

TABLE OF CONTENTS

5.4.7	Amphibians.....	5.4.7-1
5.4.7.1	Introduction.....	5.4.7-1
	5.4.7.1.1 Regulatory Considerations	5.4.7-1
5.4.7.2	Valued Component Baseline.....	5.4.7-2
	5.4.7.2.1 Past, Present, or Future Projects and Activities	5.4.7-3
	5.4.7.2.2 Traditional Ecological and Community Knowledge.....	5.4.7-4
5.4.7.3	Potential Effects of the Proposed Project and Proposed Mitigation	5.4.7-4
	5.4.7.3.1 Study Area Boundaries	5.4.7-5
	5.4.7.3.2 Temporal Boundaries	5.4.7-7
	5.4.7.3.3 Administrative Boundaries.....	5.4.7-9
	5.4.7.3.4 Technical Boundaries	5.4.7-9
	5.4.7.3.5 Potential Project Effects	5.4.7-9
	5.4.7.3.6 Assessment Approach of Measuring Potential Effects	5.4.7-16
	5.4.7.3.7 Model Results for Quantification of Potential Project Effects on Habitat.....	5.4.7-19
	5.4.7.3.8 Mitigation Measures	5.4.7-28
5.4.7.4	Residual Effects and their Significance.....	5.4.7-33
5.4.7.5	Cumulative Effects	5.4.7-41
5.4.7.6	Limitations	5.4.7-41
5.4.7.7	Conclusion.....	5.4.7-41

List of Tables

Table 5.4.7-1:	Assessment and Permitting Regulations Regarding Amphibians.....	5.4.7-2
Table 5.4.7-2:	Project Component Footprint Areas	5.4.7-6
Table 5.4.7-3:	Listed Past, Present and Future Projects/Activities Potentially Interacting with Amphibians.....	5.4.7-10
Table 5.4.7-4:	Potential Interaction of Project Activities with Amphibians.....	5.4.7-11
Table 5.4.7-5:	Categories of Potential Environmental Effects / Issues for Amphibians	5.4.7-12
Table 5.4.7-6:	Potential Key and Moderate Interactions with Categories of Potential Environmental Effects / Issues for Amphibians.....	5.4.7-14
Table 5.4.7-7:	Temporal Boundaries	5.4.7-15
Table 5.4.7-8:	Overview of Potential Project Effects on Amphibians	5.4.7-15
Table 5.4.7-9:	Potential Western Toad Suitability Living Habitat Area Affected within Footprints, LSAs, and RSA.....	5.4.7-21
Table 5.4.7-10:	Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Amphibians during Mine Site Development	5.4.7-31
Table 5.4.7-11:	Summary of Categories of Potential Environmental Effects / Issues and Mitigation Measures – Amphibians	5.4.7-34
Table 5.4.7-12:	Characterization of Residual Environmental Effects for Amphibians	5.4.7-35
Table 5.4.7-13:	Threshold(s) for Determining Magnitude of Residual Amphibian Habitat and Population Effects in the RSA	5.4.7-36
Table 5.4.7-14:	Residual Effects Assessment Summary for Amphibians	5.4.7-37

TABLE OF CONTENTS (cont.)

List of Figures

Figure 5.4.7-1 Study Area Boundaries for Amphibians and Associated Habitat5.4.7-8
Figure 5.4.7-2: Amphibian Habitat Rating for Living Suitability.....5.4.7-22

List of Appendices

Appendix 5.4.7A Western Toad Species Account (AMEC E&I)

5.4.7 Amphibians

5.4.7.1 Introduction

This section assesses the potential effects of the Project on the amphibians Valued Component (VC). The indicator species is western toad (*Anaxyrus boreas*). The assessment is described in the subsections below and will be conducted for this species. This introduction describes the information sources of the assessment and the applicable regulatory framework for the assessment of the VC (**Section 5.4.7.1.1**). The spatial, temporal, administrative, technical boundaries and assessment approach are described in **Section 5.4.7.3**. Western toad was selected as an indicator for amphibian health due to its listing as a SARA species of special concern and its link to wetland habitats and terrestrial habitats required by amphibians (**Appendix 5.4.7A**). The habitat required for western toad is representative of most of the wetland and terrestrial environments found within the study areas. The western toad is a species of conservation concern, Blue-listed provincially (British Columbia Conservation Data Centre (BC CDC), 2013), and listed as a species of Special Concern federally (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2014). The western toad is ranked as secure globally (G4) and nationally (N4) in both the United States and Canada (NatureServe, 2013). However, globally, it is on the International Union for Conservation of Nature (IUCN) Red List as near threatened, reflecting declines and extirpations over parts of its distribution in the United States.

Western toads occur in a variety of habitats, including forests, wetlands, clearcuts, and grasslands; usually include a combination of upland and wetland areas in summer (Gregory and Campbell, 1984). High value western toad breeding habitat is found in aquatic habitats with permanent, non-flowing shallow waterbodies; moderate value habitat comprises permanent, shallow waterbodies with weak flows (Davis, 2000). Western toads disperse into forested areas and wet shrublands, as they appear to favour dense shrub cover where they are protected from desiccation and predation (Davis, 2000). Summer home ranges are distinct and approximately 3 ha to 7 ha in size (Davis, 2000). The western toad occurs throughout BC, except in the northeast corner of the province (BC Ministry of Environment (BC MOE), 2013). The western toad is relatively intolerant of urban expansion and the conversion of habitat for agricultural use (Davis, 2000 and 2002). It is very dependent on oligotrophic fishless ponds and small lakes for breeding. It is also sensitive to habitat deterioration, introduced exotic predators (e.g., bullfrogs, dogs, and domestic cats), competitors, and disease (Davis, 2000 and 2002).

5.4.7.1.1 Regulatory Considerations

To assess potential effects, there are applicable regulatory requirements (**Table 5.4.7-1**) that apply to amphibians and different phases of Project development, mitigation, and reclamation. Amphibian species are subject to provincial wildlife regulations, and Red- and Blue-listed species may be subject to the *Species at Risk Act* (SARA) (Government of Canada, 2002). Broad habitat and species protection measures in the *BC Forest and Range Practices Act* and *BC Wildlife Act* provide direction for protection of amphibians, including the western toad.

Table 5.4.7-1: Assessment and Permitting Regulations Regarding Amphibians

Statute/ Guideline	Brief Description or Requirements	Data Required to Meet Regulation/Guideline	Timeframe (Pre/Post-Application Submission)
Canada <i>Species at Risk Act</i>	Species at risk may require federal permits to capture the species and recovery plans may exist. Western toad is listed as a Special Concern species.	Occurrence and abundance/distribution data from surveys and habitat assessment.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting western toad.
BC <i>Wildlife Act</i>	Permits are required for handling the species and conducting surveys that may harass animals or spread disease.	Abundance and distribution data from BC CDC records and surveys, wildlife habitat and suitability mapping.	Wildlife management plans, wildlife permits for surveys and collection/salvage.
BC <i>Forest and Range Practices Act</i>	Riparian areas, wetlands and Old Growth Management Areas require special management.	Impact assessment and proposed mitigation/offsets required to assess habitat loss to old-growth and wetland areas, both of which can include important habitat for amphibians.	Wildlife management plans and permitting for exploration.
LRMP Resource Management Zones	The Vanderhoof LRMP (BC ILMB, 1997) presents a number of wildlife objectives and strategies for maintaining wetlands and wetland function that would be applicable to the western toad.	Supporting scientific research opportunities (e.g. monitoring and comparing vegetation succession and wetland function; periodically inventorying amphibian populations; assessing high-quality wetland habitat from destruction.	Wildlife management plans, wetland management plans and permitting for exploration.
BC Conservation Data Centre	Western toad is provincially Blue-listed.	Habitat and population data related to Project.	Ongoing

Note: BC CDC = British Columbia Conservation Data Centre; LRMP = Land and Resource Management Plan

5.4.7.2 Valued Component Baseline

Background information searches did not identify historical surveys conducted for amphibians within the study areas. However, surveys for amphibians and reptiles in the Prince George Forest District were completed in 1996 and 1997 to study the regional distribution and abundance of amphibians and reptiles (Kinsey and Law, 1998). In these Kinsey and Law studies, the largest variants of the Sub-Boreal Spruce (SBS) and Engelmann Spruce – Subalpine Fir (ESSF) biogeoclimatic (BGC) zones were selected for surveying. The SBS Stuart Dry Warm variant (SBSdw3) occurs within the Project area and is found along the proposed transmission line and the Kluskus Forest Service Road (FSR) in the Regional Study Area (RSA). The SBSdw3 variant contains four amphibian species: western toad (*Anaxyrus boreas*); Columbia spotted frog (*Rana luteiventris*); wood frog (*Lithobates sylvatica*); and long-toed salamander (*Ambystoma macrodactylum*).

During baseline amphibian surveys, western toads were detected at six locations within the mine site Local Study Area (LSA). All of the toads detected were found within predominantly lodgepole pine forest with 40% to 60% crown closure (**Appendix 5.4.7A**). Roadside surveys were conducted in 2012 and 2013, and the number of amphibian detections was 1.4 individuals per kilometre and 0.4 western toads were detected per kilometre within the mine site. Sites within the study areas were also surveyed once during each survey period from June to July in 2011, 2012, and 2013 (AMEC, 2013). Finally, incidental observations of amphibians were recorded during field studies for other species.

Evidence of wood frog reproduction was observed at the mine site LSA; however, the majority of available potential breeding habitat for amphibians was found in anthropogenic waterbodies, such as ditches. Many of the natural waterbodies within the mine site LSA do not provide suitable breeding habitat, which is likely due to cold-water temperatures (AMEC, 2013). Baseline and incidental field observations indicate that small late ephemeral pools in the study area may provide breeding habitat. Sections of the Project area within the Boreal Altai Fescue Alpine Undifferentiated subzone (BAFAun) likely do not represent high quality habitat for wood frog (AMEC, 2013).

Within the RSA, 43 kilometres (km) of road were surveyed and detections of amphibians occurred at 44 sites. Western toads, Columbia spotted frogs, and wood frogs were detected in adult and tadpole stages, and long-toed salamander neonates were detected. The western toad was detected at 13 sites, and the habitat surrounding these areas was a mix of forest, open meadow/shrubs, and permanent water, which corresponds with other studies that recorded similar mixes of amphibians required for adult non-breeding habitat (COSEWIC, 2002c). Within the ESSF Nechako Moist Very Cold variant (ESSFmv1), evidence of breeding was found in a pole/sapling forest surrounded by mature forest. Within the SBS Kluskus Moist Cold variant (SBSmc3), evidence of breeding was found in mature/old-growth forest and in wetlands. In 2013, the largest number of tadpoles detected occurred at Snake Lake where thousands of toad tadpoles were observed within the shallow sedge edges of the western shore. The long-toed salamander was detected breeding at seven sites, and the Columbia spotted frog and wood frog were both detected breeding at three sites.

All four amphibian species expected to occur within the LSA and RSA were detected in the mine site and transmission line sites. All four species were detected in the SBS zone, and two species, the western toad and Columbia spotted frog, were detected in the ESSF zone. Waterbodies within the LSA that provide a suitable pH and temperature for amphibians are expected to be used by the western toad; however, their presence within any of the areas not surveyed is unknown (AMEC, 2013).

5.4.7.2.1 Past, Present, or Future Projects and Activities

Other projects or activities considered in the assessment are in the Project Inclusion List (PIL). The PIL identifies those projects or human activities that may overlap spatially or temporally with the Project as summarized in **Table 4.3-11. Appendix 4C** presents the detailed Project Inclusion List and descriptions of various projects and activities used for assessing potential environmental effects.

Pre-existing habitat loss and fragmentation due to logging and road development has altered the higher suitability low elevation habitat within the Project area. The mountain pine beetle has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested while remaining forests are in various stages of degeneration. Mineral exploration in the area increased the number of access roads. Amphibian baseline information was collected in the study areas that have been altered by these past and present activities. The future activities in the RSA are expected to include similar activities. With the increase of industrial and agricultural activities, loss of wetlands and wetland function may result in less suitable areas for amphibians.

5.4.7.2 Traditional Ecological and Community Knowledge

Community and traditional knowledge did not specifically identify amphibians. However, amphibians, particularly frogs, are of particular importance to many Aboriginal groups (First Voices, 2011). The Carrier people commonly refer to their governance system as the *bah'lats* or potlatch. The Carrier society includes four clans: *Likh ji bu* (Bear), *Gilhanten* (Caribou), *Jihl tse yu* (Frog), and *Likh sta Mis yu* (Beaver); and each clan includes a number of sub-clans (Carrier Sekani Nations, 2014). The Nadleh Whut'en and Stelat'en First Nations' clan structures include a frog clan (First Voices, 2011).

The comments and issues raised by Aboriginal groups are further discussed in **Section 3**, which contains the public and Aboriginal issues tracking tables for the Project. **Section 14** through **Section 16** provides a summary of the Aboriginal background, rights, and interests for the Project.

5.4.7.3 Potential Effects of the Proposed Project and Proposed Mitigation

This subsection identifies and analyzes potential adverse effects on the amphibian VC resulting from the proposed Project's construction, operations, closure and post-closure phases.

It first describes the features of the study area and temporal, administrative, and technical boundaries. (**Section 5.4.7.3.1 to 5.4.7.3.5**).

Then, **Section 5.4.7.3.6** details the approach used in the assessment followed by **Section 5.4.7.3.8** Mitigation Measures.

The assessment considers the following:

- Terrestrial habitat, including the quality and quantity of any lost habitat for relevant species of amphibians;
- Feeding, or breeding habitats;
- Any wetland habitat alteration or loss;
- Barriers to movement, including the roads developed as part of the mine and their potential effects on amphibian movements;
- Disturbance of daily or seasonal wildlife movements (e.g., dispersal corridors), which would include potential hazards and conflicts associated with mine access and travel corridors of amphibians;

- Wildlife habitat is being rated for suitability as a surrogate for wildlife productivity;
- Any species of amphibians that are Rare, Vulnerable, Endangered, Threatened, or of Special Concern as listed under provincial Blue and Red lists, SARA, COSEWIC, as well as, any species of international significance (**Section 5.4.7.1.1**); and
- Implications of the Project acting as an attractant for particular species.

A range of potential effects on amphibians can be associated with a project involving a mine site, and linear features including roads, pipelines and transmission line. Assessment boundaries define the scope or limits of the assessment. The boundaries encompass the areas and time periods during which the Project is expected to interact with amphibians (spatial and temporal boundaries), any constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and any limitations in predicting or measuring changes (technical boundaries). Each of these boundaries is defined in the subsections below.

Activities during each stage of the proposed Project could potentially interact with the amphibian fauna. Habitat loss, features that act as attractants, potential mortality, changes in habitat availability, noise disturbance (displacement), changes in predator numbers and predation success, and disruptions of movement are the predicted key and moderate interactions of the proposed Project related to amphibians. Taking a conservative approach, both Key and Moderate interactions are combined and considered jointly in assessment of project and cumulative effects.

5.4.7.3.1 Study Area Boundaries

Two geographic scales were defined for considering the Project effects on amphibians and amphibian habitat in the Project area, as shown on **Figure 5.4.7-1** and described below. These areas were used for collecting baseline information. The Project area encompasses the LSA and the RSA as described below. Past, present, and future activities that may affect amphibians within these areas were identified and assessed within the RSA.

LSA: The AIR describes the LSA as follows (**Table 4.3-1 Section 4**):

- Mine Site: Approximate 500 m buffer around the proposed mine site facilities; and
- Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: approximately 250 m buffer from each side of the linear component boundary.

The rationale for the LSA is as follows (**Table 4.3-1 Section 4**):

- The LSA includes the entire mine site where habitat will be removed and considers a buffer to take into account sensory disturbances; and
- The LSA includes all linear components and a buffer to take into account sensory disturbances. The buffer along the linear corridors varies because activities along those corridors vary from an access road that may have greater sensory disturbance to a transmission line with limited human activity or traffic after construction.

The LSA for the purpose of the amphibian VC comprises 22,509 ha and includes 7,032 ha for the Project footprints (**Table 5.4.7-2**). The LSA includes the proposed mine site area (the mine site footprint plus a 500 m buffer), and all linear components areas (linear components with 250 m buffer on each side of linear component boundary, except for the airstrip which is 300 m buffer on each side). The linear component boundary, also referred to as the footprint, is comprised of the feature’s right-of-way (ROW) and an additional buffer. The linear component boundary widths are as follows: existing Kluskus FSR is 20 m (20 m ROW with no buffer), proposed mine access road is 120 m (20 m ROW with 50 m buffer each side), proposed transmission line is 140 m (40 m ROW with 50 m buffer on each side), proposed freshwater supply pipeline is 110 m (10 m ROW with 50 m buffer on each side), proposed airstrip is 200 m (100 m ROW with 50 m buffer each side), and the proposed airstrip access road is 10 m (10 m ROW, with no buffer). The FSR re-alignment and transmission line access roads are included in the LSA area for these features. The transmission line includes a mainline route and two potential re-routes, the Mills Ranch and Stellako options. The final location of the transmission line access roads will be determined during the detailed engineering and permitting stage, and will consider traditional knowledge and traditional use information provided by Aboriginal groups as appropriate. Its design will follow the same principles of using existing roads avoiding sensitive habitat to the extent possible.

Table 5.4.7-2: Project Component Footprint Areas

Component	Area (ha)
Mine Site	4,430
Access Road	95
Existing Kluskus Forest Service Road	253
Airstrip	50
Freshwater Pipeline	132
Main Transmission Line	1,806
Mills Ranch Transmission Line	202
Stellako Transmission Line	62
Total Project Footprint	7,032

RSA: The AIR describes the RSA as follows (**Table 4.3-1 Section 4**):

- Mine Site: Includes ungulate winter range established for the Tweedsmuir-Entiako caribou herd (U-7-012). The western and southern edges of the RSA outline these winter ranges. The southwestern boundary follows the Upper Blackwater Management Zone where the RSA then follows the Blue Road till it reaches the Ootsa – Kluskus FSR and follows this north until it reaches the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir; and
- Transmission Line and Kluskus FSR. Approximate 1 km buffer from the linear component boundary.

The rationale for the RSA is as follows (**Table 4.3-1 Section 4**):

- Extends beyond the mine site LSA to consider natural barriers for wildlife such as large water bodies or watershed divides.

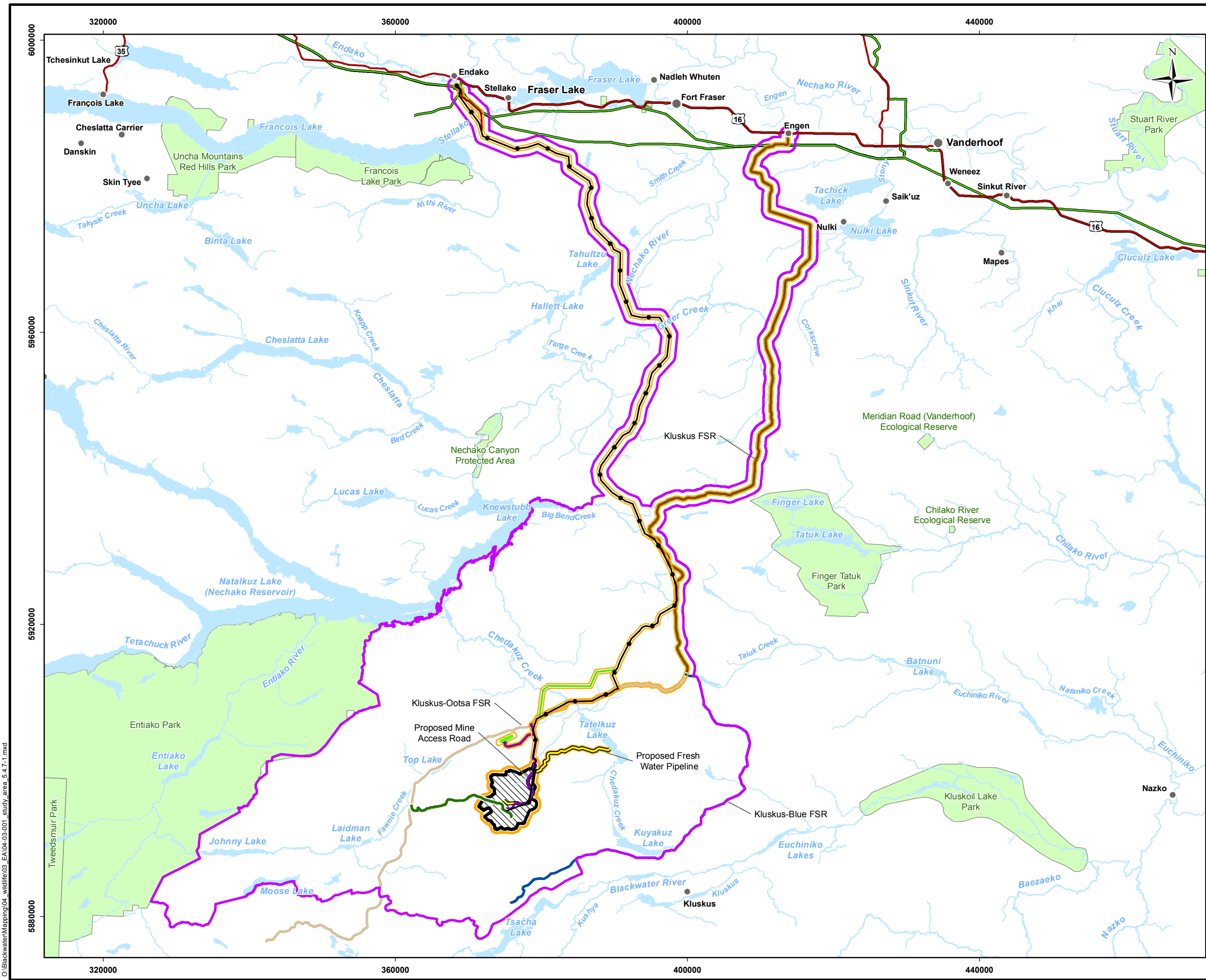
The RSA for the purpose of the amphibian VC; the RSA comprises 291,714 ha and is large enough to assess the seasonal home range movements and important seasonal habitats of most amphibian species considered, some of which have long distance movement patterns. The RSA was selected to include a wide variety of habitat types also found in the LSA, allowing the assessment of relative abundance of habitat within the LSA relative to the greater region within which the Project is situated (**Figure 5.4.7-1**).

5.4.7.3.2 Temporal Boundaries

Temporal boundaries of the Project, which are contingent on permitting, include four primary phases.

- **Construction phase:** The construction phase of the Project will occur over 2 years and will likely start following receipt of the required permits;
- **Operations phase:** The operations phase of the Project will extend for approximately 17 years;
- **Closure phase:** The closure phase is estimated to last approximately 18 years (ending in Year 35); and
- **Post-closure phase:** The post-closure phase starts in Year 35.

In terms of duration of effects, the following terms are used in this effects assessment: Short-term effects occur during the construction phase; Medium-term effects are not applicable for amphibians as they were considered long term to provide a conservative assessment; Long-term effects occur throughout operations and closure; and Chronic effects extend into post-closure or beyond.



Legend

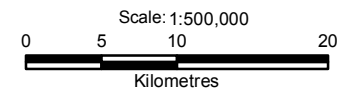
- Populated Place
- Ⓜ Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Stream
- Waterbody
- Parks & Protected Areas

Project Components

- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Reroute)
- Proposed Transmission Line (Stellako Reroute)
- Proposed Freshwater Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- ▨ Proposed Mine Site

Wildlife and Wildlife Habitat

- ▭ Local Study Area
- ▭ Regional Study Area



Reference
BC Government GeoBC Data Distribution

CLIENT: **newgold™**

PROJECT: **Blackwater Gold Project**

Study Area Boundaries for Amphibians and Associated Habitat

DATE: September, 2015	ANALYST: MY	Figure 5.4.7-1
JOB No: VE52277	QA/QC: MB	
GIS FILE: 04-03-001_study_area_5.4.7-1.mxd		amec
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-001_study_area_5.4.7-1.mxd

5.4.7.3.3 Administrative Boundaries

The Vanderhoof Land Resource and Management Plan (LRMP) identify smaller Resource Management Zones (RMZs) that have different resource development and conservation objectives. Each RMZ has a selection of species of management concerns and objectives to guide land use decisions and management. The mine site and associated infrastructure including the roads and transmission line are located within the following RMZs: Nechako Valley, Nechako West, Upper Nechako River, Vanderhoof South, Crystal Lake, Kluskus, Chedakuz, Davidson Creek, and Laidman Lake. These RMZs have objectives that are considered for each species effects assessment if relevant. The Project is located within five Wildlife Management Units (WMUs): 5-12, 5-13, 6-1, 7-11, and 7-12. Each WMU is the primary designation tool for conservation lands under section 4 of the *Wildlife Act*. Conservation and management of fish, wildlife, and their habitats are priority in a WMU and are used to set hunting regulations (BC MFLNRO, 2014).

5.4.7.3.4 Technical Boundaries

Technical boundaries for the assessment are established by the accuracy of the wildlife habitat model predictions used in the effects assessment. There is an uncertainty/margin of error associated with the use of habitat suitability models; however, Resource Inventory Standards Committee (RISC) standards for ratings and suitability classes were followed. Therefore, these include acceptable levels of uncertainty for an assessment. Surveys were completed within the LSA and RSA.

5.4.7.3.5 Potential Project Effects

The named projects from the PIL in **Section 4, Table 4.3-11** that represent present and future projects will not have interactions with the Project however the listed activities from the list will (**Table 5.4.7-3**). Pre-existing habitat loss and fragmentation due to logging and road development has altered the higher suitability low elevation habitat within the Project area. The mountain pine beetle has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested while remaining forests are in various stages of regeneration. Mineral exploration in the area increased the number of access roads. Amphibian baseline information was collected in the study areas that have been altered by these past and present activities. The future activities in the RSA are expected to include similar activities. With the increase of industrial and agricultural activities, loss of wetlands and wetland function may result in less suitable areas for amphibians.

Table 5.4.7-3: Listed Past, Present and Future Projects/Activities Potentially Interacting with Amphibians

Project/Land Use	Description/Status	Location relative to Blackwater Project	Timing Relative to Blackwater Project	Potential Adverse Effect to Amphibians and Amphibian Habitat
Mining – exploration	Two developed prospects, exploration programs, and numerous mineral claims and tenures; includes several New Gold mining exploration projects, such as Van Tine, Capoose, Fawnie, Emma, and Auro	In LSA and RSA	Ongoing	Alteration or destruction of terrestrial habitats due to exploration activities
Forestry – logging	Various historical, active, and pending logging tenures and woodlot licences; private forest lands	In LSA and RSA	Ongoing	Alteration or destruction of terrestrial habitats due to forest harvesting and silviculture activities. Potential alterations to streams and water bodies due to sedimentation.
Agriculture	69 active range tenures within the RSA	Location relative to Blackwater Project	Timing Relative to Blackwater Project	Alteration and destruction of riparian and shoreline habitat due to livestock. Alteration to vegetation communities due to livestock activities including introduction of invasive plants. Compaction of soil due to livestock.
Transportation	Traffic associated with recreation and other activities along the Kluskus FSR Several airports, airstrips, and aerodromes for fixed wing and seaplanes	Intersects transmission line LSA	Future	Alteration of riparian habitat. Increased suspended sediment concentrations and deposition. Direct road mortality during amphibian dispersal and migration.

Project effects consider both the key and moderate interactions defined and identified in **Section 4, Table 4.3-2** (Project Component and Activity Interaction Matrix). In order to conservatively assess interactions of the project with amphibians and amphibian habitat, both key and moderate interactions were combined and included in the modeling and effects assessment. The key and moderate interactions are further identified using a ranking table (**Table 5.4.7-4**) to identify different Project phases and whether the resulting effect can be managed to acceptable levels through standard operating practices through the application of best management practices (BMPs) or codified practices or if the resulting effect may exceed acceptable levels without implementation of specified mitigation. The table is used to guide specific mitigation and monitoring needed for this VC.

Table 5.4.7-4: Potential Interaction of Project Activities with Amphibians

Project Activities and Physical Works	Potential Key and Moderate Interactions
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Clearing and grubbing	2
Open pit preparation	2
General earthworks (moving surface soil)	2
Equipment operation	2
Road upgrading and construction	2
Borrow pit excavation	2
Road and airstrip use	2
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Process plant	1
Transportation system	1
Temporary waste rock stockpiles	2
Tailings storage facility	1
Camp	1
Road use	1
Water collection pond	2
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Roads	2
Reclamation	2

Note: 0 = No interaction.
 1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
 2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.

Several measurable Categories of Potential Environmental Effects / Issues for Project key and moderate effects were defined and the rationale for the selection of each category of assessment is provided in **Table 5.4.7-5**.

Table 5.4.7-5: Categories of Potential Environmental Effects / Issues for Amphibians

Category of Assessment	Notes or Rationale for Selection
Habitat Loss and Alteration	Impacts to population abundance and distribution are directly affected by habitat availability and displacement from effective habitat. Vegetation clearing for the Project and disturbance from Project activities during construction and operations may affect habitat availability and quality. This included a rating of habitat quality for western toads so that the relative quantitative loss of moderate to high quality habitat was assessed in relation to regional availability of suitable habitat measured as percentage lost and hectares lost.
Changes in Amphibian Population Dynamics	Predation may be affected by changes in watersheds resulting in differential mortality of amphibian species. This relies on provincial data and potential monitoring data of amphibian populations and distribution over the life of the Project, including species, features, and occurrences based on field surveys and BC CDC records. For amphibians, the focus is on relative abundance and distribution in areas of potential impact.
Mortality Risk	Assessment of the potential impacts of roads, pits, and other structural features on direct mortality. The assessment includes potential effects of direct mortality from vehicles. This relies on provincial data and potential monitoring western toad mortality related to the Project area. This is a qualitative estimate based on risk of vehicle collisions with a threshold of multiple toad mortality (e.g. >20 at any specific location) triggering adaptive management.
Changes in Amphibian Movement Patterns	Changes in movement patterns may impact breeding and survival rates, and may increase predation/mortality. Western toads have been documented as avoiding busy roads or having increased mortality. This relies on monitoring and surveys. Aspects such as noise, light, odours, and human presence may affect use of habitats close to Project activities. For western toads, changes in movement patterns may impact species access to hibernation sites, breeding, and forage habitats.
Changes in Amphibian Health	Contaminant loading may affect amphibian health. This is a qualitative measure that relies on reporting of animal health and provincial data. Health can include assessment of the potential impacts of identified contaminants of potential concern on feeding, movement, reproductive behaviour and success, and direct mortality. Introduction of Chytrid fungus into watersheds is a potential health risk to amphibians.

Note: Includes input from consultation with regulators, Aboriginal organizations, affected stakeholders and the public, as well as EA guidelines, other regulatory drivers, policies and/or programs

Evidence suggests that, below certain thresholds of habitat cover, species may decline more rapidly than would be expected from habitat loss alone. When remaining functional habitat is greater than 10% to 30% in a region, species are still affected by habitat loss (Andr n, 1994; Fahrig, 1997; Swift and Hannon, 2010) but are not necessarily at risk of regional extirpation. Depending on the taxa and landscape, residual habitat thresholds ranging from 10% to as high as 60% may be required to avoid rapid population declines (Bennett and Ford, 1997; Villard et al., 1999; Swift and Hannon, 2002). However, most threshold evidence supports a minimum 30% residual habitat threshold at a landscape level to avoid rapid declines that may lead to regional extirpation (Swift and Hannon, 2010). For this assessment, precautionary thresholds have been identified for species for which specific thresholds do not exist. A precautionary threshold is defined as the point before a resource would be expected to undergo an unacceptable change, either from an ecological, regulatory, or social perspective. This definition allows the Proponent and regulators to enact mitigation measures with sufficient time to prevent the particular resource from reaching or exceeding the true ecological threshold. The following precautionary thresholds are used in this assessment: 70% residual habitat (30% loss) for species not identified as a conservation concern (e.g., amphibians other than western toad, moose, water birds, forest birds); and 80% residual habitat (20% loss) for species of conservation concern (western toads, caribou, grizzly bear,

northern myotis). The precautionary threshold of 20% loss is used for assessment of the effects within the RSA because western toad is a federally listed species.

The next step was to assess each of these relative interactions of the Project phases and activities with amphibians to examine which Categories of Potential Environmental Effects / Issues may be expected in different areas and times (**Table 5.4.7-6**).

Potential key and moderate interactions are linked to the temporal scale of the Project phases and vary in the time needed to return to baseline conditions (**Table 5.4.7-7**). For instance, sensory disturbances tend to be very short-lived and transient, and effects may be related to frequency of disturbance and duration, but recovery may be very quick once disturbances stop. Conversely, habitat loss due to Project construction may require greater amounts of time to recover to baseline conditions.

Anticipated Project effects include habitat loss (e.g., cleared vegetation and wetland loss, changes to habitat quantity and quality) and some potential degradation (**Table 5.4.7-8**). The construction of the mine site, access roads, transmission line, freshwater supply pipeline, and airstrip will require the removal of vegetation. A small amount of vegetation will be lost permanently (greater than 100 years), while the majority of other areas will be reclaimed progressively or during closure. The potential for habitat degradation for amphibians was evaluated using the water quality assessment (**Section 5.3.3**) to determine any potential changes in water quality within the Project area and an Environmental Effects Monitoring (EEM) program will be used to validate or refute effects predictions. Adaptive management practices will be used to mitigate significant residual effects observed through the EEM program that are reasonably ascribed to mine activities.

In addition to direct habitat loss, activities on the mine site, airstrip, and access roads may reduce effective use of habitat, and road use may result in direct mortality from vehicle collisions. Chemical hazards, disease, and attractants have a small potential to affect western toad.

Table 5.4.7-6: Potential Key and Moderate Interactions with Categories of Potential Environmental Effects / Issues for Amphibians

Project Activities	Category of Assessment				
	Habitat Loss and Alteration	Changes in Wildlife Population Dynamics	Mortality Risk	Changes in Amphibian Movement Patterns	Changes in Amphibian Health
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Clearing and grubbing	2	1	1	2	0
Open pit preparation	2	1	1	1	0
General earthworks (moving surface soil)	2	0	0	2	1
Equipment operation	1	1	2	1	1
Road upgrading and construction	2	1	2	2	1
Borrow pit excavation	2	1	1	2	1
Road and airstrip use	1	1	2	1	1
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Open pit mining	1	1	1	1	1
Process plant	1	1	1	1	1
Transportation system	2	1	1	2	1
Temporary waste rock stockpiles	1	1	1	1	1
Tailings storage facility	1	1	1	1	1
Camp	1	1	1	1	1
Road use	2	1	2	2	1
Water collection pond	2	1	2	2	1
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Roads	2	1	2	2	1
Reclamation	2	1	1	2	1

Note: 0 = No interaction.
 1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
 2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.

Table 5.4.7-7: Temporal Boundaries

Category of Assessment	Temporal Boundary
Habitat Loss and Alteration	Construction through to late seral structures and vegetation compositions (50 to 80 years after reclamation)
Changes in Wildlife Population Dynamics	All phases after clearing and during construction
Mortality Risk	Construction and operations
Changes in Amphibian Movement Patterns	Construction and operations
Changes in Amphibian Health	All phases, and into closure, due to potential contaminants, uptake or delay in recovery of habitat

Table 5.4.7-8: Overview of Potential Project Effects on Amphibians

Category of Assessment	Description	Project Phases	Project Components
Habitat Loss and Alteration	Areas that will be cleared of vegetation for Project infrastructure (e.g., facility direct footprint, road surface and cut/fill, borrow areas, etc.) result in temporary to long-term habitat loss. Loss and degradation of habitat will occur during construction phase and adverse effects will be evident through to closure and post-closure phases. Road ditches and borrow pits frequently were observed to provide suitable breeding habitats.	Construction, operations	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip
Mortality Risk	Direct mortality from physical exposure to traffic or attractants, disrupted movements and displacement from areas used for reproduction or feeding, particularly wetlands. New access to toad breeding ponds by fish may increase mortality.	Construction, operations	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip
Change in Amphibian Movement	Indirect mortality from movement restrictions or access interruption between breeding and living sites	Construction, operations	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip
Change in Amphibian Health	Risk of disease introduction or impact from dust.	Construction, operations	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip

Four of the five potential Categories of Potential Environmental Effects / Issues, habitat loss and alteration, change in amphibian mortality risk, movement patterns, and amphibian health are applicable to the Project and therefore carried through the effects assessment. Changes in population dynamics will not be considered further in the assessment due to the mitigation measures in place and a no-net-loss of wetlands within the Project area. Mitigation measures include maintaining the amount of wetlands, conducting pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season, and reclamation of forest habitat which will be suitable habitat for western toads. The western toad is a wide ranging species throughout the Project area, and the mitigation measures included in the wildlife management plans, water management plan, and atmospheric dust management plan will limit potential effects on these categories because habitat will be maintained or reclaimed, incidental mortality will be mitigated by salvage and adaptive management will address any site-specific mortality concerns (WLMP). Although effects are not measured directly, changes in western toad movement patterns are considered in habitat alteration through buffering and downgrading habitat suitability classes near infrastructure.

5.4.7.3.6 Assessment Approach of Measuring Potential Effects

Both quantitative and qualitative approaches were used for the assessment of potential Project effects on western toads. A quantitative approach was used for determining the potential loss and alteration of habitat within the RSA and a qualitative approach was used for assessing an increase in mortality risk, amphibian health, and changes in movement patterns.

5.4.7.3.6.1 Habitat Suitability Model Assumptions

Habitat suitability modeling is based on assumptions related to TEM and PEM habitat interpretations, professional judgement and experience related to amphibians and amphibians habitat, literature and traditional knowledge. Assumptions include the quantitative rating of TEM and PEM units for value to amphibians during different life history stages and seasons and are based on similar models used and tested throughout BC and assessed over time through population estimates and research. Specific assumptions related to habitat quality are described in each sub-model. Habitat suitability value is assumed to reflect the current value of habitat and not the future value.

Assumptions related to mortality, disturbance, displacement, predation and health are described in the effects sections related to these categories of assessment. Habitat ratings were interpreted to represent potential reductions in habitat quality and effectiveness related to mine infrastructure. Models assumed that all suitable habitat could be used and that habitat was included in calculations of habitat impacted by the Project.

5.4.7.3.6.2 Habitat Loss and Alteration

As part of the environmental assessment and to address SARA concerns, western toad habitat loss due to the Project was assessed using habitat suitability modelling. Modelling habitat for western toad quantifies the amount of area that may be affected by the Project.

Western toads require a variety of terrestrial and aquatic habitat to complete the different stages of their life cycle: spring breeding, summer foraging, and winter hibernation. Hibernation normally occurs on land, sometimes in communal hibernacula, usually near breeding ponds. Each spring, toads migrate from hibernacula to breeding ponds where they mate. After breeding, adult toads disperse from breeding sites into upland aquatic and terrestrial habitats where they forage for the summer months. Common terrestrial habitats used by western toads are forested areas, wet shrublands, avalanche slopes, and sub-alpine meadows. Two types of habitat were considered for habitat suitability mapping, growing habitat (spring, summer and fall) and breeding habitat, with habitats near suitable breeding and hibernation conditions being rated highest. Because toads may travel up to 2 km from breeding ponds, this was incorporated into the habitat suitability model (Jones, 1999).

5.4.7.3.6.3 *Western Toad Growing Habitat Model*

Very little is known about the specific limiting habitat constraints of western toads, but they do have the broadest elevation range of any amphibian, and are one of few amphibians that can be found in alpine areas (Wind and Dupuis, 2002). Due to the moderate level of information available about the specific life requisites, a 4-class (nil, low, moderate and high ratings) habitat model was used. Only extremely dry and/or cold habitats (e.g., talus, snow/ice) were deemed nil for the western toad.

Breeding habitat of western toads includes wetlands, ponds, stream edges, lake margins, ditches, and road ruts (BC CDC, 2013). The species congregates at breeding sites. The western toad is an explosive breeder, congregating along the shallow margins of lentic breeding sites for a one- to two-week period each spring (Gyug, 1996). They are highly philopatric; most males return to breeding sites annually, whereas females return every 1 to 3 years. Females travel farther from breeding sites, moving 400 m to 600+ m upland to summer ranges; occasional long distance excursions of up to 7.2 km have been noted (Jones, 1999). Summer home ranges are distinct and approximately 3 ha to 7 ha in size (Klinkenberg, 2013; Bartelt et al., 2004; Brown, 2010).

Newly emerged western toads congregate in riparian areas before they disperse to upland areas. Outside of the breeding season, adult toads disperse into forest areas, wetland scrublands, avalanche slopes and subalpine meadows, and may also include wetlands that are not necessarily used for breeding. Western toads favour dense shrub cover for thermal and predatory cover. High value habitat for the growing season is moist, shaded terrestrial sites with abundant leaf litter and coarse woody debris, generally adjacent to forested communities (BC MFLNRO, 2013; Bartelt and Peterson, 1974; Black and Black, 1969; Bartelt et al., 2004; Brown, 2010).

Western toads are primarily nocturnal during the growing season but are active during the day at higher elevations and latitudes (BC MFLNRO, 2012). During winter, the species hibernates underground in contact with water (Campbell, 1970). The species is also frequently found in both forests and logged areas. However, unfragmented habitat for migration between wetlands and uplands is important to ensure that adults are able to access wetlands for breeding and young are able to disperse away from wetlands (summary in COSEWIC, 2002).

Western toad tadpoles feed on filamentous algae and organic detritus and may scavenge on carrion (Leonard et al., 1993; Sullivan, 1994). Adults feed on invertebrates, crayfish, sow bugs, grasshoppers, trichopterans, lepidopterans, and dipterans (Stebbins, 1951; Verner and Boss, 1980). Western toads are vulnerable to moisture and temperature changes and avoid open water outside of the breeding season (COSEWIC, 2002).

Due to the life history characteristics of this species, riparian and pond areas with wetlands, together with a 250 m buffer of surrounding habitats, were included in the assessment model to capture the most highly suitable breeding and feeding habitats and all forest structure classes (rated in TEM as classes 2 to 7) and mesic to sub hydric moisture regimes were classed as suitable living habitat for western toads within the LSA and RSA. The working suitability model was refined based on field observations and professional judgment and habitat classes defined as follows:

- Nil: Areas outside of a 2 km buffer of lakes and wetlands, within fish bearing large lakes, areas with TEM mapped as exposed soil, non-vegetated, or FSR footprint;
- Low: All suitable living habitat within higher elevation ESSF or areas within SBS outside of a 250 m buffer of small lakes and wetlands;
- Moderate: Areas within broad biogeoclimatic zones for Montane Spruce (MS) or Sub-Boreal Pine and Spruce (SBPS) zones not within 250 m of lakes or wetlands; and
- High: Areas within SBS, MS, or SBPS zones within 250 m of lakes and wetlands.

Additional information on the western toad is provided in the western toad species account (**Appendix 5.4.7A**).

5.4.7.3.6.4 Ratings Adjustments

Habitat suitability maps incorporate landscape heterogeneity and connectivity, habitats adjacent to significant anthropogenic disturbance regimes (e.g., roads, clearcuts), and interspersions of different structural stages within the landscape. Adjustments can increase or decrease suitability value by a single class. Habitats within 50 m of high activity roads and infrastructure are downgraded in suitability to reflect potential mortality risk and dust fall effects.

5.4.7.3.6.5 Mortality Risk

There are no measureable quantitative parameters for the assessment of direct mortality risk, therefore the assessment is qualitative.

5.4.7.3.6.6 Change in Amphibian Movement

There are no measureable quantitative parameters for the assessment of changes in movement, therefore the assessment is qualitative.

5.4.7.3.6.7 Change in Amphibian Health

There are no measureable quantitative parameters for the assessment of changes in amphibian health, therefore the assessment is qualitative.

5.4.7.3.7 Model Results for Quantification of Potential Project Effects on Habitat

The potential overlap of Project component footprints on moderate to high suitable western toad habitats is tabulated in **Table 5.4.7-9**. The areas represent the maximum potential habitat affected and do not account for existing disturbance or mitigation measures. Habitat suitability is illustrated on **Figure 5.4.7-2**.

5.4.7.3.7.1 Habitat Loss and Alteration

The loss and alteration of habitat accounts for areas of vegetation and wetland removal and/or ground disturbance due to placement of infrastructure and edge effects. To simplify the effects assessment, all lost areas are combined regardless of how long the areas are lost (even though the Project area will be reclaimed, except for some small features) to represent a worst-case scenario. Clearing of forest within the study areas will result in a decrease of available potential habitat within the Project area. Effects of habitat loss are assessed relative to the amount of similar habitat available within the RSA and related to the threshold of magnitude set to determine significance.

Potential degradation of amphibian habitat considers habitat alteration through sensory disturbance and predation risk. A distance of 50 m from the edge of infrastructure was used to estimate the potential area of alteration to amphibian habitat. Western toads cross the existing FSR and similar access roads in other areas; therefore, the road does not act as a barrier to movement. Effects of habitat loss will potentially occur from the start of Project construction to closure. This is based on the various types of habitat alteration and the potential effects on amphibians. The combination of these effects is a simplified approach, as the access road, airstrip, and transmission line effects is limited (<3% of the RSA moderate to high suitable habitat without mitigation).

Western toad habitat was identified and mapped within the LSA and RSA using a 4-class wildlife habitat suitability ranking system for spring, summer/fall, and winter habitats based on watershed atlas mapping, proximity to water and elevation of terrestrial forest environments (RISC, 1999).

High quality amphibian habitat consists of high value feeding habitat and its adjacency to forage and hibernation habitat. These habitats are characterized by elevations below the ESSF zone with forest cover and mesic to sub-mesic environments.

Of the amphibian living habitat in the RSA, 2% (6,946 ha) is rated as moderate value and 30% (87,395 ha) is rated as high value. Of the suitable RSA amphibian habitat, Project components (other than the transmission line) overlap approximately <1% of moderate and 3% of high value habitat. Most potential effects on amphibian habitat are anticipated to be associated with clearing of forests at the mine site. The transmission line footprint (including re-route options) is predicted to overlay a maximum 6% of high value habitat.

The total maximum extent of the Project footprint (within clearing limits) categorized as lost amphibian habitat is 7,032 ha; 4,430 ha of which is attributed to the mine site, 95 ha to the access roads (including borrow areas), 50 ha to the airstrip, 132 ha to the freshwater supply

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
ENVIRONMENTAL ASSESSMENT CERTIFICATE /
ENVIRONMENTAL IMPACT STATEMENT
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



pipeline, and 2,070 ha to the transmission line (all options included). The clearing limits equal maximum potential lost area, and include previously disturbed area. As a conservative estimate, this does not include restored area after reclamation. Use of the existing Kluskus FSR and Stellako transmission line option would have negligible additional impact, and the main transmission line and mine site represent 6,236 ha of potential maximum clearing.

Within the RSA, the overall effect of the Project on western toads will likely be a maximum potential alteration of 2,384 ha (2.5%) of moderate to high rated available suitable habitat. Wildlife habitat alteration and loss are below the threshold of 20%.

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
 ENVIRONMENTAL ASSESSMENT CERTIFICATE /
 ENVIRONMENTAL IMPACT STATEMENT
 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

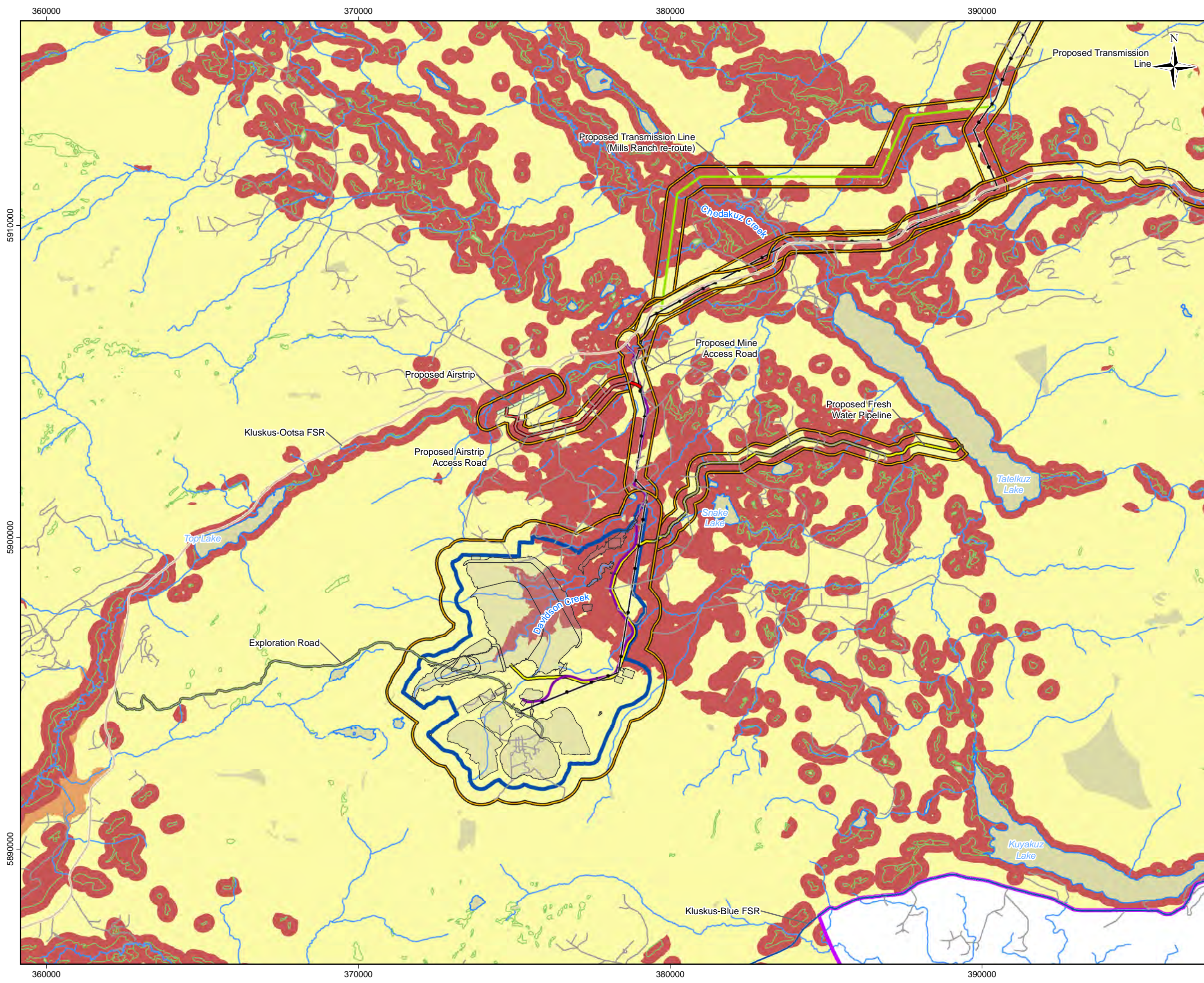


Table 5.4.7-9: Potential Western Toad Suitability Living Habitat Area Affected within Footprints, LSAs, and RSA

	Project Component	Western Toad Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of LSA or RSA Habitat by Footprint Component	Western Toad High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% RSA Moderate & High Habitat Overlap by Footprint Component or LSA
Footprint or Corridor	Access Road	0	95	0	0	51	95	53	<1
	Airstrip	0	50	0	0	23	50	45	<1
	Kluskus FSR	0	253	0	0	0	253	0	<1
	Mine Site	0	4,430	0	0	1,100	4,430	25	1
	Freshwater Supply Pipeline	0	132	0	0	73	132	55	<1
	Transmission Line - Main	0	1,806	0	0	957	1,806	53	1
	Transmission Line - Mills Ranch	0	202	0	0	147	202	73	<1
	Transmission Line - Stellako	0	62	0	0	34	62	54	<1
	Total	0	7,032	0	0	2,384	7,032	34	2
LSA	Access Road	0	363	0	0	218	363	60	<1
	Airstrip	0	465	0	0	283	465	61	<1
	Kluskus FSR	0	6,574	0	0	2,793	6,574	42	3
	Mine Site	0	6,123	0	0	1,593	6,123	26	2
	Freshwater Supply Pipeline	0	731	0	0	462	731	63	<1
	Transmission Line - Main	0	8,068	0	0	4,543	8,068	56	5
	Transmission Line - Mills Ranch	0	924	0	0	652	924	71	1
	Transmission Line - Stellako	0	306	0	0	157	306	51	<1
	Total	0	23,554	0	0	10,700	23,554	45	11
RSA Area	RSA total	6,946	291,714	2	-	87,395	291,714	30	-
	Footprint % RSA	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-
Habitat	Footprint % RSA Habitat	<1	-	-	-	3	-	-	-
	Footprint % LSA Habitat	<1	-	-	-	22	-	-	-

Note: FSR = Forest Service Road; ha = hectare; LSA = Local Study Area; RSA = Regional Study Area

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-002_WHR_Amphibian_5.4.7.2.mxd



Legend

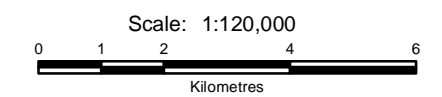
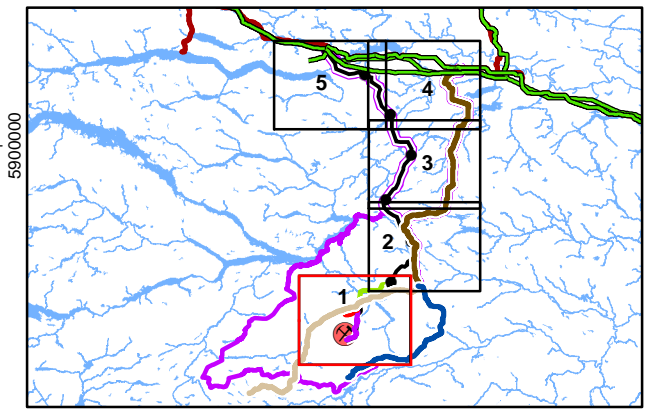
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Airstrip Access Road
- Proposed Mine Access Road
- Proposed Fresh Water Pipeline
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Site Facilities
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

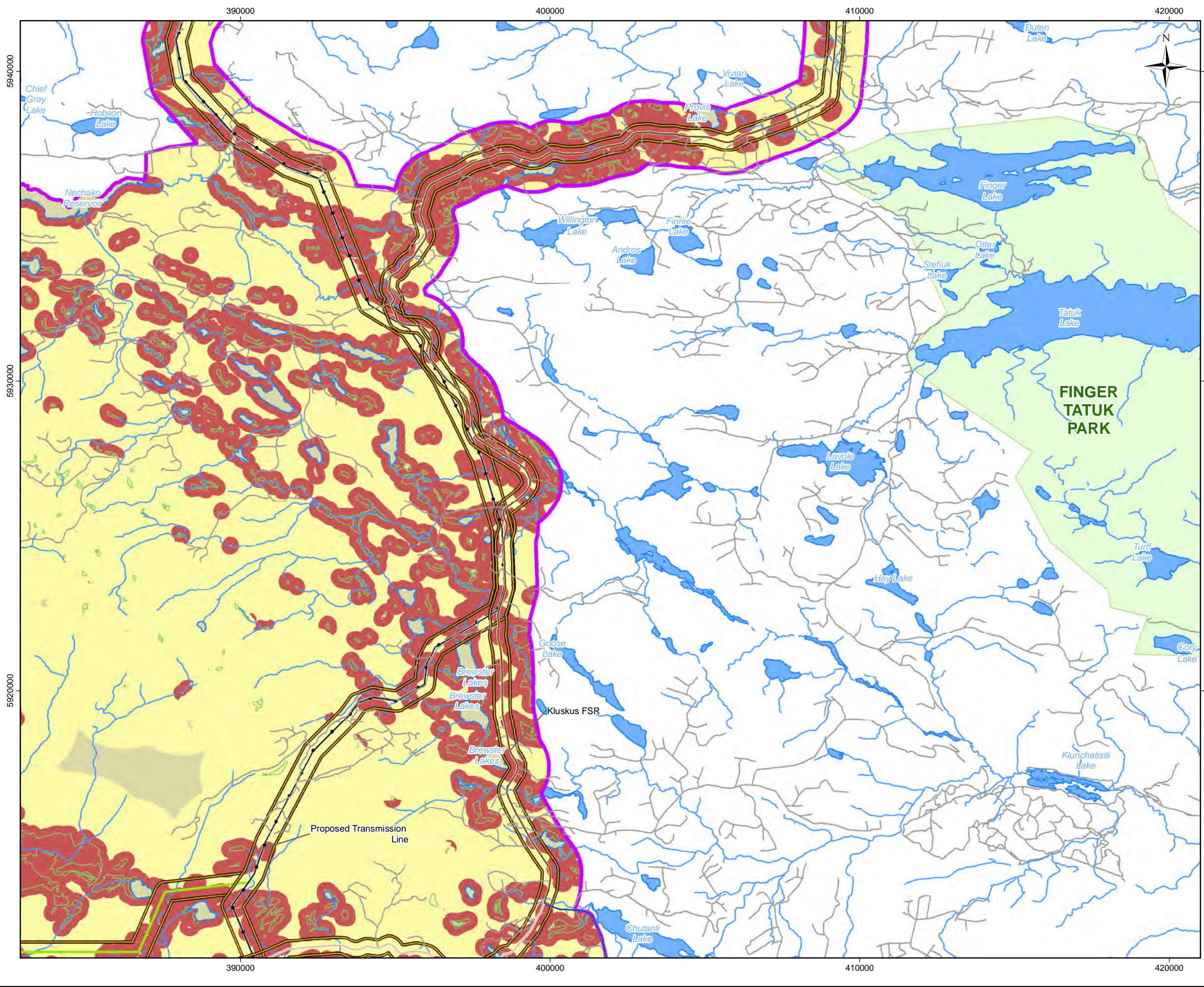
- H - High
- M - Medium
- L - Low
- N - Nil



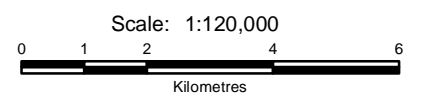
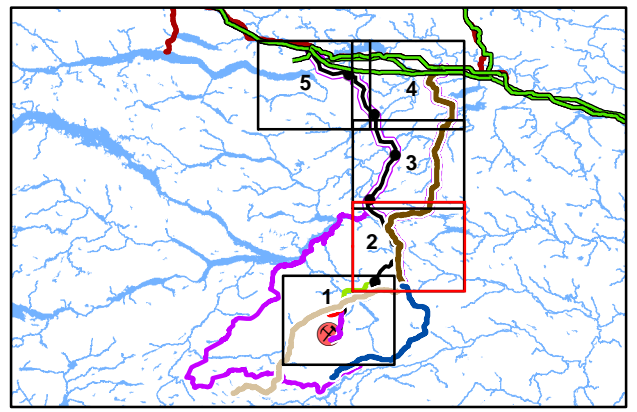
Reference
BC Government GeoBC Data Distribution

CLIENT: 		
PROJECT: Blackwater Gold Project		
Western Toad Habitat Suitability, Map 1 of 5		
DATE: September, 2015	ANALYST: MY	Figure 5.4.7-2
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-002_WHR_Amphibian_5.4.7-2.pdf
GIS FILE: 04-03-002_WHR_Amphibian_5.4.7-2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-002_WHR_Amphibian_5.4.7.2.mxd



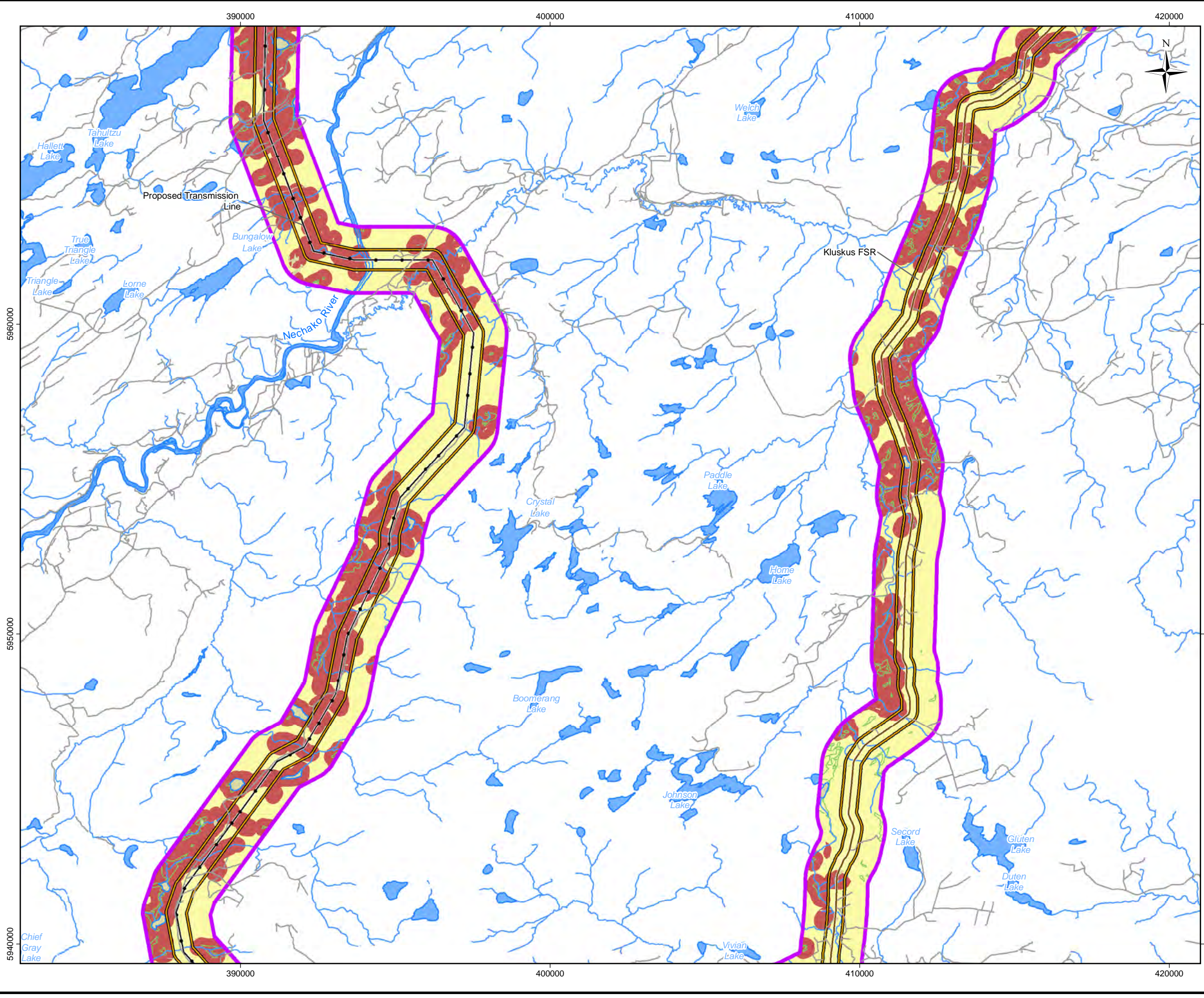
- Legend**
- Existing Road
 - Kluskus FSR
 - Kluskus-Blue FSR
 - Kluskus-Ootsa FSR
 - Proposed Transmission Line
 - Proposed Transmission Line (Mills Ranch re-route)
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
 - Parks and Protected Areas
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - L - Low
 - N - Nil



Reference
BC Government GeoBC Data Distribution

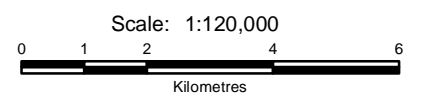
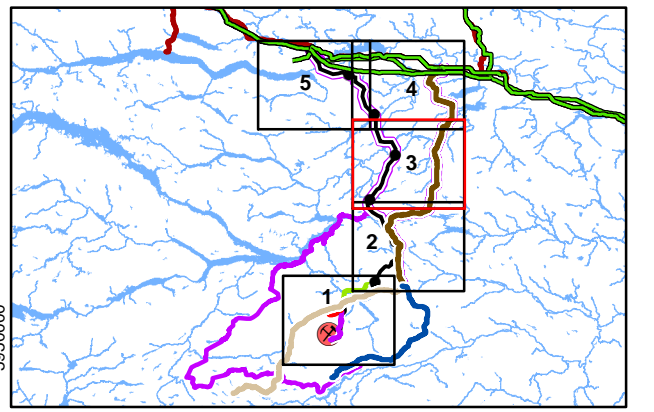
CLIENT: 		
PROJECT: Blackwater Gold Project		
Western Toad Habitat Suitability, Map 2 of 5		
DATE: September, 2015	ANALYST: MY	Figure 5.4.7-2b
JOB No: VE52277	QA/QC: MB	
GIS FILE: 04-03-002_WHR_Amphibian_5.4.7.2.mxd		PDF FILE: 04-03-002_WHR_Amphibian_5.4.7.2.pdf
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-002_WHR_Amphibian_5.4.7.2.mxd



Legend

- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Wildlife and Wildlife Habitat**
- Local Study Area
- Regional Study Area
- Wildlife Habitat Rating**
- H - High
- L - Low
- N - Nil



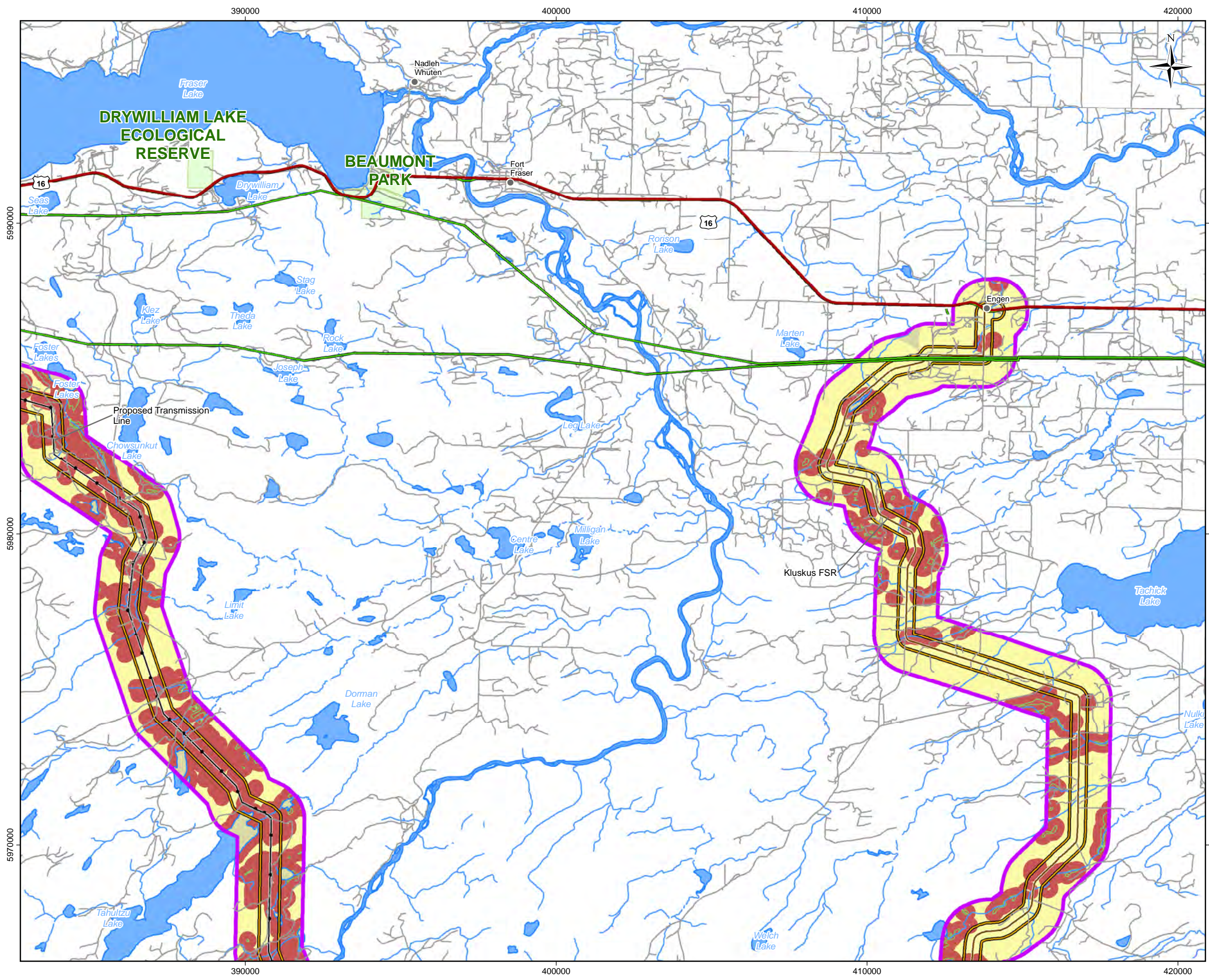
Reference
BC Government GeoBC Data Distribution

CLIENT:
newgold™

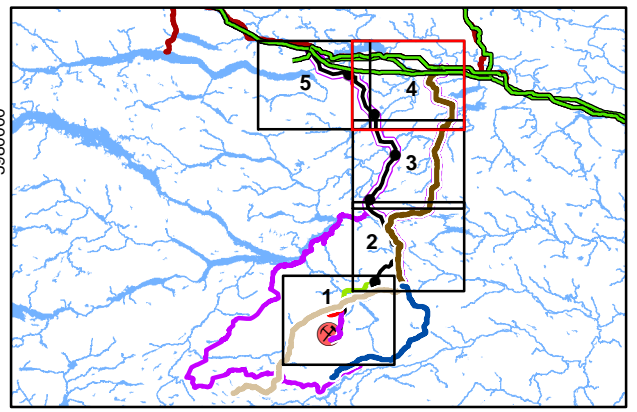
PROJECT:
Blackwater Gold Project

**Western Toad
Habitat Suitability, Map 3 of 5**

DATE: September, 2015	ANALYST: MY	Figure 5.4.7-2c
JOB No: VE52277	QA/QC: MB	
GIS FILE: 04-03-002_WHR_Amphibian_5.4.7.2.mxd		PDF FILE: 04-03-002_WHR_Amphibian_5.4.7-2.pdf
PROJECTION: UTM Zone 10	DATUM: NAD83	amec



- Legend**
- Existing Transmission Line
 - Highway
 - Existing Road
 - Kluskus FSR
 - Proposed Transmission Line
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
 - Parks and Protected Areas
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - L - Low
 - N - Nil



Scale: 1:120,000
 0 1 2 4 6
 Kilometres

Reference
 BC Government GeoBC Data Distribution

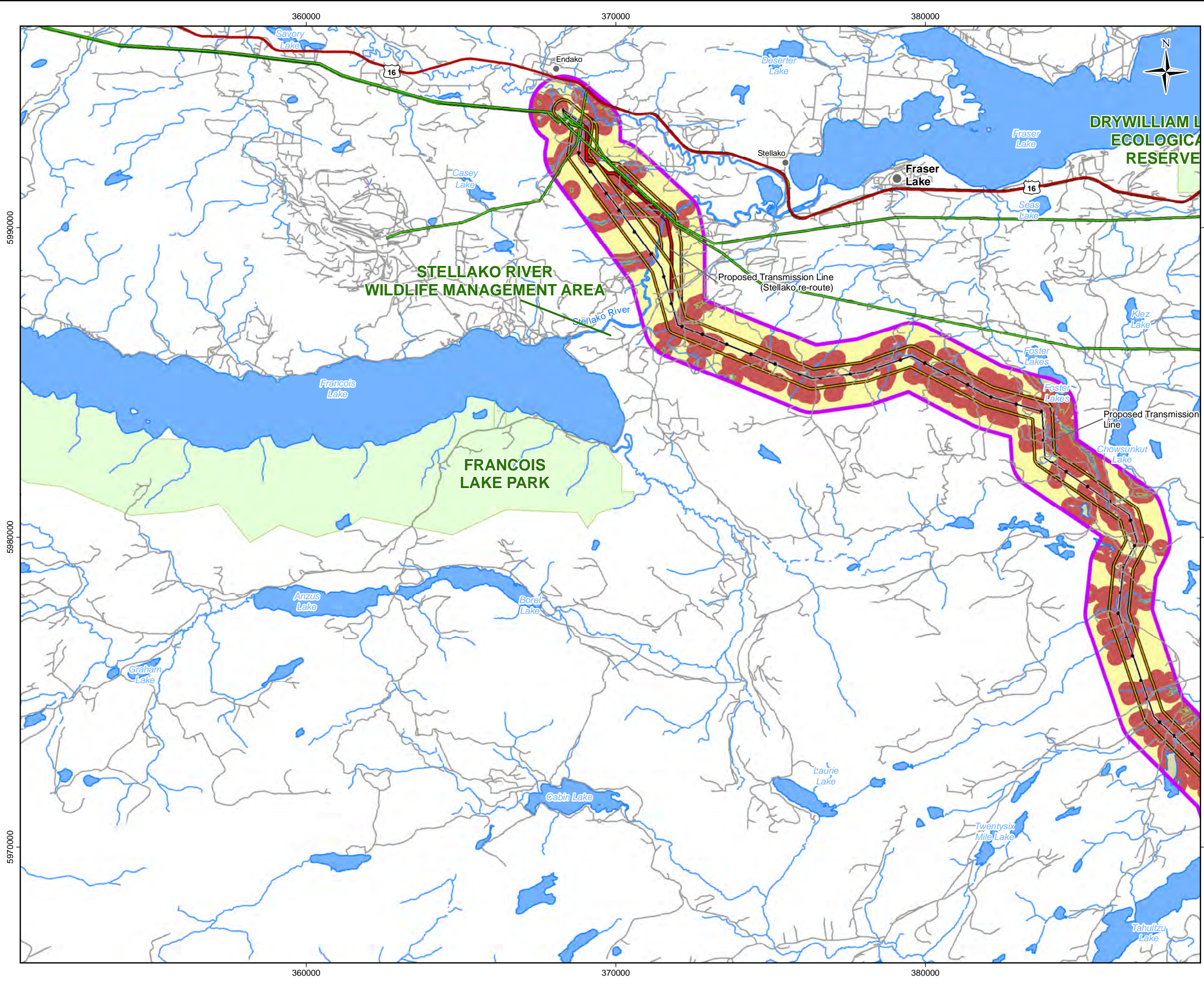
CLIENT:

PROJECT:
 Blackwater Gold Project

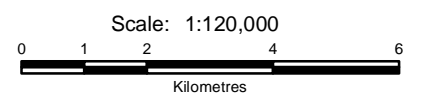
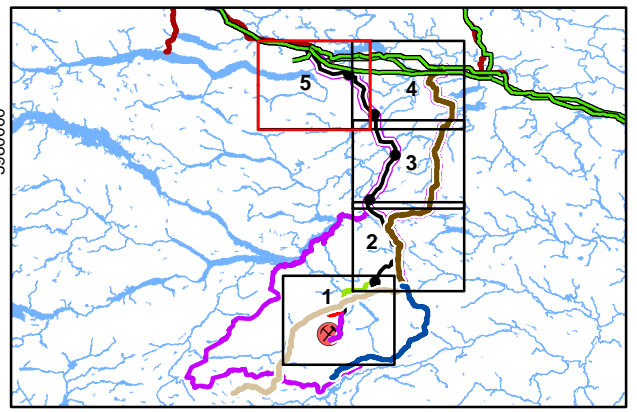
**Western Toad
 Habitat Suitability, Map 4 of 5**

DATE: September, 2015	ANALYST: MY	Figure 5.4.7-2d
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-002_WHR_Amphibian_5.4.7-2.pdf
GIS FILE: 04-03-002_WHR_Amphibian_5.4.7-2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-002_WHR_Amphibian_5.4.7-2.mxd



- Legend**
- Populated Place
 - Existing Transmission Line
 - Highway
 - Existing Road
 - Proposed Transmission Line
 - Proposed Transmission Line (Stellako re-route)
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
 - Parks and Protected Areas
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - L - Low
 - N - Nil



Reference
BC Government GeoBC Data Distribution

CLIENT: 		
PROJECT: Blackwater Gold Project		
Western Toad Habitat Suitability, Map 5 of 5		
DATE: September, 2015	ANALYST: MY	Figure 5.4.7-2e
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-002_WHR_Amphibian_5.4.7-2.pdf
GIS FILE: 04-03-002_WHR_Amphibian_5.4.7-2.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-002_WHR_Amphibian_5.4.7-2.mxd

5.4.7.3.7.2 *Mortality Risk*

The mine site access road, Kluskus FSR, and transmission corridor may increase the potential for direct mortality risk related to vehicle collisions. The Kluskus FSR is a permanent feature on the landscape; however, if traffic increases during Project operations, there will be a potential increase in direct mortality risk related to vehicle collisions. Effects have the potential to occur from the start of Project construction to closure. The airstrip and freshwater supply pipeline pose negligible mortality risk to amphibians. The access road is not considered a barrier to seasonal or daily movement based on field observations and professional judgment of similar roads, suggesting that the mine access road will not be a barrier to movement. The mine site, freshwater supply pipeline, and airstrip pose very low physical risks to amphibians.

Mitigation measures (i.e., salvage of western toads prior to construction or temporary loss of wetlands), wetland compensation and terrestrial forest habitat reclamation are considered sufficient to prevent additional mortality risk from the Project and residual effects are considered negligible.

5.4.7.3.7.3 *Changes in Amphibian Movement*

The mine site access road, Kluskus FSR, and transmission corridor may increase the potential for indirect mortality risk related to barriers to movement. The Kluskus FSR is an existing road and effects have the potential to occur from the start of Project construction to closure. The airstrip and freshwater supply pipeline pose negligible barriers to amphibians. The access road is not considered a barrier to seasonal or daily movement based on field observations and professional judgment of similar roads, suggesting that the mine access road will not be a barrier to movement.

Mitigation measures (i.e., salvage of western toads prior to construction or temporary loss of wetlands), wetland compensation and terrestrial forest habitat reclamation are considered sufficient to prevent additional indirect mortality risk from the Project and residual effects are considered negligible.

5.4.7.3.7.4 *Wildlife Health*

Chemical hazards, such as ice and dust treatments for the roads or airstrip, mine site chemicals of concern, and potential mine site contaminants in post-closure effluent or dustfall, may affect amphibian health or condition. Effects have the potential to occur from the start of construction to the end of post-closure. Project effects on amphibian health are considered negligible due to BMPs such as those in BC MFLNRO (2014), mitigation measures (i.e., salvage of amphibians from wetlands prior to construction and clearing and wetland compensation resulting in no loss of amount of wetlands), Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**), Wetland Management Plan (WMP) (**Section 12.2.1.18.4.3**), Landscape, Soils and Vegetation Management and Restoration Plan (LSVMP) (**Section 12.2.1.18.4.4**) and Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**), and low likelihood of mortality risk from traffic), which can be addressed through adaptive management if effects are detected during the life of the Project.

The atmospheric effects assessment determined that overall, potential effects of the Project on air quality were assessed as Not Significant because adverse residual effects are not predicted to result from the construction, operations, or decommissioning of the Project. There are limited residual effects predicted for water quality after mitigation, since mitigation is incorporated into the Project design. The surface water quality effects assessment predicts that residual effects relate to potential exceedances of water quality guidelines, and are parameter-specific. While there are predicted exceedances, they are almost all a consequence of existing background concentrations above guidelines, and therefore are not considered residual related to the Project. Issues related to potential spread of Chytrid disease to amphibians is completely mitigated by measures used to decontaminate potential sources from other watersheds (e.g., aquatic researcher boots, nets and equipment).

5.4.7.3.8 Mitigation Measures

A range of habitat mitigation measures and best management practises are applied to the Project as described in the Wildlife Management Plan (**Section 12.2.1.18.4.6**), (Landscape, Soils and Vegetation Management and Restoration Plan (LSVMRP) (**Section 12.2.1.18.4.4**), Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**), and Wetlands Management Plan (WMP) (**Section 12.2.1.18.4.3**). The following habitat mitigation measures apply to amphibians and will reduce or eliminate effective habitat loss, direct mortality effects, changes in movement patterns, and potential changes in population dynamics to not significant levels.

5.4.7.3.8.1 Habitat Loss and Alteration

The following mitigation measures will help reduce or eliminate habitat loss and alteration. Avoiding and/or mitigating loss and degradation effects to amphibians and amphibian habitat begin with the Project design. The design of the roads, transmission line, and mine site footprints

include avoidance of high value, habitat-suitable riparian and wetland areas, with several iterative changes in the mine site and access road components already completed. The Kluskus FSR is an existing road for most of its footprint. Some mitigation measures already in place include:

- Road design using existing roads and cleared areas when possible, and, when not avoidable, locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands; and
- Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of riparian forest.

To meet provincial and federal regulatory requirements for wildlife, vegetation, and aquatic resources relating to the conservation of species and ecosystems at risk, the WLMP will be implemented along with the LSVMRP, Invasive Species Management Plan (ISMP) (**Section 12.2.1.18.4.5**), WMP, Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**), Reclamation and Closure Plan (RCP) (**Section 2.6**), and the ARMP. These plans are designed to control invasive plant species, protect wildlife habitat, and protect

in-stream resources. Implementing these management plans, including the wildlife and wetland specific BMPs, will protect and minimize the potential effects of the Project on amphibian wetlands not directly affected by the Project.

Mitigation for unavoidable loss of amphibian habitat will be limited to the Project footprint area and will include strategies discussed in the WLMP, WMP and LSVMRP. The LSVMRP provides an outline of mitigation measures and the WMP provides compensation measures to reduce effects to vegetation and habitat from loss and degradation.

- Mitigation for loss and degradation of adjacent riparian wildlife habitats will occur by designating well demarcated no-work zones, management work zones (with restrictions, such as no heavy machinery), and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible;
- Restricting the clearing of terrestrial amphibian breeding habitats to periods outside the amphibian breeding season (1 May to 31 August) or conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season;
- Clearing of transmission line ROWs, reclamation will provide suitable habitat for amphibians;
- When possible, road design using existing roads and cleared areas and proposed access roads and transmission lines and poles located away from wetland areas and riparian areas or spanning wetlands;
- Applying erosion and sediment control measures;
- Modifying the timing of wetland draining where feasible would allow amphibians to move to other wetlands, otherwise conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season;
- Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP, ISMP, RCP and WLMP);
- Discharge effluent that will meet guidelines for the protection of aquatic life, or site-specific water quality objectives, so that no adverse water quality effects to amphibians are anticipated;
- Implementing the Wetland Compensation Plan (**Appendix 5.3.7A**); and
- Implementing invasive plant management techniques as defined in the ISMP; including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected. Management techniques will include annual monitoring for invasive plants. Based on current data from baseline reports, the invasive species identified within the LSA do not pose a risk to amphibians within the LSA or RSA.

5.4.7.3.8.2 *Mortality Risk*

Mitigation for amphibian mortality will be limited to the Project footprint area and will include strategies discussed in the WLMP, WMP and LSVMRP. The LSVMRP and WMP provide an outline of mitigation measures and compensation measures to reduce mortality risk.

- To improve visibility, dust on the mine access road and site roads will be controlled during dry periods as needed, as per the Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**);
- Posting signs warning drivers of the possibility of amphibian crossings in areas of high wildlife activity, such as potential toad crossings near breeding sites. If amphibian mortality on roadways is identified along the mine access road or the FSR, adaptive management measures will be implemented; and
- Conducting pre-clearing and pre-construction surveys and salvage of amphibians.

5.4.7.3.8.3 *Amphibian Movement Patterns*

The LSVMRP and WMP provide an outline of mitigation measures and compensation measures to reduce effects to amphibian movements and include:

- Selecting revegetation species that minimize attraction of wildlife to roadsides; and
- Implementing adaptive management, as described in the WLMP.

5.4.7.3.8.4 *Amphibian Health*

Although not expected to have residual effects, changes in amphibian health will be further prevented by strategies discussed in the WLMP, WMP, LSVMRP, and ARMP.

- Following BMPs as described in the WLMP (BC MFLNRO, 2014) to reduce potential dust contamination of amphibian habitats;
- Ensuring surface water quality parameter levels as described in the ARMP; and
- The sterilization of equipment operating in water is mainly things like boots, nets and researcher equipment that may come from other watersheds with Chytrid fungus. BMPs for construction equipment should include cleaning to remove mud / invasive species from other areas when brought to site and this will address issues around invasive species and Chytrid fungus.

5.4.7.3.8.5 *Effectiveness of Mitigation*

Table 5.4.7-10 provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on amphibians during mine site development. Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

Table 5.4.7-10: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Amphibians during Mine Site Development

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
Habitat loss and alteration	Construction, Operations	Road design using existing roads and cleared areas when possible, and, when not avoidable, locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands	High
		Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of riparian forest	High
		Mitigation for loss and degradation of adjacent riparian wildlife habitats will occur by designating well demarcated no-work zones, management work zones (with restrictions, such as no heavy machinery), and setbacks in accordance with the Forest and Range Practices Act BMPs (BC MFLNRO, 2014) where feasible	High
		Restricting the clearing of terrestrial amphibian breeding habitats to periods outside the amphibian breeding season (1 May to 31 August) or conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season	High
		Clearing of transmission line ROWs, reclamation will provide suitable habitat for amphibians	High
		When possible, road design using existing roads and cleared areas and proposed access roads and transmission lines and poles located away from wetland areas and riparian areas or spanning wetlands	High
		Applying erosion and sediment control measures	High
		Modifying the timing of wetland draining where feasible would allow amphibians to move to other wetlands, otherwise conduct pre-construction and pre-clearing surveys and amphibian salvage if during the breeding season	Moderate
		Implementing progressive reclamation using local native vegetation wherever possible, or appropriate commercially grown, weed-free native species (LSVMRP, ISMP, RCP and WLMP)	High
		Discharge effluent that will meet guidelines for the protection of aquatic life, or site-specific water quality objectives, so that no adverse water quality effects to amphibians are anticipated	High
		Implementing the Wetland Compensation Plan (Appendix 5.3.7A)	High

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
ENVIRONMENTAL ASSESSMENT CERTIFICATE /
ENVIRONMENTAL IMPACT STATEMENT
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
		Implementing invasive plant management techniques as defined in the ISMP; including developing and implementing detailed construction and operational plans of invasive plant prevention and detection strategies, and an action protocol if invasive plants are detected. Management techniques will include annual monitoring for invasive plants. Based on current data from baseline reports, the invasive species identified within the LSA do not pose a risk to amphibians within the LSA or RSA	High
Mortality risk	Construction, Operations	To improve visibility, dust on the mine access road and site roads will be controlled during dry periods as needed, as per the AQEMP (Section 12.2.1.18.4.9)	High
		Posting signs warning drivers of the possibility of amphibian crossings in areas of high wildlife activity, such as potential toad crossings near breeding sites. If amphibian mortality on roadways is identified along the mine access road or the FSR, adaptive management measures will be implemented	Moderate
		Conducting pre-clearing and pre-construction surveys and salvage of amphibians	High
Changes in predator-prey dynamics	Construction, Operations	Vegetation and wetland management reducing predator access to breeding sites and habitat management	Moderate
Amphibian health	Construction, Operations	Following BMPs as described in the WLMP (BC MFLNRO, 2014) to reduce potential dust contamination of amphibian habitats	High
		Ensuring surface water quality parameter levels as described in the ARMP	High
		The sterilization of equipment operating in water such as boots, nets and researcher equipment that may come from other watersheds with Chytrid fungus. BMPs for construction equipment should include cleaning to remove mud / invasive species from other areas when brought to site and this will address issues around invasive species and Chytrid fungus	High
Amphibian movements	Construction, Operations	Selecting revegetation species that minimize attraction of wildlife to roadsides	High
		Implementing adaptive management, as described in the WLMP	High

Note: AQEMP = Air Quality and Emissions Management Plan; ARMP = Aquatic Resources Management Plan; BC MFLNRO = British Columbia Ministry of Forests, Lands and Natural Resource Operations; BMP = Best Management Practice; FSR = Forest Service Road; ISMP = Invasive Species Management Plan; LSA = Local Study Area; LSVMRP = Landscape, Soils and Vegetation Management and Restoration Plan; RCP = Reclamation and Closure Plan; ROW = right-of-way; RSA = Regional Study Area; WLMP = Wildlife Management Plan

The mitigation/offsetting success ratings shown in **Table 5.4.7-10** are incorporated into the confidence ratings defined in **Section 4.3.5** and summarized in **Table 5.4.7-12**. In summary, low success rating means mitigation has not been proven successful, moderate success rating means mitigation has been proven successful elsewhere, and high success rating means mitigation has been proven effective.

In the case of amphibians on the mine site, mitigation/offsetting success rating is classified as moderate overall because most mitigation measures are consistent with those proposed by BC MFLNRO and Environment Canada for protection of Western toad populations, and demonstrated as moderate to high in effectiveness in other locations.

5.4.7.4 Residual Effects and their Significance

Table 5.4.7-11 presents a summary of the potential residual effects after mitigation, as well as management strategies by Project phase and component.

Residual effects are those remaining after implementing all mitigation measures, and the expected consequences of the Project on amphibians. Each of the Categories of Potential Environmental Effects / Issues determined to have potential residual effects on amphibians is characterized in terms of the effect's magnitude or severity, geographic extent, duration, and reversibility, the context/resilience of amphibians or amphibian habitat, probability of the effect's occurrence, and confidence in the conclusions (**Table 5.4.7-12**)

Thresholds are based on the ability to likely detect change in local populations as a result of Project effects; threshold effects levels to amphibians were selected to reflect the ability of surveys to detect quantitative and qualitative changes (**Table 5.4.7-13**).

Based on the categorization of effects, the residual effects assessment summary for amphibians is provided in **Table 5.4.7-14**.

Table 5.4.7-11: Summary of Categories of Potential Environmental Effects / Issues and Mitigation Measures – Amphibians

Project Phase	Project Component	Category of Assessment	Mitigation and Management of Effects	Potential for Residual Effect?
Construction/ Operations	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Habitat Loss and Alteration	LSVMRP, progressive reclamation with appropriate species. Wetland compensation measures are expected to increase suitable habitat.	Yes
Construction/ Operations	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Mortality Risk	Follow WLMP to reduce potential effects on amphibians and their habitat. Adaptive management for possible road crossings, pre-construction surveys and salvage during breeding season.	Yes
Construction/ Operations	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Changes in Predator-Prey Dynamics	Vegetation and wetland management reducing predator access to breeding sites and alternate prey through habitat management.	No
Construction/ Operations	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Amphibian Health	Manage attractants. Spill Management and Prevention Plan, effluent and dust fall management. BMPs for prevention of Chytrid disease spread among watersheds (WLMP).	No
Construction/ Operations	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Amphibian Movements	Manage attractants (WLMP). Follow Wildlife Management Plan to reduce potential effects on amphibians and their habitat. Monitor and apply adaptive management as necessary.	Yes

Note: BMPs = best management practices

Table 5.4.7-12: Characterization of Residual Environmental Effects for Amphibians

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in a measurable parameter or variable relative to baseline case	Negligible—Effects are not measurable Low—A measurable change but within the range of expected natural variation based on species life history Moderate—A measurable change but less than high High—A measurable change of density, abundance, or distribution >20% change relative to RSA.
Geographical Extent	The geographic area in which an environmental, economic, social, heritage, or health effect of a defined magnitude occurs	Site-Specific: Within the Project Site—Local (e.g., effect is closely linked to the footprint but does not extend far outside of it); many wildlife effects extend into the LSA because they are referred to as local Local: Within the LSA—Effect is prevalent in the LSA – Landscape effects when the LSA tends to match with watersheds or larger units Regional: Within the RSA—Effect is prevalent in the RSA – Regional (e.g., population effects to moose, deer, wolf)
Frequency	When the effect occurs and the number of times during the project or a specific project phase that an environmental effect may occur	Once—Effect occurs on one occasion Intermittent—Effect occurs several times Continuous—Effect occurs continuously
Duration	The period of time required until the VC returns to its baseline condition, or the effect can no longer be measured or otherwise perceived	Short-term—Effect extends throughout the construction phase Medium-term—Not applicable Long-term—Throughout operations and closure Chronic—During post-closure or beyond
Reversibility	The likelihood that a measurable parameter will recover from an effect	Yes—Effect is reversible within part of a whole generation after the impact ceases (VC- and impact-dependent) No—Effect is not reversible over the time scales listed
Context	Resilience to stress due to ecological fragility and degree of disturbance of area in which the Project is located	Low—VC has high resilience to stress, no listed species or ecosystems Moderate—VC has moderate resilience to stress, Blue-listed species or ecosystems. High—VC has low resilience to stress, Red-listed or SARA-listed species or ecosystems.
Likelihood of Effect	The likelihood that a residual effect will occur	Low—Low likelihood a residual effect will occur Medium—Moderate likelihood a residual effect will occur High—High likelihood a residual effect will occur
Significance	Expectation of a residual effect on the VC that is above the suggested threshold	Not significant (negligible)—Effects are site-specific or local in geographic extent, with a low context rating, and a negligible magnitude, short-term, reversible, and with a low frequency (once or intermittent) Not significant (minor)—Effects are local in geographic extent, with a low magnitude, and low context rating, short-term to chronic, reversible, and with a low frequency (once or intermittent) Not significant (moderate)—Effects are local to regional in geographic extent, and moderate in magnitude, moderate context rating, medium-term to chronic, reversible, and occur at all frequencies Significant—Effects occur to VCs with a medium to high context, and high context rating, high magnitude, regional in geographic extent, long-term to chronic, non-reversible, and occur at all frequencies
Confidence Level	Confidence in the residual effects prediction	Low—VC is not well understood, Project-VC interaction is not well understood, Mitigation has not been proven effective Moderate—VC understood in similar ecosystems and effects documented in the larger regional area or in the literature, mitigation proven effective elsewhere High—VC is well understood, Project-VC interaction is well understood, Mitigation has been proven effective

Note: LSA = Local Study Area; RSA = Regional Study Area; SARA = *Species at Risk Act*; VC = Valued Component

Table 5.4.7-13: Threshold(s) for Determining Magnitude of Residual Amphibian Habitat and Population Effects in the RSA

Category of Assessment	Thresholds of Environmental Effect
Habitat Loss and Alteration	Reduction in relative amphibian habitat abundance or habitat areas with a moderate to high suitability ratings within the RSA, as estimated in suitability model. A threshold of 20% loss was set for significance of Project effects and an estimated maximum of 2.5% moderate to high rated suitable habitat will be affected.
Mortality Risk	Qualitative measure of risk within the RSA because of Project effects (e.g., road density, traffic volume and frequency, and relative frequency of use of the area by western toad). Magnitude for the access road effect is defined as: Negligible - incidental mortality during the life of the Project as the result of collisions with Project-related traffic; Low - site specific concentrations of identifiable mortality; Medium - repeated site-specific occurrences of mortality during the life of the Project as the result of collisions with Project-related traffic; and High - >20% potential habitat or population has repeated mortality concentrations during the life of the Project as the result of collisions with Project-related traffic.
Change in Amphibian Movement	Qualitative measure of risk within the RSA because of Project effects (e.g., road density, traffic volume and frequency, and relative frequency of use of the area by western toad).

Note: CEA = cumulative effects assessment; km² = square kilometres; RSA = Regional Study Area

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
ENVIRONMENTAL ASSESSMENT CERTIFICATE /
ENVIRONMENTAL IMPACT STATEMENT
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



Table 5.4.7-14: Residual Effects Assessment Summary for Amphibians

Project Phase	Project Component	Category of Assessment	Mitigation and Management	Potential for Residual Effect?	Residual Effect	Context	Magnitude	Geographic Extent	Duration	Reversibility	Frequency	Likelihood Determination	Level of Confidence of Likelihood	Significance	Level of Confidence of Significance
Construction and Operations	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Habitat Loss and Alteration	LSVMRP, progressive reclamation with appropriate species, maintain forest function and vegetation cover, particularly lichen-bearing forest and terrestrial lichens, reduce sensory disturbance as per the WLMP.	Yes	Unavoidable loss of wetland and forest breeding, living and hibernation habitat	Moderate	Negligible	Site-specific	Short-term	Reversible	One time	Low	High	Not Significant (negligible)	High
Construction through to Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Mortality	Mitigation measures to reduce mortality and access from roads.	Yes	Direct mortality from collisions	Moderate	Negligible	Site-specific	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High
Construction through to Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Amphibian Movements	LSVMRP and ARMP	Yes	Unavoidable indirect mortality of amphibians	Moderate	Negligible	Local	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High

5.4.7.4.1.1 *Mine Site*

There is a low likelihood of a residual habitat loss effect occurring; however, it is with high confidence that it will be a Not Significant (negligible) residual effect based on magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of moderate to high value amphibian habitat will occur during the construction phase and these effects will be evident through the operations phase. Within the mine site, the adverse effect is rated as negligible magnitude because a small fraction (<1%) of available habitat within the RSA will be affected after mitigation and the resilience to recovery for these ecosystems is high. Regionally, these moderate to high rated habitats are available throughout the RSA. Habitat effects will be primarily limited to the mine site footprint. The duration of the habitat effect will be short-term until wetland areas and ground cover vegetation are reclaimed; however, some areas will be re-vegetated before closure thereby reducing the time the habitat is lost. Western toad habitat is resilient to respond and recover from disturbances. Once habitat loss and alteration occurs during construction, it will be approximately 17 years before closure and ecosystems may be restored to function once wetlands and ground vegetation are present, therefore the duration will extend into the short term.

The habitat effect will occur once and will be reversible in the short term. There is a low likelihood that permanent loss of <1% moderate to high value habitat will occur after reclamation and that increased predation due to changes in population dynamics may occur related to habitat alteration. The short-term recovery from habitat disturbance and ability to breed in anthropogenic ditches and borrow pits results in amphibians having a high ecological resilience. Project activities are not expected to affect the viability of amphibians or their habitat in the RSA, due to the widespread observed extent of western toads and their habitat within already disturbed areas of the RSA.

The residual effects of amphibian mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality may occur intermittently from the construction phase through to closure. Within the mine site, the effect is rated with low magnitude because of the small increase in mortality. The mortality impacts will have a local effect and will be limited to specific areas that are cleared for the Project and within amphibian habitat. The duration of the mortality effect will be short term, as these effects may occur intermittently throughout the life of the Project and populations are able to recover relatively quickly.

The residual effects to amphibian movement are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Movements may be affected intermittently from the construction phase through to closure. The impacts will have a local effect and will be limited to specific areas within the LSA that are within amphibian habitat. The duration of the effect will be short term, as amphibians could be affected throughout operations but they are able to reproduce quickly and populations are able to recover relatively quickly.

5.4.7.4.1.2 *Proposed Access Road and Kluskus Forest Service Road*

There is a low likelihood of a residual habitat effect occurring; however, it is with high confidence that it will be a Not Significant (negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of amphibian habitat, and potential for loss due to mortality will occur along roads associated with the Project. The loss and degradation of amphibian habitat will occur during the construction phase and these adverse effects will be evident through the operation phase. The existing Kluskus FSR will remain in place and increased mortality risk is considered negligible. Within the mine access road, the adverse effect is rated as negligible magnitude because a small fraction of available habitat will be affected relative to habitats where amphibians may occur and the sensitivity to recovery for these ecosystems is high. The Kluskus FSR is an existing road and no additional habitat will be affected when BMPs for pre-construction surveys and salvage are applied.

The habitat effect will occur once and will be reversible during post-closure. There is a low likelihood that loss of <1% moderate value habitat will occur after mitigation. Project activities are not predicted to affect the viability of amphibians near the existing FSR or proposed mine access road within the RSA.

The residual effects of amphibian mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality may occur intermittently from the construction phase through to closure. Within the mine site, the effect is rated with low magnitude because of the small increase in mortality. The mortality impacts will have a local effect and will be limited to specific areas that are cleared for the Project and within amphibian habitat. The duration of the mortality effect will be short term, as these effects may occur intermittently throughout the life of the Project and populations are able to recover relatively quickly.

The residual effects to amphibian movement are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Movements may be affected intermittently from the construction phase through to closure. The impacts will have a local effect and will be limited to specific areas within the LSA that are within amphibian habitat. The duration of the effect will be short term, as amphibians could be affected throughout operations but they are able to reproduce quickly and populations are able to recover relatively quickly.

5.4.7.4.1.3 *Airstrip, Transmission Line, and Freshwater Supply Pipeline*

There is a low likelihood of a residual effect occurring; however, it is with high confidence that it will be a Not Significant (negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and alteration of amphibian habitat will occur within the airstrip, transmission line, and freshwater supply pipeline areas and these adverse effects will be evident over short-term duration. The habitat effects for the airstrip and freshwater supply pipeline have a low magnitude rating because much of the area is already disturbed by logging and many of the mitigation practices implemented in the Closure and Reclamation Plan will minimize effects. The effects for the transmission line will have a low magnitude in previously

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
ENVIRONMENTAL ASSESSMENT CERTIFICATE /
ENVIRONMENTAL IMPACT STATEMENT
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



logged areas along the FSR and the ability to span wetlands and adjust placement of transmission poles reduces habitat effects to negligible.

The habitat effect will occur once and will be reversible during post-closure. There is a low likelihood that loss of <1% of moderate to high value habitat will occur after mitigation. Project activities are not predicted to affect the viability of amphibians near the airstrip, transmission line or freshwater supply pipeline within the RSA.

The residual effects of amphibian mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality may occur intermittently from the construction phase through to closure. Within the mine site, the effect is rated with low magnitude because of the small increase in mortality. The mortality impacts will have a local effect and will be limited to specific areas that are cleared for the Project and within amphibian habitat. The duration of the mortality effect will be short term, as these effects may occur intermittently throughout the life of the Project and populations are able to recover relatively quickly.

The residual effects to amphibian movement are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Movements may be affected intermittently from the construction phase through to closure. The impacts will have a local effect and will be limited to specific areas within the LSA that are within amphibian habitat. The duration of the effect will be short term, as amphibians could be affected throughout operations but they are able to reproduce quickly and populations are able to recover relatively quickly.

5.4.7.4.1.4 *Project Area*

There is a low likelihood of a residual habitat loss effect occurring; however, it is with high confidence that it will be a Not Significant (negligible) residual effect based on the magnitude, geographical extent, frequency, and reversibility of the effect. Loss and degradation of moderate to high value amphibian habitat will occur during the construction phase primarily in the mine site area and these effects will be evident through operations. Within the mine site, the adverse effect is rated as negligible magnitude because a small fraction (<1%) of regionally available habitat will be affected after mitigation and the resilience to recover for these ecosystems is high. Regionally, these moderate to high rated suitable habitats are widespread and available throughout the RSA. The duration of the habitat effect will be short-term until habitat can be reclaimed; however, some areas will be re-vegetated before closure reducing the duration that habitat is lost. Once habitat loss and alteration occurs during construction, it will be approximately 17 years before closure and reclamation restores habitat function, therefore the duration will extend into the short term. The habitat effect will occur once and will be reversible in the short term.

There is a low likelihood that a Not Significant (negligible) loss of <1% moderate to high value habitat will occur after reclamation and that Not Significant (negligible) increased mortality due to Project effects. Project activities are not expected to affect the viability of amphibians, due to the extent of amphibians and their habitat within the RSA.

The residual effects of amphibian mortality are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Mortality may occur intermittently from the construction phase through to closure. Within the mine site, the effect is rated with low magnitude because of the small increase in mortality. The mortality impacts will have a local effect and will be limited to specific areas that are cleared for the Project and within amphibian habitat. The duration of the mortality effect will be short term, as these effects may occur intermittently throughout the life of the Project and populations are able to recover relatively quickly.

The residual effects to amphibian movement are rated as Not Significant (negligible) with high confidence, due to the magnitude, geographic extent, frequency, and reversibility of the effect occurring. Movements may be affected intermittently from the construction phase through to closure. The impacts will have a local effect and will be limited to specific areas within the LSA that are within amphibian habitat. The duration of the effect will be short term, as amphibians could be affected throughout operations but they are able to reproduce quickly and populations are able to recover relatively quickly.

5.4.7.5 Cumulative Effects

A Cumulative Effects Assessment (CEA) for the Amphibian VC is not necessary because the Project is expected to have a Not Significant (negligible) residual effect of habitat loss and alteration, mortality risk, and amphibian movement.

5.4.7.6 Limitations

The key limitation of this assessment is the limited surveys to quantify the amphibian species presence over time, as they have cyclic population numbers. Regional abundance and habitat use are not known beyond habitat suitability models and professional judgment; however, there is high confidence that potential Project effects will be Not Significant (negligible) because of the widespread distribution of amphibians and habitat in the RSA and the small (<2.5%) maximum effect without mitigation on moderate to high suitable habitat.

5.4.7.7 Conclusion

Amphibian populations and habitats will be adversely affected through habitat loss and degradation during the life of the Project, but amphibians will have a high probability of returning to the Project area upon closure, except for limited portions of the airstrip and access roads. Loss and degradation effects include effects from dust deposition on vegetation and soil, invasive species introduction and/or spread, windthrow, dusting at the local scale, incidental vehicle collisions and mortality, increased predation, and potential adverse effects from pesticides. These areas will be degraded during the construction of the Project, but will return to baseline conditions upon closure and are predicted to have a negligible magnitude for effects due to mitigation measures and habitat compensation plans for wetlands that will maintain the amount of wetland habitat, mitigate mortality related to construction and maintenance, and reclaim suitable terrestrial habitats to baseline conditions.

BLACKWATER GOLD PROJECT

APPLICATION FOR AN
ENVIRONMENTAL ASSESSMENT CERTIFICATE /
ENVIRONMENTAL IMPACT STATEMENT
ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS



The potential Project residual effects include habitat loss and degradation of a maximum of 2% of moderate to high rated suitable habitat for amphibians. After mitigation and reclamation, these impacts are predicted to be less than 1% of the suitable RSA habitat. These effects will be primarily from: construction of new portions of the road; airstrip, freshwater pipeline, and mine site development; and clearing for the transmission line. The maximum extent of these effects is considered local in context, with the loss pertaining to the clearing limits and habitat degradation within 50 m of those limits.

Mitigation and adaptive management plans will avoid and mitigate the majority of adverse effects. Where it was not possible to mitigate completely, the effects will be minimized to keep the magnitude of effects at a negligible level.

Mortality and sensory impact effects to amphibian species were considered Not Significant (negligible) primarily because of the limited extent and magnitude of Project activity (maximum 2,384 ha) that overlaps suitable moderate to high rated amphibian habitats relative to the RSA (94,341 ha).