectiveness. The effects of increased mortality risk for western toad and Columbia spotted frog are not expected to be fully mitigated and a residual effect may occur. The Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) will be used to validate the efficacy of the proposed mitigation measures.

15.8.3.3.3 Mitigation Measures for Amphibian Health

The mitigation measures relevant to amphibian health are intrinsic to the Site Water Management Plan (Chapter 33, Section 33.4.1.8) and related to the mitigation measures for surface water quality, which are described in detail in Chapter 11.

15.8.3.3.4 Summary of Mitigation Measures

A summary of the key mitigation approaches and their effectiveness to mitigate potential effects is provided in Table 15.8-7. The mitigation measures, their rationale, and the potential for residual effects are similar for both amphibian VCs and are grouped for summary purposes.

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

Where mitigation measures do not or may not mitigate all effects or if there is a low level of confidence in their effectiveness, the effect was carried forward for further analysis of residual effects.

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

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

15.8.3.4.1 Methods

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

Habitat loss and degradation was measured by calculating the loss of high-quality western toad and Columbia spotted frog spring-summer habitat within the Project footprint. High-quality habitat was identified as areas with high and very high habitat suitability.

The methods used to assess amphibian health (under aquatic health) are described in Section 22.5.4.1 of the Human and Ecological Health Assessment.

Table 15.8-7: Summary of Proposed Mitigation Measures Related to Amphibian VCs

Valued Component	Potential Effect	Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Western Toad and Columbia Spotted Frog	Habitat Loss and Degradation	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year (or prior year) in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Implementation of the Site Water Management Plan	• These measures contribute to avoidance, minimization, and restoration of habitat loss and degradation. • Not all effects of habitat loss and degradation are expected to be fully mitigated for western toad and Columbia spotted frog.	• Construction and Pre-Production • Operations • Reclamation and Closure	High	Yes
Amphibians within the RSA (Amphibian Health)	Contaminant Exposure	• Intrinsic to the Site Water Management Plan	• Measures contribute to the avoidance and minimization of exposure to selenium.	• Construction and Pre-Production • Operations • Reclamation and Closure • Post-Closure	Moderate	Yes

Residual effects were characterized using the criteria described in Chapter 5, Section 5.3.4.5. The following limits were used for the magnitude of a residual effect on western toad and Columbia spotted frog:

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

The residual effect of contaminants of potential concern on amphibians is described in Chapter 22 and is therefore not repeated here.

15.8.3.4.2 Potential Residual Effects Assessment

Western Toad

Habitat Loss and Degradation

The Project footprint overlaps with high-quality western toad habitat (Figure 15.8-7 and summarized in Table 15.8-8). The Project will result in a predicted loss of up to 165 ha of high-quality western toad habitat in the Project footprint, representing 3.0% of the total amount of high-quality western toad habitat available in the Terrestrial LSA (5,562 ha). Most loss will be at lower elevations in relation to upgrades of Grave Creek Road and the construction of service corridor and the rail loadout. Some areas predicted to be lost are within the buffer zone, and the area lost may be less. On a proportional basis, the availability of high-quality western toad habitat is lower within the Project footprint compared to the Terrestrial LSA as whole (13% for the Project footprint and 23% for the Terrestrial LSA).

Table 15.8-8: Change in High-Quality Western Toad Habitat in the Project Footprint and Relative to the Terrestrial LSA

Area (ha) of High-Quality Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Habitat in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
165	13	5,562	23	-3.0%

No western toad breeding areas were identified during baseline surveys within or directly adjacent to the Project footprint; however, this does not mean that one or more might occur. Pre-disturbance surveys in suitable habitat within the Project footprint will allow for avoidance, if possible, or if necessary, removal during a least risk period.

Clearing will begin in Construction and Pre-Production, with initial clearing of the 1,283 ha Project footprint prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline, and the rail loadout. Expansion of the Mine Rock Storage Facility and incremental loss of high-quality habitat will occur over the 15 years of Operations.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands, and riparian areas (described in Section 15.8.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3).

Crown Mountain Coking Coal Project

Figure 15.8-7
High-Quality Western Toad Spring-Summer Habitat in the Terrestrial Local Study Area

LEGEND

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

0 2 4
Kilometres

Scale 1:85,000

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

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

NWP Coal Canada Ltd

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

Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\EffectsAssessment\Wildlife\126231_EA_WHamp_WesternToadHabitat_LSA.mxd

Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. Of most relevance to amphibians is the restoration of 10 ha of wetland habitat composed of shallow open water, marsh, and swamp. After five years, sedges and grasses will be established and begin to provide potential breeding habitat. The quality of restored wetlands will improve over the successive year and decades. Terrestrial areas will establish at slower rates. Young forest will become established at 25 to 50 years and mature forest at 100 years or more post-closure. Watercourses within the pits and the Mine Rock Storage Facility areas will not be restored, though these areas were found to provide only limited western toad habitat. The Project footprint is ultimately expected to be a landscape similar in structure and composition to the pre-Project landscape.

Large changes in surface water flow downstream of the Project footprint could degrade western toad habitat, given their use of margins and pools along watercourses. Up to a 40% decrease in mean monthly water flow is predicted during Operations for the portion of West Alexander Creek downstream of the sediment ponds (approximately 600 m in length). This area contains high-quality western toad habitat. The effect of reduced water flows on habitat availability is unknown, but may be small considering that water flow will still be present. Alexander Creek and Grave Creek are both predicted to have reduced mean monthly water flows, but the predicted changes are minor (see Chapter 10).

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

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

The residual effect to western toad from direct habitat loss and degradation arising from the Project is characterized as follows:

- Duration: *Permanent*, as high-quality habitat for western toad will not be restored prior to the end of Reclamation and Closure.
- Magnitude: *Low*, up to 3.0% of high-quality western toad habitat in the Terrestrial LSA will be lost.
- Geographic Extent: *Discrete to Local*, as the effect of habitat loss will be mostly within the Project footprint, though habitat degradation may occur in West Alexander Creek downstream of the Project footprint to the confluence with Alexander Creek.
- Frequency: *Continuous*, the effect of habitat loss will be continuous during all phases of the Project.
- Reversibility: *Reversible long-term to Irreversible,* as lost wetland and shrubland habitat will be restored but lost forested habitats are irreversible.
- Context: *Low*, as western toad populations depend on various habitat types throughout their lifecycle and are vulnerable to habitat loss and fragmentation.

Increased Mortality Risk

Increased mortality risk for individual western toads during vegetation clearing and grubbing, mine rock placement, and through collisions with vehicles can be minimized but is difficult to completely avoid. Western toads are conspicuous during breeding and post-breeding dispersal because of their communal congregations and movements. Since they are easy to detect during these periods, mitigation measures can be effectively applied. At other times during the spring, summer, and fall, adults and toadlets are dispersed in a variety of habitats at low densities and cannot be readily detected. They are therefore difficult to protect from accidental mortality. Toads in hibernation are even more difficult to detect since they are beneath the ground surface. The majority of clearing, grubbing, and mine rock placement will occur outside of areas of high-quality habitat and the number of western toads that may be at risk of direct mortality is likely small.

The Project will result in an increase in total road length and an increase in daily traffic volume. Collisions with vehicles have the greatest potential to occur when toads migrate to breeding habitats in spring and disperse from breeding areas, likely in June and July. No breeding, migration, or dispersal corridors have been detected in the Terrestrial LSA to date, though individual western toads may cross active roads. Wildlife will have the right-of-way; however, individual toads may not be observed by drivers and vehicles may collide with individual toads. If areas with regular western toad movements are identified, then further mitigation measures will be implemented to avoid or minimize the potential for western toad mortality.

The residual effect to western toad from increased mortality risk arising from the Project is characterized as follows:

- Duration: *Long-term*, as the potential effect of increased mortality risk will extend through to Reclamation and Closure.
- Magnitude: *Low*, as the number of western toads at risk of increased mortality is likely small.
- Geographic Extent: *Discrete*, as the effect occurs within the Project footprint only.
- Frequency: *Intermittent*, the effect of increased mortality risk is expected to occur infrequently or at sporadic intervals.
- Reversibility: *Reversible long-term*, as the potential for increased mortality risk extends through to the end of Reclamation and Closure and then is expected to decline to pre-Project levels.
- Context: *Low,* as western toad populations have limited resilience to additional mortality.

Determination of Significance

Historical western toad abundance data for the Terrestrial LSA are not available, though there is some evidence of decline based on preliminary evidence gathered during amphibian inventory surveys in the East Kootenay region (Ohanjanian et al., 2006). The removal of occupied breeding sites through mining or other anthropogenic disturbances could have large effects on local population abundance, though no breeding sites have been identified to date within the Terrestrial LSA. The Project is expected to result in loss of high-quality habitat, though the amount is small relative to availability in the Terrestrial LSA. Some lost habitat will be offset by restoration of wetlands and shrublands during reclamation. The potential for increased mortality risk can be minimized, but direct mortality of individual western toads is difficult to eliminate due to the difficulty of detection during most times of the year. Based on the characterization of the residual effects, the Project would not limit the ability of western toad to persist and maintain self-sustaining populations in the Terrestrial LSA. Critical habitat under SARA has not been defined for western

toad; loss of critical habitat is therefore not relevant for the determination of significance. The residual effects of habitat loss and degradation and increased mortality risk on western toad are therefore considered not significant.

Likelihood and Confidence

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

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

Amphibian Health

Amphibian health is assessed under aquatic health in the Human and Ecological Health Assessment. Surface water quality mitigation measures will contribute to avoidance and minimization of contaminant exposure risk, but residual effects may remain. Amphibian health is therefore carried forward and a residual effects assessment is presented below. The assessment of potential residual effects to amphibian health provided in this section is based entirely on the Human and Ecological Health Assessment and no new information is provided.

Characterization of Residual Effect

Overall, the proposed Project and associated activities are considered to present a low risk to aquatic health. Specifically for amphibians, there are no risk estimates in exceedance of the target threshold. Further details are provided in Section 22.5.4.3.2 of the Human and Ecological Health Assessment (Chapter 22).

The residual effect to amphibian health is characterized as follows:

- Duration: *Long-term*, as the potential effect of could extend through the Operations phase to the end of reclamation.
- Magnitude: *Negligible*, as there are no risk estimates in exceedance of the target threshold.
- Geographic Extent: *Local*, as the risk will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying potential levels.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as amphibians have low resilience to the effects of contaminants.

Determination of Significance

The residual effects to amphibian health is considered to be not significant.

Likelihood and Confidence

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

The confidence in the determination of significance for aquatic health was assessed and moderate. The confidence in the determination of significance for amphibian health is therefore also assessed as moderate.

15.8.3.5 Summary of Residual Effects Assessment

Residual effects and the selected mitigation measures, characterization criteria, significance determination, likelihood, and confidence are summarized in Table 15.8-9. There are no significant residual effects to western toad and Columbia spotted frog anticipated as a result of the Project.

15.8.4 Cumulative Effects Assessment

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

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

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

An assessment of cumulative effects is required for amphibian VCs due to the possibility that potential Project residual effects on amphibian VCs may remain after implementation of proposed mitigation measures. Habitat loss and degradation and increased mortality risk were found to have residual (but not significant) Project effects for western toad and Columbia spotted frog.

The residual cumulative effect of potential contaminants of concern on amphibians is described in Chapter 22 and is therefore not repeated here.

15.8.4.1 Assessment Boundaries

15.8.4.1.1 Spatial Boundaries

The assessment of cumulative effects for amphibian VCs was conducted for the Birds, Bats, and Amphibians RSA, as defined in Section 15.2.3.1. The Birds, Bats, and Amphibians RSA is approximately 12,634 km^2. It includes all operating and proposed mines within the Elk Valley and several developed areas including the municipal boundaries of Sparwood, Elkford, Fernie, and Crowsnest Pass.

Table 15.8-9: Summary of Residual Effects on Amphibian VCs

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Western Toad	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and the Mine Rock Storage Facility to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Implementation of the Site Water Management Plan	Duration: Permanent Magnitude: Low Geographic Extent: Discrete to local Frequency: Continuous Reversibility: Reversible long-term to Irreversible Context: Low	Not Significant	Not Applicable	High
Western Toad	Increased Mortality Risk	• Construction and Pre-Production • Operations • Reclamation and Closure	• Conduct surveys of suitable amphibian breeding habitat prior to clearing, grubbing, and deposition of mine rock and, if amphibians are found, conduct a salvage program to avoid mortality • A wildlife education program (as described in the Wildlife Management and Monitoring Plan)	Duration: Long-term Magnitude: Low Geographic Extent: Discrete Frequency: Intermittent Reversibility: Reversible long-term Context: Low			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Management of vehicle traffic and access as described in Traffic Control Plan, contributes to minimization of direct mortality during all Project phases • Signage along Project roads in high-value wildlife areas or known wildlife travel corridors to warn vehicle operators of the potential to encounter wildlife				
Amphibians within the RSA (Amphibian Health)	Contaminant Exposure	• All phases	• Intrinsic to Site Water Management Plan	Duration: Long-term Magnitude: Negligible Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Not Applicable	Moderate

15.8.4.1.2 Temporal Boundaries

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

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

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

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

15.8.4.1.3 Technical Boundaries

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

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

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

Descriptions of the past, present, and reasonably foreseeable projects and/or activities for consideration in the cumulative effects assessment are provided in Chapter 5, Section 5.3.5.4.

Several past, present, and reasonably foreseeable projects or activities are expected to interact with the amphibian VCs, which may result in a potential for adverse cumulative effects (Table 15.8-10). Maps showing the location of the past, present, and reasonably foreseeable future projects or activities are presented on Figure 5.3-4 to Figure 5.3-6 (Chapter 5).

Table 15.8-10: Project-Amphibian VC Interactions Matrix for Potential Cumulative Effects

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Western Toad	Amphibians within the RSA	Justification / Rationale
Past or Present Projects and/or Activities that Have Been Carried Out			
Natural Resource Extraction – Mining (past)	I	I	Has occurred within the range of amphibian VCs and their habitat.
Coal Mountain Operations	III	III	Occurs within the range of amphibian VCs and their habitat.
Elkview Operations	III	III	Occurs within the range of amphibian VCs and their habitat.
Line Creek Operations	III	III	Occurs within the range of amphibian VCs and their habitat.
Fording River Operations	III	III	Occurs within the range of amphibian VCs and their habitat.
Greenhills Operations	III	III	Occurs within the range of amphibian VCs and their habitat.
Kootenay West Mine	III	III	Occurs within the range of amphibian VCs and their habitat.
Elkhorn Quarry West (Windermere Mining Operations)	III	III	Occurs within the range of amphibian VCs and their habitat.
Marten Phosphate Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Energy - Elko Dam	III	III	Occurs within the range of amphibian VCs and their habitat.
Koocanusa Reservoir	III	I	Occurs within the range of amphibian VCs and their habitat.
Forestry	III	I	Occurs within the range of amphibian VCs and their habitat.
Energy - Pipelines	II	I	Occurs within the range of amphibian VCs and their habitat.
Energy - Electrical Transmission	II	I	Occurs within the range of amphibian VCs and their habitat.
Transportation	II	I	Occurs within the range of amphibian VCs and their habitat.
Recreation and Tourism	I	I	Occurs within the range of amphibian VCs and their habitat, though adverse effects are expected to be minimal or absent.
Commercial, Residential, and Industrial Use	II	I	Occurs within the range of amphibian VCs and their habitat.
Parks and Protected Areas	I	I	Occurs within the range of amphibian VCs and their habitat, though adverse effects are expected to be minimal or absent.
Agriculture	II	I	Occurs within the range of amphibian VCs and their habitat.
Natural Processes or Events	I	I	Magnitude of effect on amphibian VCs likely very small.

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Western Toad	Amphibians within the RSA	Justification / Rationale
Reasonably Foreseeable Future Projects and/or Activities That Will Be Carried Out			
Michel Coal Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Grassy Mountain Coal Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Tent Mountain Mine	III	III	Occurs within the range of amphibian VCs and their habitat.
Fording River Extension Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Bingay Main Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Elan Hard Coking Coal Project	III	III	Occurs within the range of amphibian VCs and their habitat.
Climate Change	III	I	May affect habitat availability of amphibian VCs
Natural Processes or Events	III	I	Magnitude of effect on amphibian VCs likely very small.

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

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

- Coal Mountain Phase 2, as the environmental assessment was placed on hold by Teck Coal Limited in 2016;
- Mount Brussilof (Baymag Mine) by Baymag, due to no temporal overlap;
- Barnes Lake Phosphate Exploration Project by Fertoz International Inc., given that the project is in exploration phase and no project has been proposed; and
- Cabin Ridge Coal by Warburton Group is in exploration and no project has been proposed.

15.8.4.3 Mitigation for Cumulative Effects

Cumulative effects to amphibian VCs can be reduced through minimizing local Project-related effects using the mitigation measures described for the Project (Section 15.8.3.3). It is assumed that other projects in the region will also adopt similar measures. Addressing cumulative effects often requires regional stakeholder involvement and government-led initiatives to implement effective management plans and monitoring programs. NWP will participate in regional initiatives, where relevant and appropriate, and will adopt new management practices and measures to meet regional planning objectives, where possible.

15.8.4.4 Potential Residual Cumulative Effects

15.8.4.4.1 Assessment Methods

The assessment of potential cumulative effects on western toad was characterized using a combination of quantitative methods and qualitative discussions. Quantitative methods were used to measure habitat loss and degradation. Qualitative discussions are based on scientific literature, baseline studies, habitat models, and professional judgment and were used to characterize increased mortality risk.

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

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

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

The methods used to assess cumulative effects to amphibian health (under aquatic health) are described in Section 22.6 of the Human and Ecological Health Assessment (Chapter 22).

15.8.4.4.2 Western Toad

Many present and future projects and activities occur within the distributional range of western toad and in suitable habitat. The residual effects of habitat loss and degradation and increased mortality risk could potentially have a cumulative effect on western toad.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

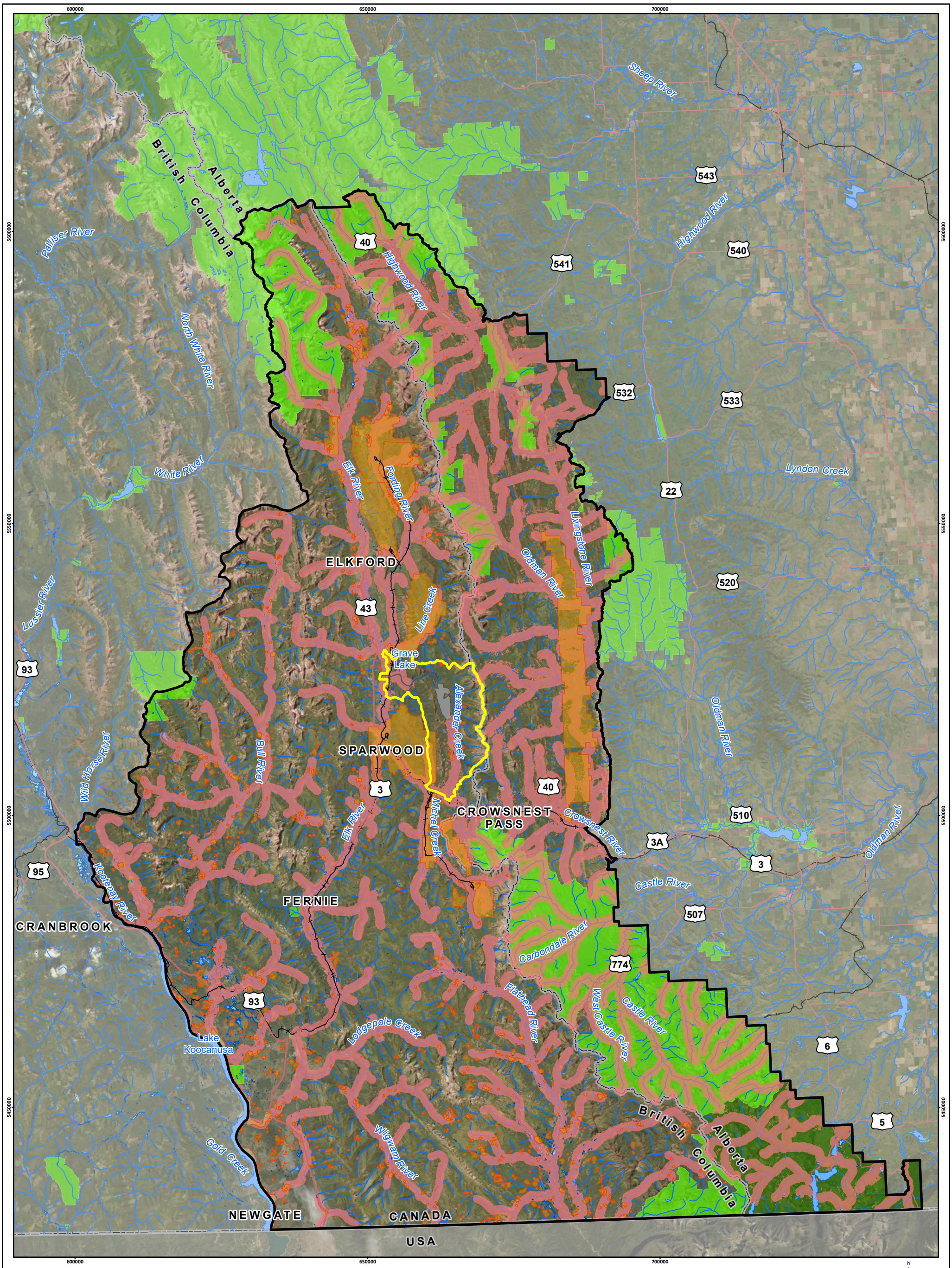
Most present and reasonably foreseeable future projects and activities occur within the range of western toad and in potentially suitable habitat and thus involve loss or alteration of western toad habitat (Figure 15.8-8). The Base Case incorporates the cumulative loss or alteration of western toad habitat as a result of past and present projects and was the basis for the assessment of Project effects. For the Future Case that includes both the Project and all reasonably foreseeable future projects and activities, approximately 8.1% of high-quality spring-summer western toad habitat is predicted to be lost within the Birds, Bats, and Amphibians RSA (Table 15.8-11). The Project is predicted to contribute 0.04% of that habitat loss.

Table 15.8-11: Change in High-Quality Western Toad Habitat for the Base Case, the Project Case, and the Future Case in the Birds, Bats, and Amphibians RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Birds, Bats, and Amphibians RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
Western Toad	Spring-Summer	448,028	447,862 (-165)	411,746 (-36,282)	-0.04%	-8.1%

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

- Duration: *Long-term and permanent*, as some lost habitat will be restored prior to the end of the Post-Closure phase and the remainder not restored until forest is established after the Post-Closure phase.
- Magnitude: *Moderate*, there will be an 8.1% loss of high-quality western toad habitat in the spring and summer in the Birds, Bats, and Amphibians RSA due to the development of the Project and all reasonably foreseeable future projects and activities. The Project contribution to these losses is expected to be 0.04% in the Birds, Bats, and Amphibians RSA.



Crown Mountain Coking Coal Project

Figure 15.8-8
High-Quality Western Toad Spring-Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Birds, Bats, and Amphibians Regional Study Area

LEGEND

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

0 10 20
Kilometres

N W E S

Scale 1:600,000

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

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

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-20

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- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversed, though not fully for many years after Post-Closure.
- Context: *Low*, western toad populations depend on various habitat types throughout their lifecycle and are vulnerable to habitat loss and fragmentation.

Increased Mortality Risk

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

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

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Negligible*, as western toad mortalities are expected to decline due to a decline in road density.
- Geographic Extent: *Regional*, as the effect will be within the Birds, Bats, and Amphibians RSA.
- Frequency: *Intermittent*, as western toad mortalities may be at sporadic intervals during any phase of the Project.
- Reversibility: *Reversible long-term*, as the potential for mortality risk will end after Reclamation and Closure.
- Context: *Low*, western toad populations have limited resilience to additional mortality.

Determination of Significance

Historical western toad abundance data for the Birds, Bats, and Amphibians RSA are not available, though there is some evidence of decline based on preliminary evidence gathered during amphibian inventory surveys in the East Kootenay (Ohanjanian et al., 2006). Based on the characterization of the residual cumulative effects and regional western toad population levels, the Project in combination with other reasonably foreseeable future projects and activities would not limit the ability of western toad to persist and maintain self-sustaining populations in the Birds, Bats, and Amphibians RSA. The residual cumulative effects of habitat loss and degradation and increased mortality risk on western toad arising from the Project in combination with the effects of other past, present, and other reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

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

There is a good understanding of western toad ecology and their habitat availability and distribution, though moderate understanding of known occurrences and abundance in the Birds, Bats, and Amphibians RSA. The confidence in the determination of the significance of residual cumulative effects to western toad is therefore high.

15.8.4.4.3 Amphibian Health

The non-significant residual effects to amphibian health could combine with other past, present, and reasonably foreseeable project and have a cumulative effect on amphibian health.

Characterization of Residual Cumulative Effects

The Cumulative Case suggests a moderate risk to aquatic wildlife health at cumulative assessment nodes impacted by drainage from Teck Coal's Elkview Operations. Risk estimates in exceedance of target thresholds were predicted for amphibians for selenium. Further details are provided in Section 22.6.6.2 of the Human and Ecological Health Assessment.

The residual cumulative effect to amphibian health is characterized as follows:

- Duration: *Long-term*, as the potential effect of could extend through the Operations phase to the end of reclamation.
- Magnitude: *Low*, as risk estimate exceedances for amphibians are predicted two locations for selenium only.
- Geographic Extent: *Local*, as the risk will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying potential levels.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as amphibians have low resilience to the effects of selenium.

Determination of Significance

The residual cumulative effects to amphibian health are considered to be not significant.

Likelihood and Confidence

Residual cumulative effects that are determined to be not significant do not require a characterization of likelihood.

The confidence in the determination of significance for aquatic health was assessed and moderate. The confidence in the determination of significance for amphibian health is therefore also assessed as moderate.

15.8.4.4.4 Summary of Cumulative Effects

Residual cumulative effects and the selected mitigation measures, characterization criteria, significance determination, likelihood, and confidence for amphibian VCs are summarized in Table 15.8-12.

Table 15.8-12: Summary of Cumulative Effects on Amphibian VCs

VC	Residual Cumulative Effect	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Western Toad	Habitat Loss and Degradation	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term and permanent Magnitude: Moderate Geographic Extent: Regional Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	High
Western Toad	Increased Mortality Risk	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Negligible Geographic Extent: Regional Frequency: Intermittent Reversibility: Reversible long-term Context: Low		
Amphibians within the RSA (Amphibian Health)	Contaminant Exposure	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Moderate

15.8.5 Follow-up Strategy

A follow-up program is used to verify environmental effects predictions or to verify the effectiveness of mitigation measures where there is uncertainty (i.e., low to moderate confidence). Where environmental effects exceed that predicted under the effects assessment, or mitigation measures prove to be ineffective, alternative strategies are developed to adaptively manage the Project's effects on wildlife VCs.

Wildlife monitoring outlined in the Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) to support the verification of mitigation measures and effects predictions relating to amphibian VCs will include:

- Where avoidance of sensitive time periods (breeding and post-breeding) is not possible, pre-disturbance amphibian surveys will be conducted for amphibian presence;
- Monitoring of footprint and habitat losses/gains to track and compare the planned footprint with the actual footprint and to track ecological restoration;
- Recording and monitoring of use of Project infrastructure by amphibians; and
- Monitoring of species occurrence at the local level by Project personnel documenting incidental observations of wildlife (i.e., wildlife sighting and incidents).

15.8.6 Summary and Conclusions

Western toad was selected as a wildlife community VC. Health effects to amphibians (as represented by Columbia spotted frog) were also included because of its inclusion under aquatic health for the Human and Ecological Health Assessment (Chapter 22). Both species were recorded within the Terrestrial LSA, though only western toad was found within the Project footprint. The potential effects of the Project on amphibians were determined to be habitat loss and degradation, increased mortality risk, and amphibian health. Various mitigation measures will avoid or minimize potential effects, though potential residual effects may remain. These residual effects were determined to be not significant. The residual cumulative effects of habitat loss and degradation, increased mortality risk, and amphibian health arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities were also considered not significant. Follow-up monitoring is to include pre-clearing amphibian surveys if sensitive habitats and time-periods cannot be avoided, and footprint and facility monitoring.

15.9 Gillette's Checkerspot

15.9.1 Introduction

The Gillette's checkerspot (*Euphydryas gillettii*) is a rare alpine butterfly in the *Lepidoptera* order of the family *Nymphalidae*. The species is non-migratory, has a highly restricted global range, and is known to be present only in parts of Idaho, Montana, Oregon, Utah, and Wyoming in the U.S.A. and only in very small portions of Alberta and B.C. in Canada (Layberry et al., 1998). The Gillette's checkerspot is of medium to average size, having a wingspan of 36 to 45 millimetres (mm) with an overall appearance of blackish, whitish, and broad reddish-orange banding (Cannings, 2004). Kondla (2005) estimated that the Gillette's checkerspot distribution consists of less than 0.2% of the national Canadian land base. Owing to its restricted distribution, Gillette's checkerspot is considered vulnerable to extirpation due to anthropogenic

habitat degradation and climate change (Cannings, 2004). Its home range has not been well documented but is likely small (<1 km). The Gillette's checkerspot is recognized as a species of global conservation concern (G3) and is currently ranked as Blue-listed (S2S3 2000) in B.C. (B.C. CDC, 2020b), although it is not federally listed or protected under Canadian federal legislation.

The Terrestrial RSA has been identified by Kondla et al. (2000) as a hot spot and area of conservation interest for butterflies, including Gillette's checkerspot, and the Project is located within the Gillette's checkerspot's sole known habitat range within B.C. Gillette's checkerspot was selected as a receptor VC for the Project because it is listed as a sensitive species globally and within B.C., and it has been documented within the Terrestrial LSA as an important part of its limited Canadian range.

15.9.1.1 Biology

15.9.1.1.1 Reproduction

Adults emerge anywhere from late June to early August, where they typically have a flight period, spend time sunning in trees, feed, and mate in trees (Kondla, 2005). Females produce one brood of eggs a year, relying primarily on black twinberry (*Lonicera involucrate*) as their host plant, but may use other plants including snowberry (*Symphoricarpos* spp.) and valerians (*Valeriana* spp.) (Williams et al., 1984; Bird et al., 1995, Hobbs, 2008). Brood sizes range anywhere from 23 to 310 eggs (Kondla, 2005). Eggs typically hatch within two to six weeks, when they begin feeding on the host plant and form a communal feeding web which becomes the overwintering hibernaculum (Kondla, 2005). In the following spring, the larvae will continue development on the new buds of the host plant or select new favorable food sources until they pupate, which lasts three weeks until which their development is complete, the adults emerge, and the cycle begins again (Kondla, 2005; Hobbs, 2008).

15.9.1.1.2 Diet and Foraging

In addition to being the primary plant host for egg-laying, black twinberry is the primary food source for developing Gillette's checkerspot larvae; however, other plants are occasionally used as mentioned above especially as they begin to develop and mature (Layberry et al., 1998). Particularly, adults feed from both wild geranium (*Geranium maculatum*) and yellow composite flowers (*Asteraceae*) (Bird et al., 1995; B.C. CDC, 2020b).

15.9.1.1.3 Habitat

Gillette's checkerspot live in small, discrete, and localized colonies and are believed to have high site fidelity within their home range (being less than 1 km); in addition, they are known to be weak fliers, although this is not well documented (Cannings, 2004). Gillette's checkerspot occurs in high elevation, open, moist, forested ecosystems in montane and subalpine zones characterized by Engelmann spruce (*Picea engellmannii*) and sub-alpine fir (*Abies lasiocarpa*). It is a habitat specialist, depending primarily on the presence and abundance of black twinberry as its larval egg-laying plant and foodplant, although they may use other honeysuckles (*Lonicera* spp.) (Williams, 1984; Williams, 1988; Cannings, 2004). General habitat requirements consist of open coniferous wet sites including disturbed areas with adequate nectar sources (i.e., honeysuckles, geranium, and yellow composite flowers), with the majority having streams flowing through the site, and several having marshes without obvious flowing water, and trees for mating (Williams, 1998; Kondla; 2005). Gillette's checkerspot are not often found near rivers, potentially due to the increased risk of flooding that may disturb host plants, nectar sources, larvae, and adults (Williams,

1988). Additionally, nectar availability influences the distribution of Gillette's checkerspot, while the specific nectar source (i.e., plant species) is not as crucial for adult feeding (Williams, 1988).

Disturbances caused by forest harvest, road and powerline construction, or fire, create ephemeral openings suitable for Gillette's checkerspot (Williams, 1988; Williams, 1995; Guppy and Shepard, 2001; Cannings, 2004; Dulc and Hobbs, 2013. Colonies are understood to be relatively stable, persisting for multiple generations in undisturbed non-ephemeral sites; in ephemeral sites caused by disturbances, however, forest succession may lead to localized extirpations.

Gillette's checkerspot typically occur at elevations up to 2,100 m asl within B.C. (Cannings, 2004); however, a recent review of 2,374 Gillette's checkerspot from 2008 to 2015 suggests that this species is limited to elevations between 1,253 to 1,779 m asl in the province (J. Hobbs, pers. comm., 2020).

15.9.1.2 Regulatory and Considerations

Gillette's checkerspot is not listed under the federal *Species at Risk Act* (2002) or the provincial *Wildlife Act* (1996); however, it is a Blue-listed species of conservation concern in B.C. due to its limited range, population size, vulnerability to extirpation, anthropogenic habitat degradation, and climate change (Cannings, 2004; B.C. CDC, 2020b). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has not conducted an assessment of its status. However, through other environmental legislation such as the *Riparian Areas Protection Act* (1997), Gillette's checkerspot habitat is incidentally afforded protection. The Government of B.C. also manages approved Wildlife Habitat Areas (WHAs) under the *Forest and Range Practices Act, 2002*, 21 of which are located within the Elk River and Elk Lakes and are dedicated to Gillette's checkerspot management (Figure 15.9-1). These WHAs include both current and historic breeding sites for the Gillette's checkerspot where they occur on Crown land, the closest of which is approximately 14 km south of the Terrestrial LSA (Hobbs, 2008).

15.9.2 Existing Conditions

Existing conditions in terms of Gillette's checkerspot distribution, biology, lifecycle, habitat, and presence in the Terrestrial LSA and Birds, Bats, and Amphibians RSA are described briefly below.

15.9.2.1 Existing Regional and Local Information

A search of the B.C. Species and Ecosystems Explorer (B.C. CDC, 2021) indicated that there are recorded Gillette's checkerspot historical occurrences at five locations within the Regional District of East Kootenay, including at two sites in the Cardona Valley (Figure 15.9-1). Exploratory surveys for Gillette's checkerspot have been conducted in B.C. by Dulc and Hobbs in 2012 and 2013, as well as by Hobbs in 2008 and 2012. Prior to the surveys conducted by Dulc and Hobbs in 2012, there were only records of Gillette's checkerspot in 17 sites in B.C. (Dulc and Hobbs, 2013). Hobbs (2008) indicated that there have been four geographically distinct populations observed at ten sites within Gillette's checkerspot's range in the southeastern portion of the province. These sites include the following (Figure 15.9-1):

- Michel Creek Drainage (one site);
- Lower Flathead River Drainage (five sites):
  - Nettie Creek (three sites);
  - Proctor Lake;
  - Howell Creek;

600000 650000 700000

5550000 5600000 5500000 5450000

1 68 8 93 2 762 543 40 541 540 532 533 93 95A 95 3 22 520 43 510 3A 507 774 6 5

Elbow River
CALGARY
Sheep River
Highwood River
Kootenay River
Palliser River
Lower Elk Lake
Elk Lakes
Elk River FSR 159km
Elk River FSR 155.6km
Elk Lakes
North White River
White River
Elk River
Fording River
Line Creek
Livingstone River
Oldman River
LyndonCreek
ELKFORD
Lussier River
Grave Lake
Alexander Creek
Wild Horse River
Bull River
SPARWOOD
CROWSNEST PASS
Crowsnest River
Michel Creek
Andy Good Creek
Michel Creek 3
Michel Creek
Michel Creek 1
Michel Creek 2
Castle River
CRANBROOK
FERNIE
Carbondale River
West Castle River
Upper Flathead
Flathead River
Upper Flathead
Lodgepole Creek
Lake Koocanusa
Wigwam River
Cold Creek
Howell Creek
Nettie Creek
Nettie Creek 2
Proctor Lake
Nettie Creek 1
Nettie Creek 3
NEWGATE

Crown Mountain Coking Coal Project

Figure 15.9-1
Gillette's Checkerspot Approved Wildlife Habitat Areas and Known Historic Population Locations

LEGEND

Historic Population Locations
- Present in 2008
- Not detected in 2008
- Not surveyed in 2008

- Gillette's Checkspot Wildlife Habitat Area
- Terrestrial Regional Study Area
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

0 15 30
Kilometres

N W E S

Scale 1:700,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Historic Survey Locations from Gillette's Checkerspot (Euphydryas gillettii) Survey - 2008, J. Hobbs Ministry of Environment, December 5, 2008. Imagery Provided By ESRI.

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

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Project: 12-6231
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- Upper Flathead River Drainage (one site); and
- Elk River Drainages (three sites).

Baseline studies for Gillette's checkerspot were conducted in the vicinity of Teck's Line Creek Operations in 2011 (Teck Coal Limited, 2011) as well in the vicinity of Teck's Elkview Operations in 2013 (Golder Associates Ltd., 2015a). No Gillette's checkerspot were observed in their study area during the surveys at the Line Creek Operations (Teck Coal Limited, 2011). However, black twinberry, which is one of the species' host plants, was observed in several vegetation plots, indicating that Gillette's checkerspot has a high potential to occur within their study area (Teck Coal Limited, 2011).

No Gillette's checkerspot were detected in the study area during the 2013 baseline surveys near Teck's Elkview Operations; however, suitable habitats were located within the Harmer Creek drainage (Golder, 2015). All other surveyed habitats were characterized as low or nil habitat suitability since they did not have the appropriate soil moisture conditions or abundance in nectar plants (Golder Associates Ltd., 2015a).

15.9.2.2 Transboundary Considerations

The home range of Gillette's checkerspot is thought to be relatively small (<1 km). Transboundary movements of Gillette's checkerspot between the Terrestrial LSA and Alberta or the U.S.A. are unlikely.

15.9.2.3 Baseline Program

15.9.2.3.1 Methods

In preparation for the field survey for the Project, key documents were reviewed, and aerial imagery of the Terrestrial LSA was examined to identify potential habitats to be surveyed in the field. The presence of black twinberry (the primary larval host plant for the Gillette's checkerspot in Canada) was recorded during terrestrial ecosystem mapping survey work conducted in the Terrestrial LSA (see Appendix 13-A), and these sites were added to the list of survey locations.

Potential habitat as described within the Gillette's Checkerspot Survey report (Keefer Ecological Services, 2014; Appendix 15-H) was examined in the field and the field work was conducted in mid-July 2014 during the prime flight window for the species and during weather conditions suitable for adult butterfly activity. Other butterfly species incidentally observed during field surveys were also recorded. Standard butterfly survey methods were employed during the field survey and are described in the baseline report provided in Appendix 15-H.

15.9.2.3.2 Results

Gillette's checkerspot surveys were conducted between July 12 and 14, 2014, and a total of 36 locations were surveyed in the Terrestrial LSA. Of the 36 locations surveyed, Gillette's checkerspot were observed in two locations (Figure 15.9-2). One area was located along Alexander Creek, which is described as an area of riparian forest with small openings and some open canopy forest, in addition to black twinberry also being present at this site. Two adults were observed at this location. The second location, where an additional two adults were observed, was located north of the weigh scales on Highway 3 in the Crowsnest Pass (Figure 15.9-2). Both sightings were outside the Project footprint; no Gillette's checkerspot were observed in the Project footprint. One site south of Grave Creek was also scored as excellent habitat for Gillette's checkerspot, although the species was not observed at the time of the field survey.

Crown Mountain Coking Coal Project

Figure 15.9-2
Locations of Gillette's Checkerspot Survey Sites and Recorded Occurrences

LEGEND

- Gillette's Checkerspot Detection
- Inspection Site - Alexander Creek
- Inspection Site - Grave Creek
- Excellent Gillette's Checkerspot Habitat
- Twinberry Survey Plot (2019)
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2 4
Kilometres

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Scale 1:85,000

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

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

NWP Coal Canada Ltd

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Results of the baseline survey are consistent with results from past surveys and academic research on this species. Additional details regarding the results of the baseline assessment for Gillette's checkerspot within the Terrestrial LSA can be referenced in the Gillette's Checkerspot Survey report provided in Appendix 15-H.

Gillette's checkerspot habitat availability and distribution in the Project footprint and Terrestrial LSA is discussed below in Section 15.9.2.4.

15.9.2.4 Modelling

15.9.2.4.1 Methods

Habitat availability and distribution was quantified using a habitat suitability model. To quantify Gillette's checkerspot occurrence, distribution, and habitat availability, site use was modelled as a function of 11 predictor variables. Variables selected for modelling were chosen based on *a priori* knowledge of habitat characteristics influencing Gillette's checkerspot survival and reproduction (i.e., fitness). These variables account for habitat suitability in terms of important food (larval and adult nectaring) resources and reproductive habitat. Details of habitat variables and modelling methods are provided in Appendix 15-C.

15.9.2.4.2 Results

Gillette's checkerspot habitat suitability in spring-summer within the Project footprint, Terrestrial LSA, and Birds, Bats, and Amphibians RSA was predicted using a habitat suitability index model. See Appendix 15-C for model details.

Habitat Use

The overall estimate for suitable habitat (moderate and high quality) for Gillette's checkerspot based on the habitat suitability index model was 2,859 ha, covering 12% of the Terrestrial LSA. Habitats assumed to contribute most towards suitability included presence of black twinberry in sites exhibiting the appropriate structural characteristics, elevation and aspect. For further details, see Appendix 15-C.

Habitat Suitability

Based on the habitat suitability index model, the best Gillette's checkerspot habitats with the Terrestrial LSA are located along West Alexander Creek, Alexander Creek, Harmer Creek, Grave Creek, lower elevation portions of Erickson Ridge, and in Deadman Pass and Racehorse Pass (Figure 15.9-3).

Approximately 47 ha of the Project footprint (4%) was predicted as high-quality spring-summer habitat for Gillette's checkerspot (Table 15.9-1). Quality habitats for Gillette's checkerspot within the Project footprint are located along lower West Alexander Creek, Greek Creek, and Grave Creek Canyon (Figure 15.9-3). Approximately 531 ha of the Terrestrial LSA (2%) was predicted as high-quality spring-summer habitat for Gillette's checkerspot. Areas of quality habitat for Gillette's checkerspot within the Terrestrial LSA are primarily located along West Alexander Creek, Alexander Creek, Harmer Creek, Grave Creek, lower elevation portions of Erickson Ridge, and Deadman Pass and Racehorse Pass. Approximately 13,381 ha of the Birds, Bats, and Amphibians RSA (1%) was predicted as high-quality spring-summer habitat for Gillette's checkerspot (Table 15.9-1).

Crown Mountain Coking Coal Project

Figure 15.9-3
Gillette's Checkerspot Habitat Suitability in the Terrestrial Local Study Area

LEGEND

Habitat Suitability

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

0 2 4
Kilometres

N W E S

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Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
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Map Created By: RB
Map Checked By: HEB
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Table 15.9-1: Gillette's Checkerspot Habitat Suitability in the Project Footprint, Terrestrial LSA, and Birds, Bats, and Amphibians RSA

Habitat Suitability	Amount of Habitat in the Project Footprint		Amount of Habitat in the Terrestrial LSA		Amount of Habitat in the Birds, Bats, and Amphibians RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Birds, Bats, and Amphibians RSA
High (3)	47	4	531	2	13,381	1
Moderate (2)	145	11	2,328	10	90,080	7
Low (1)	101	8	2,124	9	142,869	11
Unclassified (0)	990	77	19,238	79	1,016,841	80

15.9.3 Project Effects Assessment

15.9.3.1 Thresholds for Determining Significance of Residual Effects

The CEAA guidance document *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (CEAA, 2015b) and the KNC's *Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley* (KNC, 2020) provide guidance on significance determination and the role of thresholds beyond which an effect is considered unacceptable. For wildlife species listed under SARA, there are prohibitions against causing harm, injury, or mortality of a species at risk, as well as against destruction of mapped critical habitat (depending on the species and land ownership). This can readily be applied as a threshold that can be used for determining the significance of residual effects. Aside from mapped critical habitat, there are no government or industry regulations or established objectives, environmental standards, or established benchmarks to establish thresholds for the significance of residual effects on Gillette's checkerspot resulting from the Project. The desired endpoint for wildlife management is for persistent and self-sustaining wildlife populations. Any effect then that diminishes the ability of a wildlife population to be persistent and self-sustaining was therefore used as a threshold for the determination of significance for a residual effect. Thus, a significant adverse residual environmental effect on Gillette's checkerspot is one where the Project causes a decline in abundance or change in distribution of Gillette's checkerspot populations such that the populations will not be sustainable in the Terrestrial LSA.

15.9.3.2 Project Effects

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

Potential effects to wildlife are interrelated with other assessment disciplines and components that represent pathways to effects on at-risk bat species:

- Atmospheric Environment Assessment (Chapter 6);
- Acoustic Environment Assessment (Chapter 7);
- Soils and Terrain Assessment (Chapter 8);
- Groundwater Assessment (Chapter 9);
- Surface Water Quantity Assessment (Chapter 10);
- Surface Water Quality Assessment (Chapter 11); and
- Vegetation Assessment (Chapter 14).

15.9.3.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect Gillette's checkerspot. Key Project activities that are expected to interact with Gillette's checkerspot, with a potential for adverse effects, are presented in Table 15.9-2. Specific details on Project activities and components are discussed in Chapter 3.

15.9.3.2.2 Overview of Potential Effects

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

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

Potential effects on Gillette's checkerspot as a result of the Project that are carried forward in the discussion of potential effects are summarized in Table 15.9-3. Because the species has a limited home range (<1 km) and its survival depends on the availability of their food supply (i.e., nectar from yellow composite flowers, including black twinberry), habitat availability and distribution is directly correlated to known occurrence and abundance. As such, the Project effects assessment for Gillette's checkerspot is focused on a single effect, change in Gillette's checkerspot habitat availability and distribution resulting from habitat loss and alteration. The effects of sensory disturbance, disruption to movement, and increased mortality risk were removed from further consideration. The effects of sensory disturbance (noise and vibration) on Gillette's checkerspot are not known, though studies on related butterflies suggest low sensitivity to continuous noise and potentially low overlap in the range of butterfly hearing to the range of frequencies of noise generated during mining (Davis et al., 2018; Mikhail et al., 2018). The effects of disruption to movement and increased mortality risk are not well understood and difficult to separate from habitat loss and degradation and were therefore removed from further consideration.

Table 15.9-2: Project-Gillette's Checkerspot Interaction Matrix and Ranking

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

Project Phase	Project Component	Description of Activities	Gillette's Checkerspot
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road	III
	Coal Handling Process Plant Construction	Excavating and pouring of foundation	I
		Transportation of materials and personnel to site	I
		Constructing of the Coal Handling Process Plant (CHPP)	I
		Commissioning of the CHPP	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations	I
		Transportation of materials to site	I
		Construction of workshop / mine dry	I
		Equipment wash bay and heavy equipment parking	I
		Administration, first aid, and mine dry building	I
		Diesel tank farm	I
		Warehouse	I
		Potable water system	I
		Septic system	I
		Water supply pipelines from Grave Creek and West Alexander Creek	I
		Commissioning of the facilities	I
	Explosives Factory Construction	Construction of the explosives factory	III
	Rail Loadout Construction	Excavation and preparation of the rail bed	I
		Excavation and preparation of foundation stockpiling and coal handling systems	I
		Transportation of materials and personnel to site	I
		Construction of rail loadout	I

Project Phase	Project Component	Description of Activities	Gillette's Checkerspot
		Connection to the CP Fording Sub-line	I
		Commissioning of the rail loadout	I
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul	I
		Training of personnel	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks	I
		Wash facility to decontaminate the bulk explosive delivery trucks	I
		Storage of explosives (detonators and boosters)	I
	Fuel Storage	Receiving bulk fuel deliveries	I
		On-site storage of fuel	I
		Dispensing fuel	I
		Transferring fuel to on-site delivery trucks	I
	Mine Roads Development	Building roads from material sourced on-site	II
		Progressive clearing	III
	Mining	Removal of unconsolidated material	I
		Loading, hauling, and stockpiling of soil	I
		Drilling and loading of blastholes	I
		Detonating the explosives	I

Project Phase	Project Component	Description of Activities	Gillette's Checkerspot
		Loading, hauling, and dumping of mine rock	II
		Loading, hauling, and stockpiling of coal	I
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5)	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15)	I
		Backup reservoir in Grave Creek as a secondary source of process make-up water	I
	Coal Processing	Run of mine coal sizing	I
		Washing coal	I
		Mechanical and thermal drying of coal	I
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities)	I
		Conveying clean coal	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities	I
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4	II
		Management of the Main Sediment Pond discharge	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II
	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities	I
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility	I
	Removal of Linear Infrastructure	Removal of the powerline	I
		Removal of the natural gas line	I

Project Phase	Project Component	Description of Activities	Gillette's Checkerspot
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	I
	Monitoring	Reclamation monitoring	I
		Geotechnical monitoring	I
		Aquatic effects monitoring	I
	Water Management	Management of the Main Sediment Pond discharge	I
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met	I
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use	I
	Rail Line	The rail line will remain as a permanent feature	I
	Monitoring	Reclamation monitoring	I
		Geotechnical monitoring	I
		Aquatic effects monitoring	I

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

The Project has the potential to both directly and indirectly adversely affect Gillette's checkerspot habitat availability and distribution and known occurrence and abundance during the Construction and Pre-Production phases mainly through site preparation activities including logging, clearing, grubbing, and excavation for infrastructure and the pre-production development footprint, as well as for roads and the rail loadout. In addition, the Project has the potential to both directly and indirectly adversely affect Gillette's checkerspot habitat availability and distribution and known occurrence and abundance during the Operations phase through mining activity in the pits (as new surface disturbance occurs as the pit develops) and related dumping of mine rock related to mining activities. Potential effects on Gillette's checkerspot during the Reclamation and Closure and Post-Closure phases were not carried through in the assessment, as once the effects occur and the habitat is lost or impacted, it is considered a permanent effect; as such these phases are not discussed further. It is noted that through progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline as natural regeneration occurs, though habitat will not be restored for many years after Post-Closure.

Table 15.9-3: Potential Effects on Gillette's Checkerspot

Potential Effect	Rationale for Selection of Environmental Effect
Habitat Loss and Degradation	There is a potential for changes to the existing available habitat and distribution (and by extension, Gillette's checkerspot's known occurrence and abundance) through logging, clearing, and grubbing, and excavation for the Project footprint, construction of site components for Project infrastructure, and mining and dumping of mine rock during Operations. In addition, habitat may be degraded through dust deposition.

15.9.3.2.3 Discussion of Potential Effects

The Project footprint overlaps with suitable habitat for Gillette's checkerspot. The total Project footprint area is 1,283 ha, though this includes a buffer area intended to account for uncertainty in precise boundaries of disturbance and not all of the buffer areas will be cleared. The amount of high-quality spring-summer habitat for Gillette's checkerspot potentially lost is approximately 47 ha and located primarily in lower elevation portions of Project footprint (see Section 15.9.2.4.2 for a detailed summary of habitat suitability calculations).

Construction and Pre-Production

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

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

Operations

Direct habitat loss will occur during Operations as a result of progressive clearing of the pits, Mine Rock Storafe Facility, construction of mine roads, and clearing for the construction of the Main Sediment Pond. Habitat degradation may occur in areas not yet cleared, in contingency areas, and in areas directly adjacent to the Project footprint through dust deposition, spread of invasive species, and sedimentation from surface water runoff.

Reclamation and Closure

No further habitat loss or degradation is expected to occur during Reclamation and Closure beyond that which occurred in previous phases.

Post- Closure

No further habitat loss or degradation is expected to occur during Post-Closure beyond that which occurred in previous phases.

15.9.3.3 Transboundary Effects

The home range of Gillette's checkerspot is thought to be relatively small (<1 km). Transboundary movements of Gillette's checkerspot between the Terrestrial LSA and Alberta, the U.S.A., or federal lands are unlikely. Project effects on Gillette's checkerspot will be confined to the Project footprint and effects to populations outside of B.C. or on federal lands are unlikely to occur.

15.9.3.4 Mitigation Measures

Gillette's checkerspot habitat loss and degradation will occur primarily through:

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

Measures to mitigate the impact of habitat loss and degradation on Gillette's checkerspot include:

- Pre-disturbance surveys for Gillette's checkerspot will be completed in high-quality habitats within the Project footprint. If Gillette's checkerspot are identified within the Project footprint, a management strategy will be developed by a Qualified Environmental Professional and in consultation with regulatory agencies;
- Minimizing disturbance and encroachment into natural vegetation, to the extent feasible, by clearing and grubbing only what is required for Construction and Pre-Production activities and progressive development of pits and the Mine Rock Storage Facility during Operations;
- Clearing vegetation only in the year (or prior year) during which the area will be required for construction or operation to minimize the extent of cleared vegetation, to the extent possible;
- Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities;
- Progressively reclaiming areas, as described in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3) and Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6), as soon as possible to restore habitat;
- Implementation of the Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4) to reduce the potential for sedimentation of riparian, wetland and aquatic habitats; and

- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to reduce deposition of dust of vegetation that can affect plant vigour.

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

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

The mitigation measures described above are expected to contribute to avoidance and minimization of habitat loss for Gillette's checkerspot with high effectivenss. The effects are not expected to be fully mitigated and a residual effect may occur. The Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) will be used to validate the efficacy of the proposed mitigation measures.

15.9.3.4.1 Summary of Mitigation Measures

A summary of the key mitigation approaches and their effectiveness to mitigate potential effects is provided in Table 15.9-4. The potential for residual effects were assessed in consideration of the expected effectiveness of the mitigation measures to avoid, minimize, restore, or compensate for potential effects and Gillette's checkerspot measurement indicators defined in the AIR (habitat availability and distribution and known occurrence and abundance).

Mitigation measures will not mitigate all effects of habitat loss and degradation, which was therefore carried forward for further analysis of residual effects.

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

Gillette's checkerspot was assessed for a potential Project-related effect on habitat loss and degradation. Mitigation measures will contribute to avoidance, mitigation, and restoration of this effect, but a residual effect will remain. This effect was therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the effect of habitat loss and degradation.

Table 15.9-4: Summary of Proposed Mitigation Measures Related to Gillette's Checkerspot

Potential Effect	Mitigation Measures	Rationale	Applicable Project Phase(s)	Effectiveness	Residual Effect
Habitat Loss and Degradation	• Minimizing disturbance and encroachment into natural vegetation • Project design • Progressive reclamation	• These measures contribute to avoidance, minimization, and restoration of habitat loss and degradation • Not all effects of habitat loss and degradation are expected to be mitigated	• Construction and Pre-Production • Operations • Reclamation and Closure	High	Yes

15.9.3.5.1 Methods

The assessment of potential residual effects on Gillette's checkerspot was characterized using a combination of quantitative methods and qualitative discussions. Quantitative methods were used to measure habitat loss and degradation. Qualitative discussions are based on scientific literature, baseline studies, habitat models, and professional judgment.

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

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

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

15.9.3.5.2 Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality spring-summer Gillette's checkerspot habitat (Figure 15.9-4 and summarized in Table 15.9-5). The habitat model indicates that the best Gillette's checkerspot habitats are located along West Alexander Creek, Alexander Creek, Harmer Creek, Grave Creek, lower elevation portions of Erickson Ridge, and in Deadman Pass and Racehorse Pass. The Project will result in a predicted loss of up to 47 ha of high-quality Gillette's checkerspot habitat, representing a loss of 8.9% of the total amount of high-quality Gillette's checkerspot spring-summer habitat available in the Terrestrial LSA (531 ha). Loss of high-quality spring-summer habitat will primarily be through logging of merchantable timber and clearing and grubbing during site preparation activities and dumping of mine rock during mining activities. On a proportional basis, the availability of high-quality Gillette's checkerspot habitat is higher within the Project footprint compared to the Terrestrial LSA as whole (4% for Project footprint and 2% for the Terrestrial LSA), meaning high-quality habitat is proportionally more common inside the Project footprint than it is outside.

Table 15.9-5: Change in High-Quality Gillette's Checkerspot Spring-Summer Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) of High-Quality Spring-Summer Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Spring-Summer Habitat in Terrestrial LSA	% of LSA	Change as Proportion of Terrestrial LSA
Spring-summer	47	4	531	2	-8.9