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5.4.8 Water Birds

5.4.8.1 Introduction

This section assesses the potential effects of the Project on the water birds Valued Component (VC). The indicator species are the ring-necked duck *(Aythya collaris)* and yellow rail *(Coturnicops noveboracensis).* The assessment is described in the subsections below and will be conducted for these species. This Introduction describes the information sources of the assessment and the applicable regulatory framework for the assessment of the VC (**Section 5.4.8.1.1**). The spatial, temporal, administrative, technical boundaries and assessment approach is describes in (**Section 5.4.8.3**).

Water birds as a bird group were considered for inventory in the study area. This group of birds includes migratory waterfowl, pelicans, grebes, cormorants, loons, gulls, and shorebirds. There are no previously published records of water bird species of conservation concern within the study areas; however, seven species of concern may potentially occur within the study areas including, great blue heron, long-billed curlew, American golden-plover, American bittern, horned grebe and yellow rail (British Columbia Conservation Data Centre (BC CDC), 2013). Water birds and their habitats are represented by the migratory water birds, specifically yellow rail and ring-necked ducks.

Although the yellow rail (*Cotunicops noveboracensis)* was not previously recorded as occurring in the study areas or was observed during Project field surveys, this species was selected as a representative water bird Valued Component (VC) because it is a species of conservation concern, Red-listed provincially, and listed as a Species of Special Concern federally (Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2002). Ring-necked duck (*Aythya collaris*) was selected as an indicator for water birds as its habitat requirements are representative of most of the wetland and open water environments found within the study areas that may be affected by the Project. The habitat requirements of these two species were used to determine the habitat suitability of water birds within the Project area (**Appendix 5.4.8A** and **Appendix 5.4.8B**).

Water birds require aquatic habitats for most of their life cycle, including adjacent terrestrial and wetland habitats for nesting and feeding. Within the study areas, water birds may use wetlands (fens, bogs, or swamps), lakes, rivers, and ponds.

Terrestrial habitats not adjacent to water are considered unsuitable water bird habitat in the Project area. Subalpine (Englemann Spruce – Subalpine Fir (ESSF) and Boreal Altai Fescue Alpine (BAFA) zones) wetlands and waterbodies may superficially appear to provide good water bird habitat; however, they are generally of low value to the two water bird species representing the water bird group as indicators.

5.4.8.1.1 Regulatory Considerations

To assess potential effects, applicable regulatory requirements were considered (**Table 5.4.8-1**) that apply to water birds and different phases of Project development, mitigation, and reclamation.

The federal *Migratory Bird Convention Act* (Government of Canada, 1994) and provincial *Wildlife Act* (Government of British Columbia, 1996a) afford different degrees of protection for most water birds during the breeding season. Section 34 of the *Wildlife Act* specifically protects the nests of most birds when the bird or their eggs are in the nest (Government of British Columbia, 1996a) at the time of construction and clearing, Species of conservation concern that may occur in the region are afforded protection under the *Species at Risk Act* (*SARA*) (Government of Canada, 2002) on federal lands. Red- and Blue-listed bird species are subject to BC Wildlife Act regulations; when also listed federally, the Red- and Blue-listed species are subject to *SARA* and/or COSEWIC. The Vanderhoof Land and Resource Management Plan (LRMP) (ILMB, 1997) provides guidance for the development of the regional area as well as recommendations for the protection of wildlife habitat. Management of wildlife habitat and populations is considered under the BC *Forest and Range Practices Act* (Government of BC, 2002) and the BC Conservation Framework. In addition, for waterfowl management, guidance is provided under the North American Waterfowl Management Plan and Federal Policy on Wetland Conservation.

Table 5.4.8-1: Assessment and Permitting Regulations Regarding Water Birds

Regulation/ Guideline	Brief Description or Requirements	Data Required to Meet Regulation/Guideline	Time Frame (Pre/Post-Application Submission)
Canada *Species at Risk Act*	Species at risk may require federal permits for handling, harvest or habitat destruction and recovery plans may exist.	Occurrence and abundance / distribution data from surveys.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting listed water birds.
Canada *Migratory Bird Convention Act*	Pertains to migratory birds and their management.	Occurrence through breeding bird surveys, nest searches, and play/call-back data.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting listed water birds.
BC *Wildlife Act*	Permits are required for handling and for surveys that may harass animals or spread disease.	Abundance and distribution data from BC CDC records and surveys, wildlife habitat suitability.	Wildlife management plans and permitting for exploration.
BC *Forest and Range Practices Act*	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 forest edges and wetland areas, both of which can include important habitat for water birds.	Wildlife management plans and permitting for exploration.

Regulation/ Guideline	Brief Description or Requirements	Data Required to Meet Regulation/Guideline	Time Frame (Pre/Post-Application Submission)
North American Waterfowl Management Plan	Guidance document for the management of North American waterfowl. Species identified in Partners for Flight are given special management attention	Occurrence and abundance / distribution data from surveys.	Wildlife management plans pre-Application
BC Conservation Framework	Yellow rail is provincially Blue-listed.	Habitat and population data related to project.	Ongoing
Federal Policy on Wetland Conservation (Government of Canada, 1991)	Approved by Cabinet in 1992, directs all departments to implement the seven strategies of the Policy. Two key commitments include no-net-loss of wetland functions on all federal lands and waters, and enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels. Not only does the Policy apply to the management of federal lands but all federal programs, services, and expenditures. Policy is important to water birds because it helps protect their habitat.	Developed to ensure compliance with the Policy, the Implementation Guide outlines the sequence of mitigation alternatives, compensation, and monitoring to meet the policy goal of no-net-loss of wetland functions.	Pre- and post-Application (monitoring of mitigation measures)
Vanderhoof LRMP	The Vanderhoof LRMP presents a number of wildlife objectives and strategies for maintaining habitat that benefit water birds.	Abundance and distribution data from BC CDC records and surveys.	Wildlife management plans and permitting for exploration.

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

5.4.8.2 Valued Component Baseline

Background searches did not identify historic water bird surveys conducted within the study areas, although Canadian Wildlife Service (CWS) surveys were conducted on a provincial regional scale. Project-specific baseline surveys conducted from 2011 through 2013 detected 23 species of water birds, including one species of conservation concern, the great blue heron (*Ardea Herodias*). The largest number of species detected (19) was within the RSA, followed by the transmission line corridor and the Kluskus FSR corridor and LSA; nine species were detected within the mine site

LSA. All species detected and their respective locations are discussed in the AMEC Baseline Wildlife Report (AMEC, 2013). The four most frequently detected species were Wilson's snipe (*Gallinago gallinago*), greater yellowlegs (*Tringa melanoleuca*), bufflehead (*Bucephala albeola*), and common loon (*Gavia immer*). Many of the wetlands within the study areas were found to have greater yellowlegs or Wilson's snipe; bufflehead or common loon was present on most waterbodies. Wilson's snipe and greater yellowlegs were identified within the mine site.

Yellow rail was not detected during any surveys, and ring-necked ducks were detected at eight waterbodies within the transmission line and Kluskus FSR LSAs and the RSA. Most waterbodies were small (<16 ha), and located in areas lower in elevation than the mine site. A total of five ring-necked duck broods were detected at four waterbodies.

The Blue-listed great blue heron was found at one location along Davidson Creek near Tatelkuz Lake in the RSA, but was not found during the breeding baseline surveys. This species does not likely nest in any of the study areas, but may be found infrequently as a non-breeding visitor to wetlands and waterbodies throughout the area.

5.4.8.2.1 Past, Present, or Future Project Activities

The project 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 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 habitat within the Project area. The mountain pine beetle (MPB) has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads. There is a waterfowl hunting season in the Project area and the area is used by recreationalists. Baseline information collected on water birds was conducted in the Local Study Area (LSA) and portions of the Regional Study Area (RSA) that have been altered by these past and present activities. The future activities in the Project area are expected to include the same activities.

5.4.8.2.2 Traditional Ecological and Community Knowledge

Water birds are of some importance to local residents and Aboriginal groups. Comments provided during the engagement and consultation process for the Project provide insight into traditional, ecological, or community knowledge (AMEC, 2013). This includes unique knowledge about the local environment, how it functions, and its characteristic ecological relationships.

Some water birds are harvested by Aboriginal groups in the area. Historically, the water birds were captured using fishing nets suspended in the air, while swans were captured in snares. Some bird

body parts had secondary purposes; for example, dried goose esophagi were used for storing fat (Hall, 1992). Ducks continue to be harvested by Aboriginal groups.

The Chilcotin area is a popular area for tourism. Operations include wilderness tours, bird watching tours, and tours of the Nuxalk-Carrier Grease Trails (i.e., historic paths that were used to trade goods between various Aboriginal groups).

5.4.8.3 Potential Effects of the Proposed Project and Proposed Mitigation

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

It first describes the features of the study area, temporal, administrative, and technical boundaries. (**Section 5.4.8.3.1** to **Section 5.4.8.3.5**).

Then, **Section 5.4.8.3.6** details the assessment approach used in the assessment followed by **Section 5.4.8.3.8** Mitigation Measures.

The assessment considers the following:

- Aquatic and riparian habitat, including the quality and quantity of any lost habitat for relevant species of birds;
- Feeding, nesting, or breeding habitats;
- Any wetland habitat alteration or loss;
- Any species of birds that are Rare, Vulnerable, Endangered, Threatened; or of
- Special Concern as listed under provincial Blue and Red lists, *SARA*, COSEWIC, as well as any migratory birds and species of international significance (**Section 5.4.8.1.1**);
- Direct and indirect wildlife mortality from the mine operations and traffic;
- Wildlife habitat is being rated for suitability as a surrogate for wildlife productivity; and
- Implications of the proposed Project acting as an attractant for particular species.

A range of potential effects on water birds can be associated with a project involving a mine and linear features including roads, pipelines and transmission lines. Assessment boundaries define the scope or limits of the assessment. These boundaries encompass the areas and time periods during which the Project is expected to interact with water birds, constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and limitations in predicting or measuring changes (technical boundaries). Each of these boundaries is defined in the subsections below. Activities occurring during each phase of the proposed Project could potentially interact with waterbirds. Habitat alteration, noise disturbance (displacement), and potential mortality are the predicted key and moderate interactions for waterbirds. Implications of the Project acting as an attractant for particular species includes potential attraction to lighting sources at the mine facility and potential for waterfowl use

of the tailings pond. Taking a conservative approach, both Key and Moderate interactions are combined and considered jointly in assessment of project and cumulative effects.

5.4.8.3.1 Study Area Boundaries

Two geographic scales were defined for considering the Project effects on water birds and water bird habitat, as shown on **Figure 5.4.8-1** 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 water birds within these areas were identified and assessed within the RSA.

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

- The LSA includes the entire mine site where habitat will be removed and considers a buffer to take into account sensory disturbance; and
- The LSA includes all linear components and a buffer to take into account sensory disturbance. The buffer along the linear corridors varies because activities along those corridors varies 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 water birds VC comprises 22,509 ha and includes 7,032 ha for the Project footprints (**Table 5.4.8-2**). 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 project 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. Existing roads will be used to access the transmission line to the extent possible.

Table 5.4.8-2: 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**

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

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

The RSA for the purpose of the water birds VC comprises 291,714 ha and is large enough to assess the seasonal home range movements and important seasonal habitats of most water bird 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 5.4.8-1**).

5.4.8.3.2 Temporal Boundaries

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

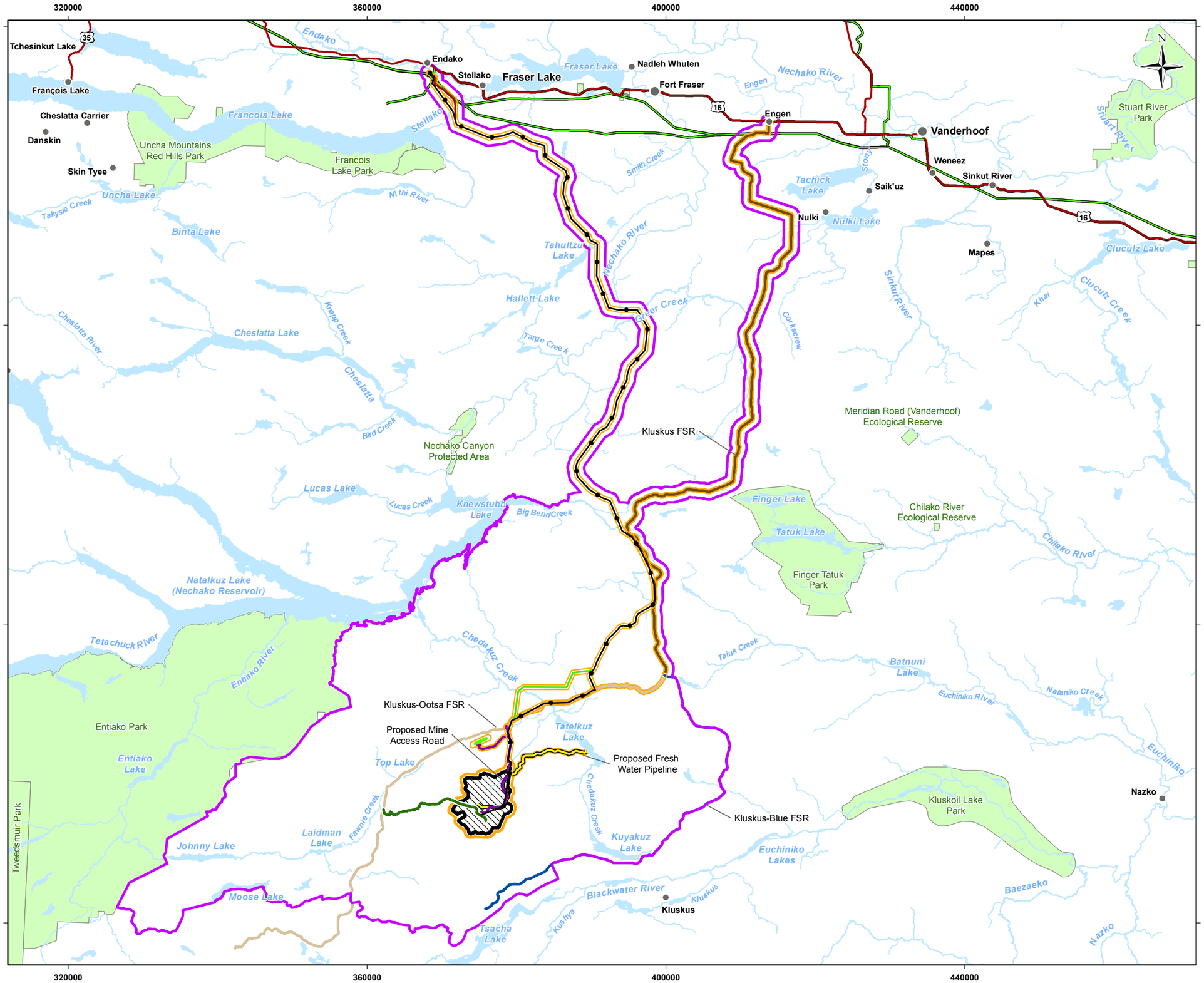
- **Construction phase:** The construction phase of the Project will occur over 2 years and will likely start following receipt of the required permits;
- **Operations phase**: The operations phase of the Project will extend for approximately 17 years;
- **Closure phase**: The closure phase is estimated 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—Effect occurs during the construction phase; Medium-term—not applicable for water birds; Long-term—Effect occurs throughout operations and closure; and Chronic—Effect extends into post-closure or beyond.

5.4.8.3.3 Administrative Boundaries

The Project site is located in the Northern Rockies Bird Conservation Region (NRBCR), an ecologically defined conservation unit managed by the Canadian Wildlife Service for bird conservation (Environment Canada (EC), 2013). The strategy for NRBCR provides information on priority bird species present in that region, as well as their population objectives, habitats, threats, and recommended conservation objectives and actions (EC, 2013).

The Vanderhoof LRMP identifies smaller Resource Management Zones (RMZs) that have different resource development and conservation objectives to guide land use decisions and management. Each RMZ has a species of management concern and objectives. 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 also 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).



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 (except for Caribou and Grizzly Bear)
- Regional Study Area (except for Caribou and Grizzly Bear)

Scale: 1:500,000

0 5 10 20

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Wildlife and Wildlife Habitat Study Areas

DATE:	ANALYST:	**Figure** 5.4.8-1
September, 2015	MY	
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-001_study_area_5.4.8-1.pdf
GIS FILE: 04-03-001_study_area_5.4.8-1.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

O:\Blackwater\Mapping\04_wildlife\03_EA\04-03-001_study_area_5.4.8-1.mxd

5.4.8.3.4 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, Resources Information Standards Committee (RISC) standards for ratings and suitability classes were followed (RISC, 1999). Therefore, these models include acceptable levels of uncertainty for an assessment.

5.4.8.3.5 Potential Project Effects

Pre-existing habitat loss and fragmentation due to logging and road development has altered the habitat within the Project area. The mountain pine beetle (MPB) has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was harvested, while remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads. There is a waterfowl hunting season in the Project area and the area is used by recreationalists. Baseline information collected on water birds was conducted in the Local Study Area (LSA) and portions of the RSA that have been altered by these past and present activities. The future activities in the Project area are expected to include the same activities. The three named projects from the project inclusion list in **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.

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 water bird and water bird habitat, both key and moderate interactions were combined and included in the modeling and effects assessment. The interactions are further identified using a ranking table (**Table 5.4.8-3**) to identify potential interactions with different Project phases and whether the resulting effect can be managed to acceptable levels through standard operating practices. These practices include 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.

Several measurable Categories of Potential Environmental Effects / Issues for Project effects were defined; **Table 5.4.8-4** presents the rationale for the selection of each Categories of Potential Environmental Effects / Issues.

Evidence suggests that below certain thresholds of habitat cover, species may decline more rapidly than would be expected from habitat loss alone (Andrén, 1994). When remaining functional habitat is less than 10% to 30% in a region, species are still affected by habitat loss (Andrén, 1994; Fahrig, 1997; Swift and Hannon, 2010) but are not necessarily at risk of regional extirpation. Higher thresholds have been reported for some species (e.g., Gibbs, 1998; Homan et al., 2004), which may reflect sensitivity to fragmentation after only moderate habitat loss. Depending on 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 and 80% (20% loss) for species of conservation concern. For water birds, the precautionary threshold of 20% loss is used for assessment of the effects within the RSA because yellow rail is a federally listed species.

Table 5.4.8-3: Potential Interaction of the Project with Water Birds

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

Table 5.4.8-4: Categories of Potential Environmental Effects / Issues for Water Birds

Categories of Potential Environmental Effects / Issues	Notes or Rationale for Selection
Habitat Loss and Alteration	Effects on population abundance and distribution are directly affected by habitat availability and displacement from effective habitat. Vegetation clearing for the Project, and sensory disturbance from Project activities during construction and operations, may affect habitat availability and quality. This analysis included ranking habitat quality for water birds, so that the relative quantitative and qualitative loss of moderate to high quality versus lower quality habitat was assessed in relation to the local and regional availability of suitable habitat measured as percentage and hectares lost.
Changes in Water Bird Population Dynamics	For some species, predation may be affected by changes in prey abundance / habitat availability, resulting in differential mortality of key species. The Project may indirectly alter predator-prey relationships among some species and contribute to cumulative landscape changes. This relies on provincial data and potential monitoring data of water bird populations and distribution over the life of the Project, including species, features and occurrences based on field surveys and BC CDC records. Future change can be monitored with intensive surveys. For water birds, the focus is on relative abundance and distribution in areas of potential impact and measures of known mortality.
Mortality Risk	Mortality related to transport options and increased hunter access could alter species abundance. This requires assessment of the potential effects of roads, pits, and other structural features on water bird feeding, migration and movement, reproductive behaviour and success, and direct mortality. This is primarily a qualitative assessment, in the absence of area-specific baseline data and predictive tools, based on characteristics of the species or species group and context of Project components.
Changes in Water Bird Movement Patterns (Sensory Disturbance)	Changes in movement patterns may affect species breeding and survival rates, and may increase predation/mortality. Changes may positively or negatively affect hunting, which can affect local species abundance and traditional sustenance use. This is a qualitative discussion based on information from habitat mapping, existing knowledge on wildlife movement patterns, and characteristics and context of Project components.
Changes in Water Bird Health	Contaminant loading may affect water bird health. Assessment of the potential effects of identified contaminants of potential concern on water bird feeding, migration and movement, reproductive behaviour and success, and direct mortality. This is a qualitative measure that relies on reporting of animal health and provincial data. Assessment of health of water bird kills may provide a surrogate measure of health. Some Human Health and Ecological Risk Assessment sampling and risk assessment address part of this concern.

Note: BC CDC = British Columbia Conservation Data Centre

The next step was to assess each of these relative interactions of Project phases and activities with water birds to examine which Categories of Potential Environmental Effects / Issues may be expected in different areas and times (**Table 5.4.8-5**).

Table 5.4.8-5: Project Interactions on Categories of Potential Environmental Effects / Issues for Water Birds

Project Activities and Physical Works	Categories of Potential Environmental Effects / Issues				
	Changes in Habitat Availability	**Changes in Wildlife Population Dynamics**	**Changes in Wildlife Mortality Risk**	**Changes in Wildlife Movement Patterns**	**Changes in Wildlife Health**
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Clearing and grubbing	2	1	1	2	0
Open pit preparation	1	1	1	1	0
General earthworks (moving surface soil)	2	0	0	2	1
Equipment operation	1	1	1	1	1
Road upgrading and construction	2	1	2	2	1
Borrow pit excavation	2	2	1	2	1
Road and airstrip use	1	1	2	2	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 preparation	2	1	1	1	1
Temporary waste rock stockpiles	2	1	1	1	1
Tailings storage facility	2	1	2	2	2
Camp	1	1	1	1	1
Road use	2	1	1	1	1
Water collection pond	2	2	2	2	2
Decommissioning: Closure and Post-Closure of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Roads	2	1	1	2	2
Reclamation	2	2	1	1	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. Potential interactions are linked to the temporal scale of the Project phases and vary in the time needed to return to baseline conditions (**Table 5.4.8-6**). For instance, sensory disturbance effects 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 significant amounts of time to recover to baseline conditions.

Table 5.4.8-6: Temporal Boundaries

Categories of Potential Environmental Effects / Issues	Temporal Boundary
Habitat Loss and Alteration	Construction through closure
Changes in Water Bird Population Dynamics	All phases after clearing and during construction
Mortality Risk	Construction and operations
Changes in Water Bird Movement Patterns	Construction and operations
Changes in Water Bird Health	All phases, and into closure, due to potential contaminants, uptake or delay in recovery of habitat

Anticipated Project effects include habitat loss (i.e., cleared vegetation, changes to wetland quantity and quality), and some potential degradation to existing wetland habitat (**Table 5.4.8-7**). The construction of the proposed mine site, access roads, transmission line, freshwater supply pipeline, and airstrip expansion will require the removal of vegetation. A small amount of this 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 water birds 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, in some cases attracting water birds close to activity, resulting in direct mortality from vehicle collisions.

Three of the five potential Categories of Potential Environmental Effects / Issues, habitat loss and alteration, changes in population dynamics and change in water bird mortality risk, are considered to have potential measurable residual effects and, therefore, carried through the effects assessment. The other two potential effects, wildlife health, and movement patterns, will not be considered further in the assessment, due to the mitigation measures in place and a no net loss of wetlands plan for the Project area Wetlands Management Plan (WMP) (**Section 12.2.1.18.4.3**). The Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**), Water Quality and Liquid Discharges Management Plan (WQLDMP) (**Section 12.2.1.18.4.10**), Noise and Vibration Management Measures (**Section 5.2.2**), and Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**) are predicted to limit potential effects on these categories to negligible levels. Consequently, changes in wildlife movement patterns due to noise disturbance are not considered further, but are included in habitat alteration considerations through downgrades in habitat suitability ratings and application of buffers to infrastructure area habitat effects.

Wildlife health is not carried forward due to the conclusions of the atmospheric effects assessment and the surface water quality effects assessment. 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 exceedences of specific water quality guidelines that are a consequence of existing background concentrations above guidelines, not as a result of Project effects, and therefore are not considered residual. Manual clearing of vegetation along the transmission line will be used instead of chemical control when feasible.

Table 5.4.8-7: Overview of Potential Project Effects on Water Birds

Categories of Potential Environmental Effects / Issues	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.	Construction Operations closure	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip
Mortality Risk	Direct mortality from physical exposure to traffic or attractants, Mortality related to transport options and increased hunter access.	Construction Operations closure	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip
Change in Population Dynamics	Indirect mortality due to changes in predator access or competing species.	Construction Operations closure	Mine site, access roads, transmission line, freshwater supply pipeline, and airstrip

5.4.8.3.6 Assessment Approach for Measuring Potential Effects

Both quantitative and qualitative approaches were used for the assessment of potential Project effects on water birds. 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 and predator-prey changes.

5.4.8.3.6.1 Habitat Suitability Model Assumptions

Habitat suitability modeling is based on assumptions related to TEM and PEM habitat interpretations, professional judgement and experience related to water birds and water bird habitat, literature and traditional knowledge. Assumptions include the quantitative rating of TEM and PEM units for value to water birds 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.

5.4.8.3.6.2 Habitat Loss and Alteration

To identify the most critical habitats for water bird species, potential habitat was rated on a four class system (RISC, 1999) depending on biogeoclimatic (BGC) zone, waterbody, and wetland classification (**Appendix 5.4.8C**). For areas where data from Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) were present, potential yellow rail habitat was generally considered to be fens and potential ring-necked duck habitat was generally considered to be open bodies of water. Areas outside of PEM and TEM coverage were classified using Freshwater Atlas data (GeoBC, 2014). Waterbodies and wetlands were buffered terrestrially to 15 m to complete habitat suitability models and calculate potential areas affected by Project component footprints. TEM or PEM and the Freshwater Atlas (GeoBC, 2014) were used to identify wetland and open water polygons containing suitable habitat for the indicator species (**Figure 5.4.8-1**). Although the yellow rail and ring-necked duck are not usually resident in higher elevations, all potential habitat sites were included to present a conservative measure of potential effects to water bird habitats and species.

5.4.8.3.6.3 Wildlife Mortality Risk

There are no measureable parameters in the Project area for the assessment of changes in mortality due to traffic or increased direct mortality such as hunting, therefore the assessment is qualitative.

5.4.8.3.6.4 Changes in Population Dynamics

There are no measureable parameters for the assessment of changes in mortality due to predator-prey changes, therefore the assessment is qualitative.

5.4.8.3.7 Model Results for Quantification of Potential Project Effects on Habitat

The potential overlap of Project component footprints on focal species of water bird habitats is tabulated in **Table 5.4.8-8** and **Table 5.4.8-9,** and illustrated on **Figure 5.4.8-2** and **Figure 5.4.8-3**. The areas shown represent the maximum potential habitat affected, and do not account for existing disturbance or mitigation measures.

Table 5.4.8-8: Potential Moderate and High Rated Ring-Necked Duck Habitat Area Affected within Footprints, LSAs, and RSA

	Component	Moderate and High Rated Ring-Necked Duck Habitat Area (ha)	Total Area (ha)	Habitat % of Total Area*	% of RSA Habitat by Footprint Component*
Footprint or Corridor	Access Road	0	95	0	0
	Airstrip	0	50	0	0
	FSR	1	253	0	<1
	Mine Site	6	4,430	0	<1
	Freshwater Supply Pipeline	0	132	0	<1
	Transmission Line, Main	13	1,806	1	<1
	Transmission Line, Mills Ranch	8	202	4	<1
	Transmission Line, Stellako	0	62	0	0
	Total	**27**	**7,032**	**0**	**<1**
LSA	Access Road	0	363	0	0
	Airstrip	1	465	0	<1
	FSR	142	6,574	3	1
	Mine Site	16	6,123	0	<1
	Freshwater Supply Pipeline	3	731	0	<1
	Transmission Line, Main	104	8,068	1	<1
	Transmission Line, Mills Ranch	40	924	4	0
	Transmission Line, Stellako	0	306	0	0
	Total	**306**	**23,554**	**1**	**3**
RSA		11,380	291,714	4	-
Area	Footprint % RSA	2	-	-	-
	Footprint % LSA	31	-	-	-
Habitat	Footprint % RSA habitat	<1	-	-	-
	Footprint % LSA habitat	9	-	-	-

Note: FSR = forest service road; ha = hectare; LSA = Local Study Area; RSA = Regional Study Area; * = total % was rounded down if <0.5 and up if >0.5

Table 5.4.8-9: Potential Moderate and High Rated Yellow Rail Habitat Area Affected within Footprints, LSAs, and RSA

	Component	Moderate and High Rated Yellow Rail Habitat Area (ha)	Total Area (ha)	Habitat % of Total Area	% of RSA Habitat by Footprint Component
Footprint or Corridor	Access Road	0	95	0	0
	Airstrip	0	50	0	0
	FSR	1	230	0	<1
	Mine Site	1	4,430	0	<1
	Freshwater Supply Pipeline	1	133	1	<1
	Transmission Line, Main	11	1,806	1	<1
	Transmission Line, Mills Ranch	8	202	4	<1
	Transmission Line, Stellako	0	62	0	0
	Total	**21**	**7,032**	**0**	**<1**
LSA	Access Road	1	363	0	<1
	Airstrip	7	465	2	<1
	FSR	75	5,529	1	2
	Mine Site	10	6,123	0	<1
	Freshwater Supply Pipeline	22	731	3	<1
	Transmission Line, Main	55	8,068	1	2
	Transmission Line, Mills Ranch	38	924	4	1
	Transmission Line, Stellako	0	306	0	0
	Total	**207**	**22,509**	**1**	**6**
RSA		3,635	291,714	1	-
Area	Footprint % RSA	2	-	-	-
	Footprint % LSA	31	-	-	-
Habitat	Footprint % RSA Habitat	<1	-	-	-
	Footprint % LSA Habitat	10	-	-	-

Note: FSR = forest service road; ha = hectare; LSA = Local Study Area; RSA = Regional Study Area

360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Chedakuz Creek

Proposed Mine Access Road

Proposed Airstrip

Proposed Fresh Water Pipeline

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Tatelkuz Lake

Snake Lake

Top Lake

Davidson Creek

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

Legend

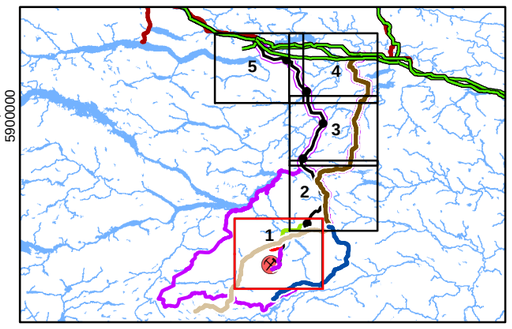
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Airstrip Access Road
- Proposed Mine Access Road
- Proposed Fresh Water Pipeline
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Site Facilities
- Stream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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Ring-necked Duck Habitat Suitability, Map 1 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-2
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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Vivian Lake
Provis Lake
Duten Lake
Finger Lake
Willington Lake
Finnie Lake
Andros Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
FINGER TATUK PARK
Lavoie Lake
Turff Lake
Hay Lake
Cory Lake
Goose Lake
Brewster Lakes
Brewster Lakes
Brewster Lakes
Kluskus FSR
Proposed Transmission Line
Klunchatistli Lake
Chutanli Lake

N

Legend

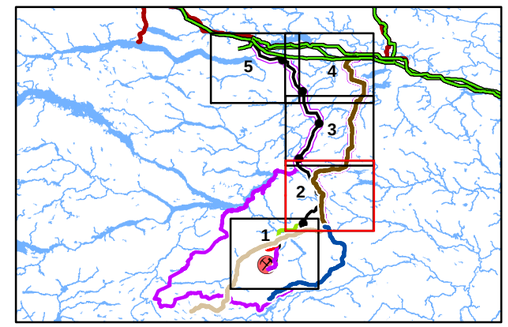
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Ring-necked Duck Habitat Suitability, Map 2 of 5

DATE:	ANALYST:	**Figure** 5.4.8-2b
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390000 400000 410000 420000

5960000 5950000 5940000

Tahultzu Lake
Hallett Lake
Proposed Transmission Line
Bungalow Lake
True Triangle Lake
Triangle Lake
Lorne Lake
Nechako River
Welch Lake
Kluskus FSR
Paddle Lake
Crystal Lake
Home Lake
Boomerang Lake
Johnson Lake
Secord Lake
Gluten Lake
Duten Lake
Chief Gray Lake
Vivian Lake

N

Legend

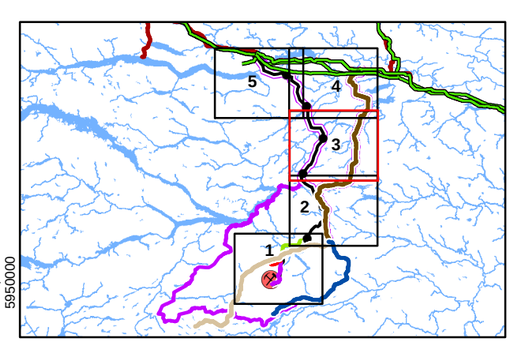
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Ring-necked Duck Habitat Suitability, Map 3 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-2c
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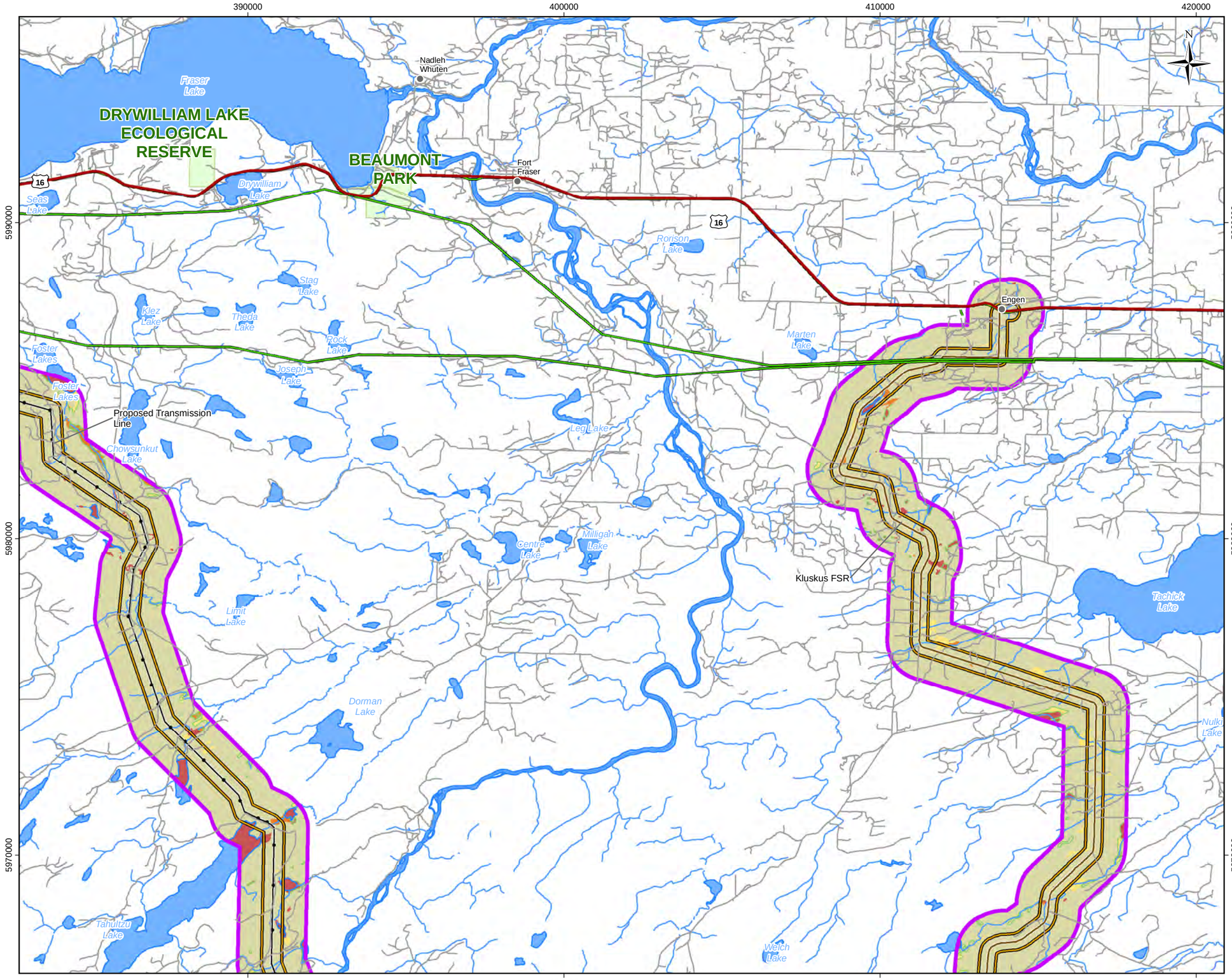

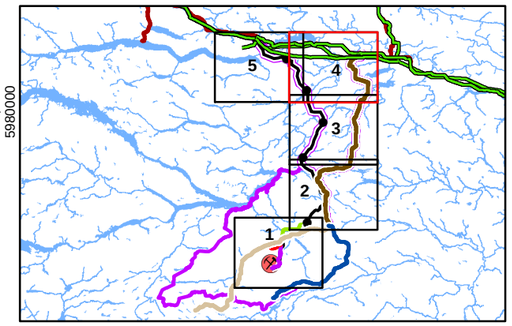

Legend

- 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
- M - Moderate
- L - Low
- N -Nil

Scale: 1:120,000

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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Ring-necked Duck Habitat Suitability, Map 4 of 5

DATE:	ANALYST:	**Figure** 5.4.8-2d
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000
370000
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Savory Lake
Endako
Deserter Lake
Fraser Lake
DRYWILLIAM L
ECOLOGICA
RESERVE
Stellako
Fraser Lake
Casey Lake
Seas Lake
STELLAKO RIVER
WILDLIFE MANAGEMENT AREA
Proposed Transmission Line
(Stellako re-route)
Stellako River
Klez Lake
Foster Lakes
Francois Lake
Proposed Transmission Line
Chowsunkut Lake
FRANCOIS
LAKE PARK
Anzus Lake
Borel Lake
Graham Lake
Laurie Lake
Cabin Lake
Twentysix Mile Lake
Tahultzu Lake
16

N

Legend

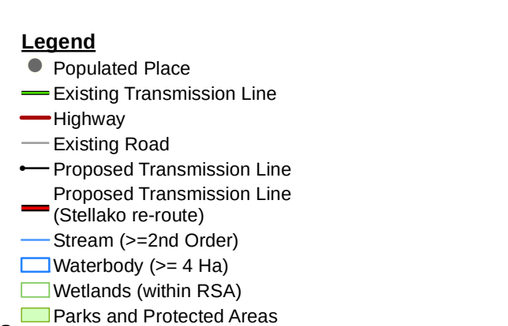
- Populated Place
- Existing Transmission Line
- Highway
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Kilometres

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BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Ring-necked Duck Habitat Suitability, Map 5 of 5

DATE:	ANALYST:	**Figure** 5.4.8-2e
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360000 370000 380000 390000

5910000 5900000 5890000

Proposed Transmission Line

Proposed Transmission Line (Mills Ranch re-route)

Chedakuz Creek

Proposed Mine Access Road

Proposed Airstrip

Proposed Fresh Water Pipeline

Kluskus-Ootsa FSR

Proposed Airstrip Access Road

Tatelkuz Lake

Snake Lake

Top Lake

Davidson Creek

Exploration Road

Kuyakuz Lake

Kluskus-Blue FSR

N

Legend

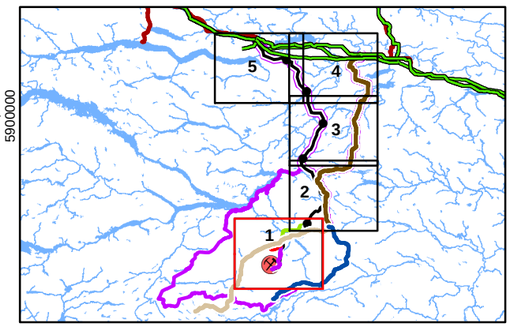
- Existing Road
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Airstrip Access Road
- Proposed Mine Access Road
- Proposed Fresh Water Pipeline
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Site Facilities
- Stream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

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Yellow Rail Habitat Suitability, Map 1 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-3
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PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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390000 400000 410000 420000

5940000 5930000 5920000

Chief Gray Lake
Hobson Lake
Nechako Reservoir
Willington Lake
Finnie Lake
Andros Lake
Vivian Lake
Provist Lake
Duten Lake
Finger Lake
Otter Lake
Stefiuk Lake
Tatuk Lake
FINGER TATUK PARK
Lavoie Lake
Turff Lake
Hay Lake
Cory Lake
Klunchatistli Lake
Chutanli Lake
Goose Lake
Brewster Lakes
Brewster Lakes
Brewster Lakes
Kluskus FSR
Proposed Transmission Line

N

Legend

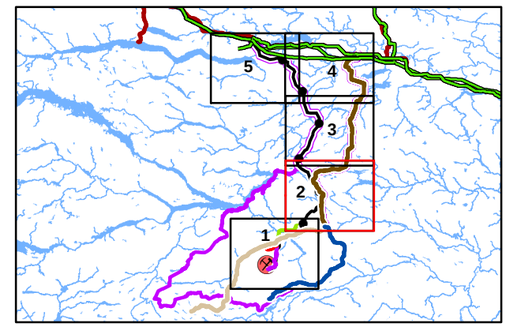
- Existing Road
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Yellow Rail Habitat Suitability, Map 2 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-3b
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390000 400000 410000 420000

5960000 5950000 5940000

Tahultzu Lake
Hallett Lake
Proposed Transmission Line
True Triangle Lake
Triangle Lake
Lorne Lake
Bungalow Lake
Nechako River
Welch Lake
Kluskus FSR
Paddle Lake
Crystal Lake
Home Lake
Boomerang Lake
Johnson Lake
Secord Lake
Gluten Lake
Duten Lake
Chief Gray Lake
Vivian Lake

N

Legend

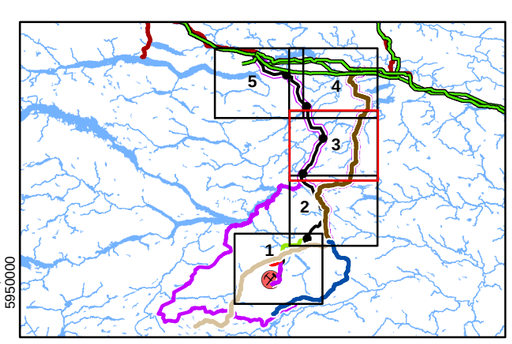
- Existing Road
- Kluskus FSR
- Proposed Transmission Line
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



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Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Yellow Rail Habitat Suitability, Map 3 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-3c
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5990000 5980000 5970000

DRYWILLIAM LAKE ECOLOGICAL RESERVE

BEAUMONT PARK

Fraser Lake

Nadleh Whuten

Fort Fraser

16

Seas Lake

Drywilliam Lake

Ronson Lake

Stag Lake

Klez Lake

Theda Lake

Rock Lake

Foster Lakes

Joseph Lake

Marten Lake

Engen

Leg Lake

Proposed Transmission Line

Chowsunkut Lake

Centre Lake

Milligan Lake

Kluskus FSR

Limit Lake

Tachick Lake

Dorman Lake

Nulki Lake

Tahultzu Lake

Welch Lake

N

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
- M - Moderate
- L - Low
- N - Nil

Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Yellow Rail Habitat Suitability, Map 4 of 5

DATE:	ANALYST:	**Figure** 5.4.8-3d
September, 2015	MY	
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-004_WHR_YERA_5.4.8-3.pdf
GIS FILE: 04-03-004_WHR_YERA_5.4.8-3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	amec

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360000 370000 380000

5990000 5980000 5970000

Savory Lake
Endako
Deserter Lake
Fraser Lake
DRYWILLIAM L ECOLOGICA RESERVE
Stellako
Fraser Lake
Casey Lake
Seas Lake
STELLAKO RIVER WILDLIFE MANAGEMENT AREA
Proposed Transmission Line (Stellako re-route)
Stellako River
Klez Lake
Foster Lakes
Francois Lake
Proposed Transmission Line
Chowsunkut Lake
FRANCOIS LAKE PARK
Anzus Lake
Borel Lake
Graham Lake
Laurie Lake
Cabin Lake
Twentysix Mile Lake
Tahultzu Lake

16

N

Legend

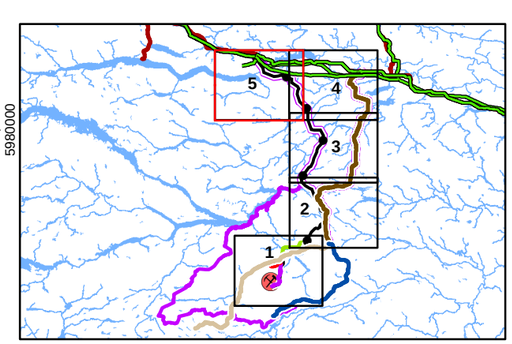
- Populated Place
- Existing Transmission Line
- Highway
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

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



Scale: 1:120,000

0 1 2 4 6

Kilometres

Reference

BC Government GeoBC Data Distribution

CLIENT: newgold™

PROJECT: Blackwater Gold Project

Yellow Rail Habitat Suitability, Map 5 of 5

DATE: September, 2015	ANALYST: MY	**Figure** 5.4.8-3e
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-004_WHR_YERA_5.4.8-3.pdf
GIS FILE: 04-03-004_WHR_YERA_5.4.8-3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

amec

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5.4.8.3.7.1 Habitat Loss and Alteration

The habitat loss and alteration category of effects is a method to account for areas of vegetation removal and/or ground disturbance due to placement of infrastructure. To simplify the effects assessment, all lost areas are combined, regardless of how long they are lost (even though the Project area will be reclaimed, except for some small features) to represent a worst-case scenario.

The distance used in this assessment considers the potential effects to water birds beyond 50 m of the component footprints to be negligible. This is considered a reasonable distance, based on professional judgement of the various types of direct degradation effects that may potentially occur for the focal species.

The loss of waterbodies and wetlands within the mine site will result in a temporal decrease of available habitat and potentially a decrease in the local number of water birds. No wetlands or waterbodies will be lost in areas other than the mine site.

Water bird habitat was identified and mapped within the LSAs and RSA using a habitat suitability ranking system for all potential living and breeding habitat within the Project area (**Figure 5.4.8-1**).

High and moderate quality ring-necked duck habitat consists of lower elevation ponds and lakes and adjacent wetland or forest, which provide breeding and feeding habitat (generally lower than the ESSF zone). Only 4% (11,380 ha) of the RSA was rated high and moderate for ring-necked duck habitat (**Appendix 5.4.8C**). The LSA suitable habitat associated with the Project components represent 3% of the available suitable habitat in the RSA and the actual footprint components overlap less than 1% of the RSA before mitigation. High elevation Project infrastructure associated with the mine site, airstrip, access road, and freshwater supply pipeline overlaps negligible (<1%) suitable habitat high in value, as this species typically breeds near open water habitats at lower elevations.

The total maximum extent of the Project footprint (within clearing limits) categorized as lost ring-necked duck habitat is 27 ha, 6 ha of which is attributed to the mine site, and 21 ha to the transmission line. The clearing limits equal maximum lost area, regardless whether they were previously disturbed or not and do not account for reclaimed habitat. Effects will have the potential to occur from the start of Project construction to the end of closure.

High quality yellow rail habitat consists of lower elevation wet sedge fens that provide breeding and feeding habitat (generally lower than ESSF). Less than 1% (11 ha) of the RSA was rated high and moderate for yellow rail habitat (**Appendix 5.4.8C**). Within the LSA, less than 1% (207 ha) of the area was high or moderate value habitat. The LSA habitat associated with the Project components represent 6% of the available habitat in the RSA and the actual footprint components overlap less than 1%. In the LSAs, high elevation infrastructure associated with the mine site, airstrip, access road, and freshwater supply pipeline are not expected to be high or moderate in value, as this species typically nests at lower elevations. Most potential effects on yellow rails are anticipated to be associated with the transmission line at lower elevations.

The total maximum extent of the Project footprint (within clearing limits) categorized as lost yellow rail habitat is 21 ha, 1 ha of which is attributed to each of the Kluskus FSR upgrade, mine site, and freshwater supply pipeline, and 18 ha to the transmission line. The clearing limits equal maximum lost areas, regardless whether they were previously disturbed or not.

5.4.8.3.7.2 Mortality Risk

There are low physical risks to water birds through increased mortality caused by vehicle and aircraft collisions. Increased mortality may also occur if water birds are exposed to an increase in hunter access. Effects will have the potential to occur from the start of Project construction to the end of closure.

5.4.8.3.7.3 Changes in Population Dynamics

There are low indirect risks to water birds through increased mortality caused by predator access or increases in competition with enhanced species. Effects will have the potential to occur from the start of Project construction to the end of closure.

5.4.8.3.8 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**) and Reclamation and Closure Plan (RCP) (**Section 2.6**). The following habitat mitigation measures apply to water birds will reduce or eliminate effective habitat loss, direct mortality effects, changes in movement patterns, and potential changes in population dynamics to not significant levels.

5.4.8.3.8.1 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 water birds and water bird 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, and 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 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 Landscape, Soils and Vegetation Management and Restoration Plan (LSVMRP) (**Section 12.2.1.18.4.4**), Invasive Species Management Plan (ISMP)

(**Section 12.2.1.18.4.5**), WMP (**Section 12.2.1.18.4.3**), Sediment and Erosion Control Plan (SECP) (**Section 12.2.1.18.4.1**), RCP (**Section 2.6**), and the Aquatic Resources Management Plan (ARMP) (**Section 12.2.1.18.4.2**). 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 water bird wetlands not directly affected by the Project.

Mitigation for unavoidable loss of water bird habitat will be limited to adjacent areas and will include:

- Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible;
- Applying erosion and sediment control measures;
- Restoring disturbed habitats at mine closure or development of habitats capable of supporting water birds as defined in the RCP and WLMP;
- Implementing pre-clearing nest surveys of areas to be cleared during the bird breeding seasons (March to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found;
- Implementing invasive plant management techniques as defined in the ISMP;
- Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures; and
- Implementing the Fisheries Mitigation and Offsetting Plan (FMOP) and Wetland Compensation Plan (**Appendix 5.3.7A**).

Mitigation measures for altered hydrology will include implementation of BC MFLNRO BMPs for construction. For example, installing appropriate culverts where required, and maintaining functioning water tables and drainage throughout all phases from construction to decommissioning will maintain wetland function. Mitigation of existing road areas and wetland crossings are predicted to maintain or restore wetland function along the proposed access roads and transmission line.

5.4.8.3.8.2 Mortality Risk

Mitigation measures to reduce the potential for direct and indirect mortality risk include:

- posting speed limits along roads for Project related vehicles, as well as implementation of BMPs of road surface maintenance; and
- Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program).

5.4.8.3.8.3 Changes in Population Dynamics

Mitigation measures to reduce the risk for changes in water bird population dynamics include:

- Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program);
- Restoring disturbed habitats at mine closure or development of habitats capable of supporting water birds as defined in the RCP);
- Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible;
- Implementing invasive plant management techniques as defined in the ISMP; and
- Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures.

5.4.8.3.8.4 Effectiveness of Mitigation

Table 5.4.8-10 provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on water birds during mine site development. Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

Table 5.4.8-10: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Water Birds during Mine Site Development

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
Habitat loss and alteration	Construction, Operations, Closure, Post-closure	Road design using existing roads and cleared areas, and 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 forest	High
		Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible	High
		Applying erosion and sediment control measures	High
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting water birds as defined in the RCP and WLMP	High
		Implementing pre-clearing nest surveys of areas to be cleared during the bird breeding seasons (March to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found	High
		Implementing invasive plant management techniques as defined in the ISMP	High
		Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures	Moderate
		Implementing the FMOP and Wetland Compensation Plan (**Appendix 5.3.7A**)	High
Mortality risk	Construction, Operations, Closure, Post-closure	Posting speed limits along roads for Project related vehicles, as well as implementation of BMPs of road surface maintenance	Moderate
		Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program)	High
Water bird health	Construction, Operations,	Managing attractants such as road salt during construction, operations, decommissioning, and closure to reduce leaching into waterbodies	High

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
	Closure, Post-closure	Implementing the Spill Management and Prevention Plan, AQEMP, ARMP	High
Water bird movements	Construction, Operations, Closure, Post-closure	Minimizing Project footprint, as outlined in existing Project Description	High
		Implementing the Noise and Vibration Measures (to reduce attraction of water birds to facilities and potential resultant mortality)	Moderate
Changes in population dynamics	Construction, Operations, Closure, Post-closure	Water quality monitoring and adaptive management (Decommissioning and Closure Activities, RCP, and Follow-up Program)	High
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting water birds as defined in the RCP)	High
		Mitigating for loss and degradation of adjacent riparian wildlife habitats such as well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible	High
		Implementing invasive plant management techniques as defined in the ISMP	Moderate
		Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures	Moderate

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; FMOP = Fisheries Mitigation and Offsetting Plan; ISMP = Invasive Species Management Plan; RCP = Reclamation and Closure Plan; WLMP = Wildlife Management Plan

The mitigation/offsetting success ratings shown in **Table 5.4.8-10** are incorporated into the confidence ratings defined in **Section 4.3.5** and summarized in **Table 5.4.8-12**. 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 water birds 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 Water bird populations, and demonstrated as moderate to high in effectiveness in other locations.

5.4.8.4 Residual Effects and their Significance

Table 5.4.8-11 presents a summary of the potential residual effects for water birds after mitigation, as well as management strategies by Project phase and component.

Table 5.4.8-11: Summary of Categories of Potential Environmental Effects / Issues and Mitigation Measures – Water Birds

Project Phase	Project Component	Categories of Potential Environmental Effects / Issues	Mitigation and Management of Effects	Potential for Residual Effect?
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Habitat Loss and Alteration	Implementing the LSVMRP, progressive reclamation with appropriate species. Primary areas of concern are low elevations of the transmission line and FSR.	Yes
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Mortality Risk	Following the WLMP to reduce potential effects on water birds and their habitat. Enforcing speed limits, as outlined in the Transportation and Access Management Plan (TAMP) (**Section 12.2.1.18.4.14**).	Yes
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Water Bird Health	Managing attractants such as road salt during construction, operations, decommissioning, and closure to reduce leaching into waterbodies. Implementing the Spill Management and Prevention Plan, AQEMP, ARMP.	No
Construction, Operations, and Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Water Bird Movements	Minimizing Project footprint, as outlined in existing Project Description. Implementing the Noise and Vibration Measures (to reduce attraction of water birds to facilities and potential resultant mortality).	No
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Changes in Population Dynamics	Implementing vegetation management.	Yes

Note: FSR = Forest Service Road

Residual effects are those remaining after implementing all mitigation measures, and the expected consequences of the Project on water birds (BC EAO, 2013). Each of the Categories of Potential Environmental Effects / Issues determined to have potential residual effects on water birds is characterized in terms of the effect's magnitude or severity, geographic extent, duration, and reversibility, the context/resilience of water birds or water bird habitat, probability of the effect's occurrence, and confidence in the conclusions (**Table 5.4.8-12**).

Table 5.4.8-12: Characterization of Residual Environmental Effects for Water Birds

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 natural variation Medium—A measurable change but less than high High(1)— A measurable change of density, abundance or distribution (>30% change and >20% for listed species such as yellow rail)
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 that extend into the LSA are referred to as local Local: Within the LSA—Effect is confined to the LSA Regional: Within the RSA—Effect extends beyond the LSA into the RSA
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— Less than two years (i.e., effects happens during the construction phase only) Medium-term—Not applicable for water birds Long-term— From more than 17 to less than 35 years (i.e., effect happens during construction, operations and closure) Chronic— More than 35 years and beyond (i.e., effect happens from construction through to post closure and 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 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 – Water birds have high resilience to stress, have not been affected by other projects or activities or natural changes. No listed species or ecosystems identified .Medium –Water birds have moderate resilience to stress, the VC has been affected by other projects or activities, or

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		natural changes but still has capacity to assimilate more changes. Presence of blue-listed species or ecosystems High – Water birds have weak resilience to stress, the VC has been severely affected by other projects or activities, or natural changes. Presence of 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 Moderate – 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, or 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, or 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 medium in magnitude, medium context rating, medium-term to chronic, reversible, and occur at all frequencies Significant –Effects occur to water birds with a medium to high context, , 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 – Effects on water birds are not well understood, Mitigation has not been proven effective Moderate— Effects on water birds are understood in similar ecosystems and effects documented in the larger regional area or in the literature, mitigation proven effective elsewhere High – Effects on water birds are well understood, mitigation has been proven effective

Note: LSA = Local Study Area; RSA = Regional Study Area; VC = Valued Component
(1) High: A threshold of 20% change or loss is proposed for high magnitude. This is a general environmental practitioner approach, which has been used and supported in the past for resource development projects, including the Joint Review Panel Report on the Jackpine Mine Expansion Project which decision statement was made under *CEAA 2012*.

Thresholds are based on the ability to likely detect change in local populations as a result of Project effects. Threshold effect levels to water birds were selected to reflect the ability of surveys to detect quantitative and qualitative changes (**Table 5.4.8-13**).

Table 5.4.8-13: Threshold(s) for Determining Significance of Residual Water Bird Habitat and Population Effects in the RSA

Categories of Potential Environmental Effects / Issues	Proposed Threshold of Environmental Effect
Habitat Loss and Alteration	>20% reduction in relative water bird habitat abundance or habitat areas with a moderate to high suitability ratings (e.g., >20% change in amount of water bird moderate to high suitable habitats within the RSA, as estimated in suitability model). Evidence of lack of use or displacement due to sensory disturbance may be included as lost habitat if evident.
Mortality Risk	Qualitative measure of risk within the RSA because of Project effects (e.g., road density).
Changes in Population Dynamics	Qualitative measure of risk within the RSA because of Project effects (e.g., road density, potential for alternate prey increases and increased predation risk).

Note: RSA = Regional Study Area

Table 5.4.8-14 presents the residual effects assessment summary for water birds, based on the categorization of effects.

Table 5.4.8-14: Residual Effects Assessment Summary for Water Birds

Project Phase	Project Component	Categories of Potential Environmental Effects / Issues	Mitigation and Management	Potential for Residual Effect?	Residual Effect	Context	Magnitude	Geographic Extent	Duration	Reversibility	Frequency	Likelihood Determination	Level of Confidence for Likelihood	Significance Determination	Level of Confidence for Significance
Construction through to Post-Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Habitat Loss and Alteration	LSVMRP, WMP, Conceptual Wetlands Compensation Plan (Appendix 5.3.7A), SECP, AQEMP, RCP	Yes	Unavoidable loss of habitat, some habitat areas are lost temporally	Low	Low	Site-specific	Short-term	Reversible	Once	Moderate	High	Not Significant (minor)	High
Construction through to Post-Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Mortality Risk	WLMP, TAMP.	Yes	Potential for increased mortality caused by vehicle and aircraft collisions, and increased hunter access.	Low	Negligible	Site-specific	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High
Construction through to Post-Closure	Mine site, airstrip, transmission line, freshwater supply pipeline, and access roads	Change in Population Dynamics	WLMP, TAMP	Yes	Potential for increased mortality caused by increased predator access related to alternate prey increases near roads.	Low	Negligible	Site-specific	Short-term	Reversible	Intermittent	Low	High	Not Significant (negligible)	High

5.4.8.4.1 Mine Site

The residual effects of habitat loss are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, reversibility, frequency, and likelihood of an effect occurring. Loss and degradation of a maximum of 6 ha of water bird habitat will occur during the construction phase, and these effects will be evident through the operations and closure phases. Wetland compensation works will begin in early operations.

Within the mine site, the adverse effect is rated as low magnitude for both ring-necked duck and yellow rail because no detections of either species occurred within the mine footprint and because of the wetland compensation program objective is no net loss of wetlands (i.e., no loss in area of wetlands available in the Project area). The geographic extent of the available moderate and high value habitat will be affected is small, relative to the total potential habitat available in the LSAs and the RSA. Regionally, yellow rail appear to be rare and uncommon, which may be due to a lack of detail of wetland mapping on the regional scale. Ring-necked duck habitat was considerably more abundant and regionally widespread. As wetland areas are being compensated, the clearing of wet sedge fen wetlands may temporally reduce the available habitat for yellow rail, and the draining of waterbodies would have the same effect for ring-necked duck.

The habitat impacts have a local effect limited to the LSAs, and the duration will extend into the long-term, due to the wetlands compensation program. The habitat effect will occur once, with potential degradation occurring on a regular basis, and will be reversible. The tailings facility may potentially impact water birds, particularly migratory water birds; however, adaptive management measures to discourage use will minimize potential impacts. Project activities are not expected to affect the regional viability of water birds, due to the widespread availability of habitat within the RSA (except for yellow rail, which was not found within the Project area). Therefore, the residual effect is rated as Not Significant (minor) with high confidence.

The residual effects for mortality risk are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site. Early development of wetland compensation areas will reduce risk of additional mortality related to habitat loss.

The residual effects for changes related to predator-prey dynamics are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the mine site. Traffic and access control, as well as early compensation works and mitigation measures, will mitigate any risk of additional mortality.

5.4.8.4.2 Access Roads and Kluskus Forest Service Road

The existing Kluskus FSR will not have any additional effect on baseline water bird habitat. The mine access road will be reclaimed during closure.

The residual effects of habitat loss are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, resilience, frequency, and likelihood of an effect occurring.

Within the proposed access road area, the adverse effect is rated as low magnitude because it is not expected to directly impact wetland marsh, shallow water, or pond habitats. The access road and Kluskus FSR are not predicted to impact wetland marsh, shallow water, or pond habitats. The footprint of the access road does not overlap any of the potential moderate to high value yellow rail habitat.

Most of the FSR exists currently, and the geographic extent of available habitat that will be affected relative to habitats where water birds occur is small, and the resilience of these ecosystems is high. Regionally, suitability modelling showed that the majority of habitat was unsuitable for yellow rail. The habitat impacts and mortality risk have a local effect, limited to the Project footprint. The duration of the habitat loss and mortality risk effect will extend into the long term, due to some wetlands being reclaimed during closure from disturbances; however, no residual impacts are predicted after reclamation.

The habitat effect will occur once, and will be reversible in the long term. Short recovery time of wetlands for water bird functional habitat after reclamation results in this VC having a moderate ecological resilience. There is a predicted low probability that an increase in mortality will occur due to lack of suitable habitat in proximity to roads. Overall, there is a low to moderate likelihood that that Project activities will cause a residual effect that will affect the regional viability of water birds after mitigation measures for the VC.

Habitat loss and mortality risk of the Project for the access road and Kluskus FSR are not predicted to affect the regional viability of water birds due to the widespread extent of suitable habitat within the RSA.

The residual effects for changes related to predator-prey dynamics are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, site-specific and intermittent nature of the risk, and the site-specific and limited increase in access above baseline conditions. Traffic and access management as well as early wetland compensation works will mitigate risk of additional mortality.

5.4.8.4.3 Airstrip, Transmission Line, and Freshwater Supply Pipeline

The loss and alteration of water bird habitat, and mortality risk, will occur or be evident within the airstrip, transmission line, and freshwater supply pipeline areas and be long-term in duration. The habitat loss effect has a low magnitude, as much of the area is already disturbed, losses will represent greater than 3% of local habitat and be site-specific in extent, for which mitigation practices will minimize the majority of effects.

The residual effects for habitat loss are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, reversibility, and likelihood of an effect occurring. The effects have a site-specific geographic extent within the Project footprint. Mitigation and monitoring measures will reduce the risk of additional loss of adjacent habitat to the footprint. With respect to the mine site and other linear features, there is a moderate likelihood that some

temporal loss or alteration of habitat will occur; however, the amount of lost or altered habitat will be minimal compared to the regional habitat availability.

The transmission line, including re-routes, is expected to cross wetland habitats. However, no loss or change of these habitats is expected, since these are not forested habitats that would otherwise require vegetation clearing and maintenance during construction. Footings for the power pole structures will be placed outside of these wetland habitats to the maximum extent practicable. The airstrip and freshwater supply pipeline are not expected to directly impact wetland marsh, shallow water, or pond habitats.

As with the mine site, the residual effects for mortality risk are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, site-specific and intermittent nature of the risk within the airstrip, transmission line, and freshwater supply pipeline. Early compensation works will reduce risk of additional mortality.

Habitat loss and mortality risk of the Project for the airstrip, transmission line, and freshwater supply pipeline are not expected to affect the regional viability of water birds due to the widespread extent of suitable habitat within the RSA.

The residual effects for changes related to predator-prey dynamics are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the for the airstrip, transmission line, and freshwater supply pipeline. Access control as well as early compensation works and mitigation measures will mitigate any risk of additional mortality.

5.4.8.4.4 Project Area

For the Project as a whole, the loss and alteration of water bird habitat will occur during Project construction; however, wetland compensation works will begin in early construction and end in a no net loss of wetlands at the end of the Project. Within the RSA, the overall effect of the Project on water birds will likely be a small reduction in area of suitable habitat, affecting less than 1% of suitable yellow rail and ring-necked duck moderate to high value habitat. The wetland compensation habitats will create high value waterfowl habitat equivalent to amounts lost in the mine site area. The habitat effect will occur once and will be reversible in the long term during operations through to closure. The Project is unlikely to affect the overall habitat supply for water birds within the RSA, due to the large amount of available habitat present within this area.

The residual effects for changes related to mortality risk and changes in predator-prey dynamics are rated as Not Significant (negligible) with high confidence due to the negligible magnitude, and site-specific and intermittent nature of the risk within the Project footprint. Access control as well as early compensation works and mitigation measures will mitigate any risk of additional mortality.

5.4.8.5 Cumulative Effects

A Cumulative Effects Assessment (CEA) for the Water Bird VC is necessary because the Project is expected to have a Not Significant (minor) residual adverse effect on water bird habitat loss **Table 5.4.8-15**. Residual effects on water bird habitat loss that could arise from other projects or activities in the region should be assessed to fully understand the context of the residual adverse effects on the water bird habitat loss by the Project. The spatial boundary for this assessment is the RSA. The temporal boundaries include historical, present, and certain and reasonably foreseeable projects within the RSA.

Table 5.4.8-15: Project Related Residual Effects; Rationale for Carrying forward into the CEA

Project Component	Project Phase	Residual Effect	Rationale	Carried Forward to Cumulative Effects Assessment
Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Construction through to Post-Closure	Habitat Loss and Alteration	Change in baseline habitat conditions	Yes

For the CEA of habitat loss for water birds, the most relevant land uses in the RSA that could potentially interact include forestry, mining, and agriculture activities and are listed in the project inclusion list (PIL) (**Section 4**, **Table 4.3-11**). **Table 5.4.8-16** presents identified interactions between past, present, and future projects and land uses in the RSA for the CEA.

Table 5.4.8-16: Key and Moderate Interactions between Water Bird Habitat Loss and other Past, Present, and Future Projects/Activities

Potential Residual Effect	Historical Land Use		Representative Current and Future Land Use			Carried Forward into CEA?
	Forestry (cut blocks and woodlots)	Agriculture (range tenures)	Mining (active, current prospecting, quarries)	Forestry (cut blocks and woodlots)	Agriculture (active range tenures)	
Loss of Water Bird Habitat	I	I	I	I	I	Yes

Note: I = interaction, KI = key interaction, NI = no interaction

As with wetland function, a residual cumulative effect on the loss of wetland function is expected for water bird habitat loss. However, the residual cumulative effect is not expected to be significant because of the on- and off-site mitigation measures described in the Conceptual Wetland Compensation Plan (**Appendix 5.3.7A**) and other environmental management plans.

5.4.8.5.1 Potential Residual Cumulative Effects and Mitigation Measures

The Project will contribute to additional temporal loss of water bird habitat in combination with the past, present, and future activities (e.g., forestry, agricultural, and mineral exploration) identified in the RSA.

Forestry-related activities in the RSA have the potential to temporarily alter wetland functions through habitat conversion, noise pollution, erosion and sedimentation, and invasive species introduction. Although forestry activities do not typically result in loss of water bird habitat due to recommended buffers, the temporary effects on wetlands from current and future forestry activities could result in the long-term alteration of water bird habitat. Habitat conversion results from removing the over story in multi-strata forested wetland habitats.

Suggested mitigation measures for forestry activities include: 1) following forest harvest guidelines, including cutblock and road design to minimize erosion and maximize reforestation; 2) maintaining buffers around wetlands and riparian areas; 3) applying sediment control to areas around wetlands and other waterbodies; 4) implementing invasive plant control measures and monitoring systems; 5) maintaining drainage pathways and wetland hydrology by installing appropriately sized culverts for stream and wetland crossings; 6) avoiding harvesting in wetland and riparian areas; and 7) replanting native vegetation to expedite succession. These mitigation activities are already included in the environmental management plans for the Project (**Section 12.2.1**). Logging activities in the RSA have generated loss of habitat; however, application of BMPs (BC MFLNRO, 2014) will protect the key wetland and open water habitats needed by water bird species by minimizing disturbance, increasing success of reforestation, and minimizing the duration of disturbance.

Agricultural activities in the RSA have the potential to cause the loss and degradation of wetland functions. Conversion of natural habitat to agricultural habitat typically results in the loss of wildlife habitat and many species of water birds. Cattle grazing can alter wetland vegetation cover in emergent habitats, and potentially introduce invasive vegetation species. Trampling can compact wetland soils and cause erosion in riparian areas resulting in sedimentation of surface waters. Mechanical harvesting of wetland vegetation can cause rutting and soil displacement. Farms and other agricultural operations can result in reduced water quality in wetlands due to fertilizer and pesticide use. Agricultural activities do not typically result in the loss of water bird habitat but may result in temporary habitat alteration.

Suggested mitigation measures for agricultural activities include: 1) establishing cattle exclusion zones to limit grazing to uplands, thereby minimizing erosion and sedimentation to riparian vegetation and allowing increased opportunity of bird use of water habitats; 2) minimizing pesticide and fertilizer use around aquatic resources and before precipitation events to limit chemical runoff from entering wetlands; 3) establishing protected riparian areas prior to clearing; and 4) controlling invasive species.

Mining activities (e.g., current prospecting, exploration) occur southeast and northwest of the mine site, and are likely to continue into the future. Mineral prospecting can result in degraded water

bird habitat through noise pollution, vegetation removal, and invasive species introduction. Loss of wetland extent is possible due to temporary access road construction.

Suggested mitigation measures for mineral exploration and prospecting, which are typical permit conditions under the *Mines Act* (Government of BC, 1996b), include: 1) pre-planning to avoid wetlands and minimizing stream crossings for access roads; 2) avoiding work during critical breeding and rearing seasons for wildlife; 3) limiting the production of excess drilling fluids; and 4) avoiding discharges of drilling fluids into aquatic systems.

As stated in the Wetland VC (**Section 5.3.7**), the Proponent is committed to following mitigation measures provided in the guidance document Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia (Cox and Cullington, 2009) to minimize adverse effects on wetland functions. If forestry, agricultural, and mineral prospecting practitioners in the RSA follow this guidance, then potential degraded wetland functions (and resultant water bird habitat) resulting from these activities can be successfully mitigated through avoidance and minimization. A residual cumulative effect on the loss of wetland function is expected for water bird habitat loss. However, the residual cumulative effect is expected to be Not Significant.

5.4.8.5.2 Significance of Potential Residual Cumulative Effects

The significance of the Project's contribution to cumulative effects in the RSA was determined at the post-closure phase for this assessment as wetlands mitigation and compensation will occur prior to and concurrent with construction, and during operations and closure. Due to the minimal loss of wetlands associated with forestry, agricultural, and mineral exploration; the significance determination for residual cumulative effects is Not Significant (minor) (**Table 5.4.8-17**). This incorporates the on and offsite mitigation measures described in the Conceptual Wetland Compensation Plan; (**Appendix 5.3.7A**); and other environmental management plans for the Project, as well as the recommended mitigation measures outlined above for the other activities. The level of confidence is high due to the low risk associated with the wetland mitigation measures, which can be addressed through monitoring to ensure the success of the created wetlands on site.

Table 5.4.8-17: Residual Cumulative Effects Assessment for Loss of Water Bird Habitat

Effect Attribute	Current/Future Cumulative Environmental Effect(s) without Project	Cumulative Environmental Effects with Project Contributions
Context	Medium	Medium
Magnitude	Low	Low
Geographic Extent	Regional	Regional
Duration	Long Term	Long Term
Reversibility	Reversible	Reversible
Frequency	Intermittent	Once
Likelihood Determination	High	Low
Level of Confidence of Likelihood		
Significance Determination	Not Significant (minor)	Not Significant (minor)
Level of Confidence of Significance	High	High

5.4.8.6 Limitations

The key limitation of this assessment is with surveys conducted in the Project area to quantify breeding and migratory water bird species presence: some species may not have been present during times when surveys were conducted, or may have been present in the Project area where surveys were not conducted. Regional abundance is not known beyond results from habitat suitability models and professional judgment.

5.4.8.7 Conclusion

The Project will directly affect wetland ecosystems in the mine site during construction, operations, and closure. The primary effect on water bird habitat will be the temporal loss of wetlands. The potential residual effects include habitat loss and degradation of a small amount of moderate to high value habitat for water birds. These effects will primarily be caused by the: construction of new portions of the road; widening along the existing FSR; airstrip, freshwater pipeline, and mine site development; and clearing for the transmission line. Mortality risk was considered Not Significant, primarily due to the limited extent and magnitude of Project activity that overlaps key water bird habitats. Mitigation measures to address these impacts include monitoring and compensation actions to achieve an objective of no loss of amount of wetlands area due to the Project. After considering mitigation measures, the temporal loss of water bird habitat remains a residual effect. The loss of wetland habitat was rated as a Not Significant (minor) effect as there will be a less than 1% reduction in wetlands cover at post-closure within the mine site.

The cumulative effects of forestry, agriculture, mineral exploration, and the Project on water bird habitat loss were assessed for the RSA. Potential cumulative effects of the Project on water bird habitat loss are predicted to be Not Significant (minor) within the RSA as a result of mitigation measures such as BMPs (BC MFLNRO, 2014).