CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

Environmental Overview:

ZINCTON

New Denver, BC

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Executive Summary

Zincton Farms Ltd. propose to cultivate an all-season backcountry experience along London Ridge and Whitewater Ridge near New Denver, British Columbia (BC). The proposed backcountry resort will include limited lift access for winter and summer-based activities. This Environmental Overview identifies the existing environmental conditions, environmental opportunities and constraints, potential impacts, opportunities and mitigation strategies and recommendations and conclusions for the proposed project including operations of the Controlled Recreation Area (CRA). Each chapter of this report discusses its relevance to the cultural environment, physical environment, aquatic environment, and terrestrial environment. The proposed project includes three lifts, access and egress trails for the lift staging areas, a backcountry lodge on top of London Ridge, and areas of forest glading.

Existing Environmental Conditions

Cultural Environment

The cultural environment chapter identifies Indigenous land use, forestry, mining, trapping, anthropogenic values, features and recreational activities within the proposed CRA.

Indigenous Communities

There are four Nations who traditionally use the area; the Ktunaxa, the Sinixt, the Syilx tmix and the Secwépemc. The Ktunaxa Nation have identified interest in fish habitat impacts and the cumulative effects information on wildlife and habitat due to commercial recreation tenures in the area.

Other Land Uses

The proposed CRA is located within the Regional District of Central Kootenay. The subject property is unzoned and is designated as Resource Area (RA). The CRA contains two forest operating license areas of Interfor and BC Timber Sales. The CRA is located within the Slocan Mining Division and contains 47 current mining claims, leases, and Crown grants. There is one identified trapline within the proposed CRA and three other traplines are within the 3 km study area surrounding the proposed CRA. Other anthropogenic features in the proposed CRA include several ghost mining towns from the early to mid-1900s along Highway 31A.

Popular recreational activities in the New Denver/Kaslo corridor include hiking and ski touring. However, there is a lack of recorded presence on crowd-sourced trail databases suggesting low recreational use levels. Other recreation operators in the study area include Retallack (mountain biking and snowcat-skiing) and Stellar Heli-skiing. Two new Recreation Reserves were recently registered by Recreation Sites and Trails BC with a third Notation of Interest (NOI) registered by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) within the CRA following the submission of the Zincton Expression of Interest (EOI).

Physical Environment

The Central Columbia Mountains are described as a moist area with high precipitation generated by Pacific air moving over the mountains. The moisture creates high humidity and rain the summer and deep snow in the winter. Conversely the mountain systems block cold Arctic air on all sides. Large systems carrying Arctic air can overwhelm the entire area for short periods in the winter.

The proposed Zincton CRA includes three Biogeoclimatic zones and contains elevations ranging from valley bottom to alpine: Interior Cedar – Hemlock (ICH), Engelmann Spruce – Subalpine Fir (ESSF), and Interior Mountain-heather Alpine (IMA). These zones are further classified into six subzones and variants:

- Interior Cedar – Hemlock, moist warm subzone, Slocan variant (ICHmw2);
- Engelmann Spruce – Subalpine Fir, Wet Hot subzone, Columbia variant (ESSFwh1);

- Engelmann Spruce – Subalpine Fir, Wet Cold subzone, Selkirk variant (ESSFwc4);
- Engelmann Spruce – Subalpine Fir, Wet Cold Woodland subzone (ESSFwcw);
- Engelmann Spruce – Subalpine Fir, Wet Cold Parkland subzone (ESSFwcp);
- Interior Mountain-heather Alpine, Undifferentiated subzone (IMAun).

Most of the proposed Zincton CRA is part of the Nicola tectonic assemblage and is underlain by sedimentary rocks including limestone, slate, siltstone and argillite. The Columbia Mountains are characterized by extreme relief, high ridges and mountain with narrow valleys and trenches. These mountains are underlain by a variety of rocks including sedimentary, metamorphic, gneiss and granitic batholiths. Peaks within the Selkirk Mountains rise to 3,200 m above sea level while the valleys range from 445 m to 800 m above sea level. The physiology of the study area is dominated by bedrock. The area in and around the proposed CRA was mined extensively since the western settlement in the area for various minerals and compounds. Soils within the CRA vary by elevation and geomorphic processes. Parent materials are mostly colluvium with some glacial till. Valley bottom soil parent material can be fluvial. The proposed CRA contains soil classifications of Orthic Humo-Ferric Podzol and Gleyed Humo-Ferric Podzol throughout the entire area. The hydrology of the CRA includes the Slocan River Watershed to the west and the Kootenay Lake Watershed to the east.

Aquatic Environment

Due to the steep slopes found throughout the proposed CRA and the 3 km study area surrounding the proposed CRA fish and fish habitat is concentrated within the lower reaches and valley bottom watercourses. Marten Creek, O.K. Creek, Kane Creek, Seaton Creek and Carpenter Creek have all been identified as fish bearing waterbodies within the Slocan River Watershed portion of the proposed CRA. Within the Kootenay Lake Watershed, fish-bearing waterbodies include Whitewater Creek, Stenson Creek, Lyle Creek and Rossiter Creek, Bear Lake, Fish Lake and Kaslo River (downstream of the study area). Bull trout and the westslope cutthroat, provincially blue listed species and designated as species of Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA) are known to occur within the proposed CRA and the study area.

Geochemical Stream Survey sediment samples collected under the Regional Geochemical Survey (RGS) within the proposed Zincton CRA and within the surrounding 3 km study area are derived from sediment to capture select subbasins. These samples showed exceedances in comparison to BC's working water quality guidelines for freshwater aquatic life. Sample sites downstream of past producing mines and within the drainage basins of O.K. Creek and McEllis Creek, Kane Creek, Watson Creek, Goat Creek, Whitewater Creek all showed exceedances of Lead (Pb), Zinc (Zn), Cadmium (Cd), Nickel (Ni), Aresenic (As), Chromium (Cr) and Manganese (Mn). However, high concentration of elements which exceed the water quality guidelines were also detected upstream of all known past producing mines on Kane Creek upstream of the confluence with O.K. Creek. Conversely sample sites down stream of the confluence of Seaton Creek and Carpenter Creek showed no exceedances despite the presence of several upstream and upslope past producing mine sites.

Terrestrial Environment

The proposed CRA contains a variety of vegetation that includes dry, wet and mesic forest sites, wetlands, subalpine parkland and alpine areas. Disturbance exists on site from roads, mining, forestry, and fires, all of which influence the existing vegetation. The proposed CRA covers approximately 5,150 ha and is composed of mainly Mature Forest which covers 51.3% of the site. Second most is Shrub, covering 15.0% of site, then Sparse/Bryoid at 14.1%, Young Forest at 8.1%, Herb at 6.5%, Old Forest at 2.2%, non-vegetated at 1.9%, and Pole/Sapling at 0.8%. Non-vegetated refers to lake, river, glacier, roads and disturbed mining sites.

Rare and Endangered plant species confirmed to occur or with the potential to occur within the proposed Zincton CRA include lance-leaved figwort, piper's anemone and whitebark pine. There are two rare and endangered ecological communities of concern that potentially occur within the project site. The first is *Western redcedar – western hemlock / common horsetail* (ICHmw2/111), a wet forest associated with old

growth forest stands. This ecological community covers 21 ha on site and is provincially blue listed. The second is *Subalpine fir / black huckleberry / bear-grass* (ESSFwc4/00) is provincially blue listed and occurs on warm aspect avalanche chutes.

This report described the wildlife habitat for five species potentially occurring in the area and of regional importance. These included detailed descriptions of the habitat use and baseline conditions are provided for: western toad, southern mountain caribou, mountain goat, grizzly bear and wolverine.

There are no designated Ungulate Winter Range (UWR) areas within the proposed CRA, however one exists within the 3 km study area. There are no Wildlife Management Areas (WMAs) within the proposed CRA or study area.

Environmental Opportunities and Constraints

Cultural Environment

Several high potential archaeological sites are identified with the proposed Zincton CRA. The London Ridge area may provide harvesting opportunities and Indigenous communities may desire unencumbered and unobserved access to traditional harvesting areas.

The historic structures remaining in the Valley of the Ghosts should be considered constraining to project and recreational activities.

BC Timber Sales (BCTS) and Interfor both have active forest operating license areas within the proposed Zincton CRA with certain harvesting rights of Crown land timber. BCTS also has legislative silviculture obligations to maintain forest regeneration. The project will be constrained by these rights and obligations.

The mineral titles listed that overlap the proposed Zincton CRA have certain subsurface rights to the land within their claim and right to enter said claims and may have certain constraints to the operating area.

Traplines are present within the proposed Zincton CRA. Traplines entitle the holder rights to trap and harvest fur bearing animals.

Physical Environment

Soil survey results that may constrain works include the glacier polygons within the uppermost elevations due to a lack of soil and extreme climate conditions. Other constraints include the soil associations Curtis, Mount Cond and Ymir. These are typically treeless and sometimes entirely non-vegetated due to their location on unstable terrain on steep slopes, at the base of cliffs, or within avalanche chutes. These areas are prone to avalanches, rockslides, and harsh climates due to high elevations in mountainous terrain. Soil types are variable, and permeable with loose rock and boulders. Due to the unstable nature of these soils, this may pose a constraint to the project. Another constraint to soils on site is sediment erosion due to the project.

Several watercourses are present within the proposed Zincton CRA the location and abundance of which present a constraint to the assembly of lift lines and associated access and egress routes.

Aquatic Environment

All identified waterbodies within proposed Zincton CRA including downstream fish bearing watercourses and their associated riparian zones present a constraint to works.

Concentrations of Lead (Pb), Zinc (Zn), Cadmium (Cd), Nickel (Ni), Arsenic (As), Chromium (Cr) and Manganese (Mn) in the Geochemical Stream Survey sediment samples collected within the drainage basins of O.K. Creek and McEllis Creek, Kane Creek, Watson Creek, Goat Creek, Whitewater Creek within the proposed Zincton CRA exceed BC's working water quality guidelines for freshwater aquatic life. Sediment contamination may pose a constraint to works however, there is an opportunity for the proponent to conduct site remediation of known past producing mine sites to mitigate the further release of the above-mentioned elements into the surrounding water course through precipitation and snow melt.

Terrestrial Environment

There is a known occurrence of lance-leaved figwort, a blue-listed species (special concern) in British Columbia on the southern boundary of the proposed CRA along Highway 31A. The presence of this species may present a constraint to works. Identified individuals should be retained where possible, however there are no legal constraints pertaining to the protection of the lance-leaved figwort in BC. No other rare or endangered plant species are yet confirmed within the proposed CRA.

Western toad, southern mountain caribou, mountain goat, grizzly bear and wolverine all have the potential to occur within the proposed CRA and the surrounding 3 km study area. These species are protected under the provincial *Wildlife Act* from killing, wounding, and taking of individual species. Western toad, mountain goat, grizzly bear and wolverine are also protected under the federal under Schedule 1 of the *Species At Risk Act* (SARA). SARA contains prohibitions that make it an offence to:

i. *kill, harm, harass, capture, or take an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated;*
ii. *possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated;*
iii. *damage or destroy the residence (e.g. nest or den) of one or more individuals of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated, if a recovery strategy has recommended the reintroduction of that extirpated species.*

Valued Ecosystem Components within the proposed CRA include wildlife trees, whitebark pine habitat, wildlife connectivity corridors, rocky outcrops and talus slopes, avalanche chutes, mineral licks, huckleberry patches and riparian areas associated with identified watercourses.

Recommendations

Mitigation measures are suggested along with a number of additional recommendations to avoid or reduce the potential impacts of the project.

Cultural Environment

Indigenous Communities

Commit to respect and protect traditional/cultural use of the area. Continue to engage local Indigenous communities to investigate opportunities for collaboration and capacity building.

Anthropogenic Values and Features

Designate the proposed CRA as non-mechanized with only self-propelled activities like skiing and hiking. Work with local recreation groups and interests to develop a Backcountry Access Plan and facilitate safe and responsible access to the CRA.

Develop a comprehensive signage program for wayfinding, safety and environmental education.

Forestry

Relationships should be established with active licensee holders Interfor and BCTS which overlap the proposed CRA area and discussions should take place during the resort master planning process.

Mining

Discussion and agreements with active mineral title holders should continue within the proposed CRA area throughout the application process for land use agreements.

Trapline Areas

Trapline license holder (TR0417T006) and adjacent trapline licensees should be consulted throughout the application process for input on access points and operational wildlife measures enacted to mitigate

effects on fur bearing resource within the area. Impacts to trapline tenure holders should be considered as it is a licensed use of Crown land.

Local Government and Official Community Plan

Local government and Official Community Plans are relevant to the resort planning process at this initial stage and throughout the resort master planning process. Local communities surrounding Zincton should be kept informed of the resort master plan process through public engagement and initiatives should be explored to promote local businesses and local hiring.

Higher Level Land Use Plans

Retain as much old and mature forest during works to ensure the mature/old forest connectivity corridor Kootenay-Boundary Regional Land Use Plan (KBLUP) objective is met. Water quality goals are met to ensure the land use objective for protection of water intake points for human consumption is achieved. No Ungulate Winter Ranges (UWR's), Wildlife Habitat Areas (WHA's) or Wildlife Management Areas (WMA's) overlap the proposed Zincton CRA.

Physical Environment

Geotechnical studies may be required for lift assembly and building sites within the CRA. However, soil associations do not pose a constraint to the proposed project as the lifts, lodge and egress trails will not cross unstable terrain such as steep slopes, talus slopes, the base of steep cliffs or avalanche chutes. The proposed project will minimize the amount of ground disturbance and vegetation removal leaving as much of the proposed Zinction CRA as possible in a natural state. However, London Ridge is significantly roaded, with relic access roads to many adits and prospects from the valley floor to the ridgetop.

Aquatic Environment

Riparian Area Protection Assessments should be conducted at sites of disturbance near watercourses to determine appropriate clearing setbacks for the protection of fish habitat values and water quality.

Stream crossings should be minimized. Bridges rather than culverts or fords are preferred. Planting of additional native, riparian shrubs and trees may be necessary where intrusions occur.

Terrestrial Environment

Five rare and endangered wildlife species and three plant species at risk have the potential to be present on the subject site. Any future detections should trigger the implementation of appropriate BMPs. Manage recreational activities to protect wildlife and wildlife habitat.

Vegetation should be retained wherever possible, particularly near creeks and wetlands and within riparian buffers to facilitate wildlife movement. Efforts should be made to conserve snags and wildlife habitat trees.

Conclusions

Based on the information reviewed the proposed Zincton CRA appears to be suitable for use in the creation of an all-season backcountry experience. Any identified potentially adverse impacts appear to be mitigable and any identified potential residual effects are not expected to be significant, nor are they expected to contribute significantly to cumulative effects.

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1 Introduction

Zincton Farms Ltd. propose to cultivate and all-season resort along London Ridge and Whitewater Ridge near New Denver, British Columbia (BC). The purpose of the project is to establish an all-season, backcountry-oriented mountain destination resort. The proposed backcountry resort will include limited lift access for winter and summer-based activities.

1.1 Project Area

The application area straddles the height of land that separates Electoral Area H to the west from Electoral Area D to the east in the Regional District of Central Kootenay. The proposed Controlled Recreation Area (CRA) occupies approximately 5,152 ha, ranging in elevation from 800 m to 2,768 m. Located on the north side of Highway 31A and K & S Railroad (Trail). Highway 31A passes through the valley divide referred to locally as Goat Pass. The height of land is the drainage divide for the Kaslo River which flows east into Kootenay Lake at Kaslo and Seaton Creek which flows west from the pass to the confluence with Carpenter Creek and Kane Creek, known as Three Forks. Kane Creek forms the northwest boundary of the CRA. Carpenter Creek carries the waters from the west slopes of the project area into Slocan Lake at New Denver. Goat Range Provincial Park forms the northern boundary, and the northeastern boundary follows Whitewater Creek (Map 1).

The base area of the proposed resort is wholly located on private land and as such falls outside the scope of this environmental overview assessment (EOA). However, it is discussed because of its interactions with the proposed CRA and for context purposes is presented in Map 2.

Recreation activities on the proposed CRA vary by type, distribution, and season. Winter activities will be snow based and consist primarily of ski and snowboard touring with limited access to higher elevations by ski lift. The spatial distribution of winter recreational use within the proposed CRA is presented in Map 3. Winter activities and its potential effects on the environment will be discussed later in this report.

The summer season will include the range of activities that are not dependant on over snow travel and may extend into spring and fall depending on the weather and snowpack. Activities will be hiking related and will be spatially less extensive due to a voluntary wildlife closure presented in Map 4. Public access to existing trails, like the Whitewater Creek Recreation Trail (Whitewater Canyon Trail), will be preserved.

Map 1: Location Map

Map 2: Base Area

Map 3: Site Map – Winter

Map 4: Site Map - Summer

2 Methodology

This EOA considered all environmental and cultural attributes identified in consultation with the proponent, the resort planners, and the Mountain Resort Branch (MRB). The attributes and valued components were compiled from both agency, stakeholder and public response to the Expression of Interest submitted to the MRB by the proponent in May, 2020 (Brent Harley and Associates, The Resort Planning Group, 2020). Each of the attributes and valued components were assembled in a series of broad categories including the cultural environment, the physical environment, the aquatic environment, and the terrestrial environment. This section identifies the attributes and components as well as the approach to understanding the interaction with the project and its potential effects.

2.1 Cultural Environment

2.1.1 Indigenous Communities

Research regarding Indigenous interests in the area included internet-based searches, feedback provided from the Mountain Resort Branch through the engagement process and information provided by the proponent through engagement.

As part of the engagement efforts, Zincton sent letters soliciting input regarding the project, as well as interests or issues associated with the proposed use of the subject lands, to the following Indigenous communities:

- Ktunaxa Lands and Resource Agency
- Similkameen Indian Band
- Neskonlith Indian Band
- Okanagan Indian Band
- Shuswap Indian Band

Cascade made an archaeological data request to the Archaeology Branch of FLNRO, requesting information on any documented sites within the study area of the proposed Zincton CRA.

2.1.2 Land Use

Overlapping Crown land use with the proposed Zincton CRA were researched through the BC Governments Natural Resource Online Services Explore by Location Tool (BC Government Natural Resource Online Services, 2021). A shapefile of the proposed area was uploaded to the tool and a detailed land use report created of all overlapping land use interests, including forestry, mining, commercial recreation tenures, Crown land licence of occupations, reserves and trapline area licences.

Higher level land use plans were researched for the area using the Provincial Governments of BC's Land Use and Legal Direction by Region web-page for the Kootenay-Boundary Region (BC Government, 2021a) and the land use provincial data layers on iMap BC (BC Government, 2021b).

2.2 Physical Environment

2.2.1 Climate

Climatic conditions of the proposed Zincton CRA were described using the ClimateBC Map database (Wang et al., 2016) and the Biogeoclimatic Ecosystem Classification (BC Government and Ministry of Forests and Range, 2021).

2.2.2 Geology and Geomorphology

Geological and geomorphological conditions were described using the BC Geological Survey MapPlace database (BC Ministry of Energy, Mines and Low Carbon Innovation, 2021), BC Data Catalogue website and GIS information derived through iMap BC (BC Government, 2021c).

2.2.3 Soils

Soils were evaluated and described based on the soil survey results displayed in iMap BC (BC Government, 2021b) and described from Soil Resources of the Lardeau Map Area (Wittneben, 1980). Soil information is based on the 1980 study that was primarily based on aerial photos with field verification at polygons accessible by road or trail (Wittneben, 1980).

2.2.4 Hydrology

Watershed information was collected through the BC Data Catalogue website and the Kootenay Boundary Water Tool (Ministry of Forest, Lands, Natural Resource Operations and Rural Development, 2021).

2.3 Aquatic Environment

A search of the BC Fish Inventories Data Queries (FIDQ) database was carried out to find records of fish observations and stocking programs (BC Government, 2021d). Available information was reviewed concerning fish presence and distribution in the drainages of the study area. The FIDQ database was searched to locate obstacles to fish passage and up-to-date fish occurrence records for the proposed Zincton CRA.

2.3.1 Water/Sediment Quality

The Regional Geochemical Survey (RGS) is a joint federal and provincial program that began in 1976. The purpose of the program is to aid exploration and development of mineral resources. In 2020 the British Columbia Geological Survey (BCGS) released the most current and complete province-wide geochemical data set collected under the RGS program. The dataset includes sample locations, field observations, analytical results and laboratories, and geology underlying sample sites for stream-, lake- and moss-sediment, water and lake samples, heavy mineral concentrates, tree twig, and needle ash. These samples provide representative geochemical data for the catchment basin upstream from the sample site (BC Ministry of Energy, Mines and Low Carbon Innovation and Han, T. and Rukhlov, A.S., 2020).

Geochemical Stream Survey Samples collected under the Regional Geochemical Survey (RGS) program were collected from various locations within and around the proposed Zincton CRA and were focused on sediment samples.

Presenting geochemical data from regional stream sediment surveys has known difficulties due to the following factors:

- Contouring and image analysis methods can create artifacts which misrepresent the data and
- Display as point values may not portray the spatial variation inherent to the data set,
- Geochemistry of a stream sediment sample is often most influenced by the geology of the sediment source area.

To counter these issues the catchment basin was used to define the zone of influence for each sample. This method defines the actual aerial coverage of the survey, reclassifies the geological influence of each sample, and redefines the thresholds which separate anomalous readings from the background. Catch

basins are based on the topographic height of land which divides one drainage from another (BC Ministry of Energy, Mines and Petroleum Resources and BC Geological Survey, 2020).

Three methods were used to analyze the sediment samples: atomic absorption spectroscopy (AAS), thermal instrumental neutron activation analysis (INA) and inductively coupled plasma emission/mass spectroscopy (ICP). AAS is a method that is employed to determine element concentrations. INA is a non-destructive analysis that is used to estimate the "total" element concentration. ICP is an analytical method used for measuring ore-indicator elements. ICP is considered a significant upgrade from AAS which was a method used by provincial and federal agencies prior to 1999 (GeoScience BC, 2008).

The Geochemical Stream Survey sample records were compared to BC's Working Sediment Quality Guidelines which serves as benchmark for the protection of benthic aquatic life in freshwater. The guideline are obtained from various jurisdiction including the Canadian Council of the Ministers of the Environment (CCME) (Ministry of Environment and Climate Change Strategy, 2020).

2.4 Terrestrial Environment

2.4.1 Vegetation

The classification of terrestrial regions and areas in this Environmental Overview utilizes the Biogeoclimatic Ecosystem Classification (BEC) developed by the Province of British Columbia Ministry of Forests (MacKillop, D. and A. Ehman, 2016); (MacKenzie and Meidinger, 2021). The BEC system is a hierarchical classification scheme that combines three classifications: climatic (or zonal), vegetation, and site. Classifications utilized existing Vegetation Resource Inventory (VRI) data (Ministry of Forest, Lands , Natural Resource Operations and Rural Development, 2021), in combination with methods outlined in A Field Guide for Site Identification and Interpretation for the Nelson Forest Region (Ministry of Forests, 1992). Terrestrial Ecosystem Mapping (TEM) standards (RISC, 1998) were used to interpret and delineate the ecosystem units and describe their distribution within the study area. It should be noted that insufficient information was available for compliance with TEM standards. To differentiate between the two, TEM codes are used to refer to Terrestrial Ecosystems (TE).

The Biogeoclimatic zones were determined using the Biogeoclimatic Ecosystem Classification mapping from VRI (Ministry of Forest, Lands , Natural Resource Operations and Rural Development, 2021). BEC mapping was reviewed along with the descriptions of the subzones and variants to determine suitability. TEM description methods generally include a field component to verify the subzones or variants of BEC mapping through vegetation and ecosystem observations. It should be noted that this Environmental Overview does not include field observations to verify BEC and TEM descriptions. VRI obtained from Data BC, provided information on tree species, percentage cover, age classification, soil moisture regimes, soil nutrient regimes. This was used in combination with available soil survey data that was collected in field (Wittneben, 1980) of soil texture, parent material and coarse fragment percentages. TRIM elevation information was used to create surface data of slope percentage and aspect (Ministry of Forest, Lands , Natural Resource Operations and Rural Development, 2019). This data was compared to the Biogeoclimatic zonal vegetation comparisons to verify the TE mapping.

Satellite imagery of the project area utilized Google Earth Pro (Google Earth Pro, n.d.) and the ESRI imagery data (Earthstar Geographics, n.d.). This data was used to assist in TE polygon descriptions and provided aspect and slope analysis. TE descriptions were then determined by integrating site, soil, and vegetation information using site unit tools of edaphic grids, flowcharts, vegetation tables, environment tables, and descriptions (MacKillop, D. and A. Ehman, 2016). TE descriptions address the fact that natural variability exists within the environments described and do not always exactly fit each data criteria, however, was chosen as a best fit within all available data. Table 13: Vegetation Species Potentially Occurring on Site lists all plant species likely to occur within the site series classifications of the study area.

Rare and endangered plant species and ecological communities were identified by conducting a search through the BC Species & Ecosystems Explorer (B.C. Ministry of Environment, 2021). Searches were conducted for the identified project area using the interactive map selection tool. Selected criteria for conservation status or legal designation were Red (Extirpated, Endangered, or Threatened) and Blue (Special Concern) under the BC List and the legal designation of Federal Species at Risk Act (SARA). Search results are displayed in the respective sections for vegetation, wildlife and ecological communities. Results are further delineated by habitat requirements and the likelihood of the presence on the project site is discussed. Critical habitat for federally listed SARA species were researched using the Data BC catalogue in the area.

Areas of TE site series and non-vegetated codes were calculated by adding together the individual TE polygon areas. TE site series that have undetermined classifications between two separate site series were calculated by dividing the polygon area equally between the two potential site series.

2.4.2 Wildlife and Wildlife Habitat

Rare and endangered wildlife species and habitat communities were identified by conducting a search through the BC Species & Ecosystems Explorer (B.C. Ministry of Environment, 2021). Searches were conducted for the identified project area using the interactive map selection tool. Selected criteria for conservation status or legal designation were Red (Extirpated, Endangered, or Threatened) and Blue (Special Concern) under the BC List and the legal designation of Federal Species at Risk Act (SARA). Search results are displayed in the respective sections for vegetation, wildlife, and ecological communities. Results are further delineated by individual species' habitat requirements and the likelihood of the presence on the project site is discussed. Critical habitat for federally listed SARA species were researched using the Data BC catalogue for the area. Scientific papers, literature, and webinars of specific species at risk in the area where then researched for known wildlife occurrences.

Mapping of habitat area polygons for grizzly bear (Map 20), mountain goat (Map 21), marmot (Map 22) and wolverine density areas (Map 22) were provided to the applicant for consideration by the Province Resource Management Division. The files were provided in .pdf form. Geospatial files were not provided and pdf files were georeferenced to overlay the proposed CRA area. As the habitat areas were georeferenced from .pdf files, mapping data and accuracy for these areas have limitations.

3 Existing Environmental Conditions

3.1 Cultural Environment

3.1.1 Indigenous Communities

The study area has a history of occupation by Indigenous communities extending back more than 10,000 years (Ktunaxa Nation, 2021). Four Indigenous communities traditionally used the area; the Ktunaxa (935, Census Canada population, 1,140 estimate, BC Treaty Commission), the Sinixt (population estimated at 6,800, but declared extinct in Canada in 1956), the Syilx tmix (5,140, Census Canada population) and the Secwépemc (3,020 Census Canada population) (Native Land Digital, 2021).

The communities are organized in four affiliations as follows:

1. Okanagan Nation Alliance (Syilx tmix)
   - Lower Similkameen Indian Band – Smalqmix
   - Penticton Indian Band
   - Okanagan Indian Band
   - Okanagan Nation Alliance
   - Upper Nicola Band
2. Sinixt-Lakes Tribe of the Colville Confederated Tribes
3. Secwépemc (Shuswap) Nation
   - Little Shuswap Lake Band
   - Shuswap Indian Band
   - Neskonlith Indian Band
   - Adams Lake Indian Band
4. Ktunaxa Nation
   - ʔakisq̓nuk First Nation (Akisq̓nuk)
   - yaqan nuʔkiy (Lower Kootenay Band)
   - ʔaqam̓ (St. Mary's Indian Band)
   - ʔakink̓um‡asnuq‡iʔit (Tobacco Plains Indian Band)

While the Ktunaxa Nation has historic connections with the Secwépemc Nation, it is an independent entity linguistically, ethnically, and culturally. The Ktunaxa Nation responded to the engagement request by the MRB and are currently in Stage 5 of the BC treaty negotiation process. Sinixt right to hunt in Canada was recently recognized by the Supreme Court of Canada and as such there may be an interest in the study area (The Supreme Court of Canada, 2019).

There are no identified historic settlements within the proposed CRA. However, several high potential archaeological locations are identified within the proposed CRA by the Archaeology Branch as shown on Map 5. No information was provided with respect to the potential locations, so they are simply noted and presented. In the absence of further information, and in accordance with the precautionary principle, they should be considered as protected.

Traditional use of the Highway 31A – Goat Pass corridor included movement following the seasonality for plant harvesting, fishing, and hunting. Respect for the "Law of the Land" is held in common by the Indigenous communities of this area, with the following points providing guidance for land use:

- Ensuring land, air and water will be clean and healthy
- Ensuring access to, and protection of, traditional foods and medicines
- Balancing the economic use of land with cultural and spiritual values
- Ensuring that long-term sustainability and ecological integrity take precedence
- Following natural law; taking only what you need (Ktunaxa Nation Community, 2012)

Map 5: Archaeological Site Inventory

3.1.1.1 Ktunaxa Nation

Correspondence received from the Ktunaxa Nation indicated an interest in fish habitat impacts focusing on bull trout and Westslope cutthroat trout. "*Both species require intact riparian areas, cool and clean waters with ground water up-welling specifically for spawning, incubation and early life stage rearing. Bull trout are of concern in the Slocan Lake watershed*" (Dunn, 2021).

The MRB forwarded comments with respect to another non-motorized Adventure Tourism application in the corridor. The Ktunaxa Nation requested consideration for "*cumulative impacts resulting from overlapping proposals, existing commercial recreation tenures combined with a high public use pressures. Emphasis in on wildlife species and habitat (GB, mountain goat, moose and wolverine, nesting birds etc.)*" (Boskovic, 2021). This request was not directed at the Zincton proposal but was taken under consideration for the purposes of this assessment.

3.1.2 Anthropogenic Values and Features

There are three ghost towns in the valley bottom of the Highway 31A - Goat Pass corridor. The ghost Town of Three Forks, located in the southwest corner of the study area, was one of several mining towns that boomed at the turn of the last century before falling into decline in the mid-1900's. The study area's anthropogenic features are essentially limited to residual ground disturbance from mining and forest harvesting. Other mining ghost towns on the southern boundary of the CRA include Zincton, Alamo, and Retallack (originally known as Whitewater), leaving behind a legacy of abandoned mineshafts and tailings piles. The side valley of Carpenter Creek also contains the ghost towns of Cody and Sandon. The Highway 31A – Goat Pass corridor is also referred to as the Valley of the Ghosts. In spite of its history of significant settlement, boasting a corridor population exceeding 11,000 residents circa 1900, the corridor appears to be in a naturally vegetated setting today. Old mine sites, prospects and cut blocks have resulted in a network of resource roads. Some of these roads are now used for access of recreational activities.

3.1.3 Recreational Activity

The Kaslo/New Denver corridor is a popular destination with a small recreation sector devoted to ski touring and hiking. It is well documented in online forums. However, its lack of presence on crowd-sourced trail databases like TrailForks or AllTrails could indicate low levels of use or an aversion by the users to record their routes and activities. For example, both sites listed contained only a single trail in the Whitewater Creek valley (AllTrails, n.d.), and no activity on the heat map (Trailforks Mapping Inc. and Barry McLane, 2021). The proposed CRA which includes London Ridge and Whitewater Ridge experiences a range of recreational activities year-round. Proximity to the highway from the summit pass makes it a convenient objective and residents from Kaslo and New Denver are protective of what they consider to be their back yard amenity.

Active recreation tenures in the context of the proposed CRA are presented in Map 9. During the snow season, ski and snowboard touring takes place, along with snowcat skiing (Retallack) and heli-skiing (Stellar Heliskiing). It should be noted that the area within the CRA held by Stellar is approximately 2% of their tenure and contains 4% of their identified ski runs (Matt Bakker, 2021). It is more than 25 km from Kaslo, a significant access time cost and financial constraint to operations. As a result, the operator appears to rarely visit the area (David Harley, 2021). This could be verified through annual reporting to FLNRORD. Retallack does not use London Ridge for snowcat skiing; concentrating their activities on the south side of the highway above their base facilities (Chris McNamara, 2020).

In the summer, Retallack holds tenure for guided mountain biking, but does not commonly use the trails for that purpose (Chris McNamara, 2020).

Summer activities by the public include hiking and mountain biking on the roads and trails within the CRA. Mount Brennan and Whitewater Mountain are both hiking/mountaineering objectives accessed from the

Highway 31A corridor. Both Fish Lake and Bear Lake are regularly stocked with rainbow trout to provide sport fishing opportunities (Freshwater Fisheries Society of BC, n.d.) and (Freshwater Fisheries Society of BC, n.d.).

Two new Recreation Reserves within the proposed CRA were registered after the submission of the Zincton EOI by Recreation Sites and Trails BC.

Mountain Trek Fitness and Spa and Wild Bear Lodge Ltd. also has an AT tenure located within the corridor. North Valley Huts, a commercial lodging for outdoor recreationists, is located near Highway 31A and the entrance to Whitewater Canyon Access Road. An existing operation on private land referred to as Mt. Brennen Backwoods Recreation has recently applied for AT tenure within the CRA (Hutton, 2020).

3.1.3.1 Trapline Areas

Trapline areas are granted by the regional manager of the freshwater fisheries and wildlife programs for licensed trappers to trap furbearing animals. One identified trapline area is within the proposed CRA and three other trapline areas are within the 3 km study area and presented in Map 10: Wildlife Management, which shows the Game Management Zones and Traplines in the study area. Trapline area identifiers are presented in Table 1.

Table 1: Trapline Areas within the Proposed Zincton CRA

Trapline Area#	Trapline Area Identifier#	Location
2721967	TR0417T007	Within the proposed CRA
2721961	TR0418T008	East of proposed CRA boundary
2721950	TR0417T008	West of proposed CRA boundary
2721956	TR0430T001	Northeast of proposed CRA boundary

3.1.4 Other Land Uses

3.1.4.1 Forestry

The proposed Zincton CRA overlaps the forest operating license areas of Interfor and BC Timber Sales (Map 6). Interfor license area is within the Arrow Resource Management Zone (RMZ) in the west and BC Timber Sales license area within the Kootenay Lake RMZ in the east.

BC Timber Sales

BC Timber Sales has active development plans within the proposed Zincton CRA area on the south aspect of Whitewater Ridge. Two active timber sale licenses are located in the proposed Zincton CRA as well as silviculture obligations for Forest Cover Reserves and five Forest Cover openings. Forest Cover Reserves areas were designated to provide present or future wildlife habitat whereas Forest Openings were selectively harvested in the past and have reforestation obligations to allow for vegetation growth in the area. Road Construction is anticipated in 2021 to support these operations. A retired cut block also exists in the proposed Zincton CRA which costs were divided by the government and forest license holders for regeneration.

Interfor

Interfor has a forest operating license within the west of the proposed CRA (Map 6) no silviculture obligations are listed in the area in the form of Forest Openings or Forest Cover Reserves.

3.1.4.2 Mining

The study area is within the Slocan Mining Division that has a history of mining throughout the area. Mining titles within the proposed study area are listed in Table 2 and displayed in Map 7. As of August 6, 2021, there are 58 active registered mineral claims, leases, and Crown grant tenures within the proposed CRA. The most distant expiry date of these tenures is July 31, 2029. The *Mineral Tenure Act* defines *mineral* as an ore of metal or a natural substance that can be mined, that is in the place or position in which it was originally formed or deposited or is in talus rock. This does not include coal, petroleum, natural gas, marl, earth, soil, peat, sand, or gravel.

Title types for this area includes RCG Claim (MCR), Mineral Cell Title Submission (MCX), Two Post Claim (MC2), two Post Claim (MC4), and one Mining Lease (ML).

Table 2: Mining Grants, Claims and Leases within the Proposed Zincton CRA

Grants						
Number	**Lot ID #**	**Pin SID**	**District Lot No.**	**Claim Name**	**Crown Grant #**	**Lot Status**
1	809571	8602420	5990	SLOPER FRACTION	1240/158	CROWN GRANTED
2	810111	9095530	10473	TRURO	6528/377	CROWN GRANTED
3	810120	9492710	1163	PAUPERS DREAM	148/79	CROWN GRANTED
4	810124	9493460	1170	WHITEWATER	177/79	CROWN GRANTED
5	810126	8831580	11898	RIDGEWAY	6106/357	CROWN GRANTED
6	810127	8831610	11899	SILVER QUEEN	6107/357	CROWN GRANTED
7	810128	8831740	11900	SILVER KING	6108/357	CROWN GRANTED
8	810129	8831870	11901	ROWSE FRACTION	6109/357	CROWN GRANTED
9	810148	9510400	1418	MYRTLE R.	654/96	CROWN GRANTED
10	809807	8763680	2024	VANCOUVER	20/195	CROWN GRANTED
11	809817	8772300	2159	MILTON	4366/204	CROWN GRANTED
12	809900	9288810	3825	MILTON FRACTION	1346/185	CROWN GRANTED
13	809838	8425970	2429	LITTLE RALPH	878/105	CROWN GRANTED

Tenures (Claims and Leases)							
Number	**Tenure Number #**	**Claim Name**	**Tenure Type Description**	**Tenure Type Description**	**Title Type**	**Issue Date**	**Good to Date**
1	257284		Mineral	LEASE	ML	19701221	20201221
2	256015	REFER TO LOT TABLE	Mineral	CLAIM	MCR	19840106	20241205
3	390396	LYLE 1	Mineral	CLAIM	MC4	20011018	20231016
4	364025	WELL	Mineral	CLAIM	MC4	19980712	20231016
5	331084	LEO	Mineral	CLAIM	MC2	19940916	20231016
6	352218	LEMAC 4	Mineral	CLAIM	MC2	19961027	20231016
7	601637	HILLSIDE	Mineral	CLAIM	MCX	20090326000527	20231016
8	921269	OH YA	Mineral	CLAIM	MCX	20111022100212	20230801
9	941008	EMPRESS	Mineral	CLAIM	MCX	20120115101701	20230801
10	902309		Mineral	CLAIM	MCX	20110928100138	20230801

Tenures (Claims and Leases)							
Number	Tenure Number #	Claim Name	Tenure Type Description	Tenure Type Description	Title Type	Issue Date	Good to Date
11	902290		Mineral	CLAIM	MCX	20110928100109	20230801
12	1011328	EMPRESS	Mineral	CLAIM	MCX	20120720100113	20230801
13	1077864	SLOCAN CHARLES WHITEWATER	Mineral	CLAIM	MCX	20200808143254	20210808
14	1077526	BACKUS TO THE FUTURE	Mineral	CLAIM	MCX	20200723	20220723
15	1076058		Mineral	CLAIM	MCX	20200506	20220506
16	1076060		Mineral	CLAIM	MCX	20200506	20220506
17	1076061		Mineral	CLAIM	MCX	20200506	20220506
18	1075810		Mineral	CLAIM	MCX	20200420104749	20210420
19	1061516	SLOCAN KANE 4	Mineral	CLAIM	MCX	20180702104005	20230801
20	1075878	WHITEWATER GOLD	Mineral	CLAIM	MCX	20200424130350	20231231
21	1076008		Mineral	CLAIM	MCX	20200502	20220502
22	1076049	SLOCAN WHITEWATER ACG'S	Mineral	CLAIM	MCX	20200506071436	20210506
23	1069026	SLOCAN B GROUSE KANE 4 CN	Mineral	CLAIM	MCX	20190608213100	20230801
24	1069029	SLOCAN MCALLISTAR TAIL	Mineral	CLAIM	MCX	20190608233446	20230801
25	1069031	SLOCAN LONDON HILL JO-JO	Mineral	CLAIM	MCX	20190608234244	20230801
26	1069033	SLOCAN JO-JO-LONDON HILL	Mineral	CLAIM	MCX	20190608235129	20230801
27	1080158	JAM	Mineral	CLAIM	MCX	20201221123332	20211221
28	1079304		Mineral	CLAIM	MCX	20201028055031	20211028
29	1079305		Mineral	CLAIM	MCX	20201028055243	20211028
30	1068389	VERNON	Mineral	CLAIM	MCX	20190508	20290731
31	1078331	SLOCAN KANE	Mineral	CLAIM	MCX	20200903085936	20210903
32	1076559	WHITEWATER 3	Mineral	CLAIM	MCX	20200602141421	20210602
33	1072543	ROBIN	Mineral	CLAIM	MCX	20191106	20211106
34	1072544	SWAN	Mineral	CLAIM	MCX	20191106	20211106
35	1075967		Mineral	CLAIM	MCX	20200430	20220430
36	1075970		Mineral	CLAIM	MCX	20200430	20220430
37	1072647		Mineral	CLAIM	MCX	20191110	20211110
38	1052496	SLOCAN BLACK GROUSE	Mineral	CLAIM	MCX	20170611204650	20230801
39	1069186	SLOCAN MINER BOY	Mineral	CLAIM	MCX	20190608234630	20230801
40	1069187	Slocan McAllister Tail 2	Mineral	CLAIM	MCX	20190608234630	20230801

Tenures (Claims and Leases)							
Number	Tenure Number #	Claim Name	Tenure Type Description	Tenure Type Description	Title Type	Issue Date	Good to Date
41	1077639		Mineral	CLAIM	MCX	20200728	20220728
42	1076510	WHITEWATER 2	Mineral	CLAIM	MCX	20200530150925	20231231
43	1071871	OLYMPUS	Mineral	CLAIM	MCX	20191017101720	20201017
44	1071831		Mineral	CLAIM	MCX	20191016	20211016
45	1071832		Mineral	CLAIM	MCX	20191016	20211016

3.1.4.3 Local Government and Official Community Plans

Official Community Plans (OCP) are guiding documents produced by local governments that establish policies that guide decisions on community planning and land use management.

The proposed Zincton CRA crosses the boundaries of Electoral Areas D and H within the Regional District of Central Kootenay (RDCK). The subject property is unzoned, and is designated as Resource Area (RA) within the North Kootenay Lake Electoral Area D Comprehensive Land Use Bylaw No. 2435, 2016 and Electoral Area H Slocan Lake North Official Community Plan No. 1967, 2009 (RDCK, 2020).

The Proposed CRA is also within the Watercourse Development Permit Area for both Electoral Areas D and H.

3.1.4.4 Higher Level Land Use Plans Objectives

Land use planning sets the strategic direction to guide sustainable resource stewardship and management of provincial public land and waters that meets economic, environmental, social, and cultural objectives. In other words, it sets high-level direction and helps define 'what' can occur on the land base (BC Government, 2021a).

3.1.4.4.1 Kootenay-Boundary Land Use Plan

The proposed Zincton CRA boundary is within the Kootenay-Boundary Resource Region and lies within the boundaries of the Kootenay-Boundary Regional Land Use Plan (KBLUP). The KBLUP was released in 1995 and the KBLUP Implementation Strategy was completed in 1997. In 2001, selected provisions in the strategy were legally established as a higher-level plan under the Forest Practices Code of B.C. Act. Nine legal orders with varying objectives have been approved since 2003. Certain objectives of the orders relating to caribou habitat were cancelled due to the development of Ungulate Winter Ranges (UWR) and Wildlife Habitat Area (WHA) of the Forest Range and Practices Act (FRPA) (BC Government, 2021a) along with other orders and updates from updated land use strategies. The KBLUP is now retired but, the legal objectives set from the KBLUP Higher Level Plan Order are considered in Crown land use decisions (BC Government, 2021a).

Resource Management Zones

The proposed Zincton CRA straddles the Resource Management Zone (RMZ) boundary of both the Arrow RMZ in the west and the Kootenay Lake RMZ in the east (BC Government, 2021b).

Connectivity Corridors

The proposed Zincton CRA is within the legal objective boundary's RMZ for connectivity corridors within plan boundaries (Map 20). Connectivity corridors were designated to maintain mature/old forests for the purpose of regional ecosystem connectivity (BC Ministry of Agriculture and Lands, 2009). The connecting

corridors boundary cover large swathes of Crown land within the plan boundary connecting areas between protected parks to establish a connection corridor. The connection corridor overlapped by the proposed Zincton CRA transcends from the Goat Range Park to the north to the Kokanee Glacier Park to the south (BC Government, 2021b) (Map 20).

Water Intakes for Human Consumption

Delzell Creek is one point for water intake for domestic use and is located in the southeast of the proposed Zincton CRA boundary approximately 500 m east of Murray Creek. Brad Spring is another water intake point located close to the southern boundary of the proposed CRA on Goat Creek and is likely an unmapped tributary of Goat Creek which is identified for domestic use (Map 16).

The objective within the KBLUP order is to reduce impacts of forest development on streams licensed for human consumption (BC Ministry of Agriculture and Lands, 2009).

3.1.4.4.2 Forest Range and Practices Act Wildlife Orders

Ungulate Winter Range Habitat

An Ungulate Winter Range (UWR) is defined as an area that contains habitat that is necessary to meet the winter habitat requirements of an ungulate species and made under the authority of sections 9 and 12 of the *Government Actions Regulation* of the FRPA.

There are no UWR areas within the proposed Zincton CRA, but a UWR polygon is located within the 3 km study area. The closest UWR exists to the west of the proposed Zincton CRA boundary; UWR number u-4-014 established for mountain caribou (Map 21) (BC Government, 2021b).

Wildlife Habitat Areas

No Wildlife Habitat Areas are located within the proposed Zincton CRA or 3 km study area (BC Government, 2021b).

Wildlife Management Areas

No Wildlife Management Areas exist within the proposed Zincton CRA or 3 km study area. Fire Threat, Map 11, shows historic wildfire locations and relative risk within the study area.

Map 6: Forestry

Map 7: Mining

Map 8: Active Tenures

Map 9: Commercial Recreation Tenures

Map 10: Wildlife Management

Map 11: Fire Threat

3.2 Physical Environment

3.2.1 Climate

The proposed project is located in the Central Columbia Mountains (CCM) Ecosection, which lies within the Northern Columbia Mountains Ecoregion, part of the Southern Interior Mountains Ecoprovince. The Central Columbia Mountains are described as a moist area with high precipitation generated by Pacific air moving over the mountains either from the west across the interior of the province or from the south across the Columbia Basin (Demarchi, 2011). This moisture creates high humidity and rain the summer and deep snow in the winter. Conversely the mountain systems block cold Arctic air on all sides. However, large systems carrying Arctic air can overwhelm the entire area for short periods in the winter (Demarchi, 2011).

The valley bottoms (500-1,450 m) in and around the proposed Zincton CRA are dominated by moist warm Interior Cedar-Hemlock (ICH) Slocan variant forest (mw2). The ICHmw2 subzone variant is described by hot, moist summers. As a result, soils dry out in late summer. The winters are described as very mild with light snowfall resulting in snowpacks of moderate depth and duration (BC Ministry of Forests, 2002).

Mid mountain slopes (1,650-1,950m) are dominated by wet Engelmann Spruce-Subalpine Fir (ESSF) forests including the wet hot Columbia variant (wh1), the wet cold Selkirk variant (wc4) wet cold woodland variant (wcw) and the wet cold parkland variant (wcp).

The alpine region of the project area is comprised of moist vegetation Interior Mountain-heather Alpine (IMA) and barren rock in the highest areas (Demarchi, 2011). The IMA is the smallest of the alpine zones and occurs above 2,500 m. Precipitation is variable but summers are warm in comparison to other alpine zones (BC Ministry of Forests and Range, 2006).

The meteorological records from the New Denver Weather Station (Canadian Climate Normals 1981 - 2010) which is located approximately 15 km west of the project area, record an annual total precipitation of 872.6 mm, which mainly falls as rain (Environment and Climate Change Canada, 2013). The total precipitation peaks in the month of November, and is lowest in the month of August, with averages of 105.2 and 54.9 mm of precipitation, respectively. The mean annual temperature is 8.1°C at the New Denver Weather Station. July is the warmest month, with a mean daily maximum temperature of 26.1°C, and a mean daily temperature of 19.1°C. Conversely, December is the coolest month with a mean daily minimum temperature of -4.0°C, and a mean daily temperature of -1.9°C.

3.2.2 Geology

The Selkirk Mountains are predominately composed of Proterozoic and Paleozoic sedimentary and metamorphic rocks, gneiss of igneous origin, late Paleozoic and Mesozoic sedimentary and volcanic rocks and Cretaceous and Tertiary granite stock and batholiths (Wittneben, 1980).

Most of the proposed Zincton CRA is part of the Nicola tectonic assemblage and is underlain by sedimentary rocks including limestone, slate, siltstone and argillite (BC Ministry of Energy, Mines & Petroleum Resources and BC Geological Survey, 2017a). A small pocket of Mesozoic intrusive feldspar porphyritic rock is found on the western slope of London Ridge and traverses Kane Creek south of Chatham Creek (BC Ministry of Energy, Mines & Petroleum Resources and BC Geological Survey, 2017b). The north eastern portion of the project area is part of the Slide Mountain tectonic assemblage and is underlain by basaltic volcanic rocks from the Paleozoic era (BC Ministry of Energy, Mines & Petroleum Resources, BC Geological Survey and BC Geological Survey, 2017). The Slide Mountain assemblage also includes a narrow parcel that buffers Whitewater Creek and continues southeast traversing through Jardine Creek. This parcel is composed of metamorphic serpentinite ultramafic rock from the Paleozoic era (BC Ministry of Energy, Mines & Petroleum Resources and BC Geological Survey, 2017c) (Map 13).

3.2.2.1 Mining

The area in and around the proposed Zincton CRA was mined extensively since western settlement in the area. The proposed CRA is within the Slocan mining division. The following minerals and compounds were mined within the study area: Silver (Ag), Gold (Au), Lead (Pb), Zinc (Zn), Cadmium (Cd), Technetium (Tc), Antimony (Sb), Copper (Cu), Nickel (Ni), Chrysotile (CH), and Asbestos (AB). Deposit types are Polymetallic Mantos Ag-Pb-Zn (J01), Polymetallic Veins Ag-Pb-Zn±Au (I05), Au-Quartz Veins (I01), Gabbroid Stocks Ni-Cu (M02), Ultramafic-hosted chrysotile asbestos (M06), Ultramafic-hosted talc-magnesite (M07), and Besshi massive sulphide Cu-Zn (G04) (Government of British Columbia, 2021).

The Provincial records of mineral inventories on the project site from the BC Geological Survey database (BC Geological Survey et al., 2008) lists 16 records for past producers on site, 14 records of showing, and 8 records of prospect that are displayed in (Appendix A: Mineral Inventories, Table 25 (Map 7). The status “Showing” denotes occurrences hosting minor in-situ mineralization. The status “Prospect” denotes occurrences documented as containing mineralizations which warrants further exploration. The status “Past Producer” status denotes mines that are not currently being mined but have produced in the past.

3.2.3 Geomorphology

The project area is located within the Central Columbia Mountain Ecosection and more specifically within the Selkirk Mountains (Wittneben, 1980). The Columbia Mountains are characterized by extreme relief, high ridges and mountain with narrow valleys and trenches. These mountains are underlain by a variety of rocks including sedimentary, metamorphic, gneiss and granitic batholiths. Peaks within the Selkirk Mountains rise up to 3,200 m above sea level while the valleys range from 445 m to 800 m above sea level. The physiology of the study area is dominated by bedrock. Active geomorphological processes in the study area include fluvial erosion and deposition of alluvial fans in the valley bottoms. Mass wasting and colluvial activity is evidenced through talus slopes and identified potentially unstable on the Terrain Geomorphology (Wittneben, 1980) (Map 14).

3.2.4 Soils

The proposed Zincton CRA contains soil classifications of Orthic Humo-Ferric Podzol (O.HFP) and Gleyed Humo-Ferric Podzol (GL.HFP) throughout the entire area. Gleyed Dystric Brunisol (GL.DYB) is seen in the lower elevations of the site and Gleyed Sombric Humo-Ferric Podzols (GLSM.HFP) are seen throughout the upper elevations of the site. A small amount of Luvisolic Humo-Ferric Podzol (LU.HFP) is found in the lower elevations and a small amount of Sombric Humo-Ferric Podzol (SM.HFP) is found in the site’s upper elevations.

The parent material is mostly colluvium (COLL) throughout the site with some glacial till (TILL) parent material found in the lower elevations. Glacial Fluvial (GLFL) and Fluvial (FLUV) material are found only along the lowest elevations on site adjacent watercourses. The uppermost elevations contain two large polygons and a small portion of a third polygon composed of mostly undifferentiated bedrock. There are also two small polygons of glacier at the highest elevations at the north end of the site.

Soil drainage ranges from imperfectly drained to rapidly drained. Imperfectly is the most common drainage characteristic throughout the site, which is characterized by a slow removal of water from soil, keeping soil wet for a significant part of the growing season (B.C. Ministry of Forests and Range, 2010).

Soil textures on site includes sand (S), silt loam (SIL), sandy loam (SL), loam (L), and loamy sand (LS). Soils on site may range from 0-100% sand and 0-28% clay. Sand has lowest proportion of clay and highest proportion of sand, while silt loam has the lowest proportion of sand and highest proportion of clay on site (B.C. Ministry of Forests and Range, 2010).

Soil survey data for the proposed Zincton CRA is displayed in Table 3 and Map 15. There are a total of twenty-six soil survey polygons within the proposed CRA. Soil survey polygons may be a combination of soil types with their respective percentages listed in Table 3.

Table 3: Soil Survey Data within the Proposed Zincton CRA

Map Polygon #	SIFT ID	Soil Name (%)	Parent Material	Soil Classification	Texture	Coarse Fragment (%)	Drainage	Soil System
1	121703	Undifferentiated bedrock (60)	-	-	-	-	-	BCRKL
		Rossland (20)	COLL	SM.HFP	SL	N/A	Moderately well to well	BCRSLwli
		Ymir (20)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
2	121674	Ymir (60)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
		Mount Cond (40)	COLL	GLSM.HFP	L	35	Imperfect	BCMUCw
3	121779	Brouse (70)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
		Carney (30)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
4	121757	Kuskanax (100)	GLFL	GL.HFP	LS	31	Imperfect	BCKUSw
5	121906	Cataract (60)	COLL	GL.HFP	SL	27	Imperfect	BCCTAw
		Burkitt (40)	COLL	O.HFP	SIL	N/A	Well	BCBKTli
6	121770	Carney (70%)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
		Brouse (30)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
7	121884	Brouse (100)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
8	121639	Mount Cond (50)	COLL	GLSM.HFP	L	35	Imperfect	BCMUCw
		Ymir (30)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
		Brouse (20)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
9	121806	Undifferentiated Bedrock (50)	-	-	-	N/A	-	BCRKL
		Bonner (30)	COLL	GLSM.HFP	L	N/A	Imperfect	BCBNRwlia
		YMIR	COLL	O.HFP	S	47		BCYMI
10	121867	Steenhoff (80)	TILL	LU.HFP	SIL	N/A	Well	BCSTN
		Blaylock (20)	COLL	O.HFP	SL	N/A	Well	BCBAYli
11	121840	Cataract (100)	COLL	GL.HFP	SL	27	Imperfect	BCCTAw
12	121823	Brouse (70)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
		Carney (30)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
13	121775	Brouse (70)	COLL	O.HFP	SL	N/A	Rapidly	BCBRUli
		Curtis (30)	COLL	GLSM.HFP	SL	20	Imperfect	BCCISw
14	121885	Kaslo (70)	GLFL	GL.DYB	SL	44	Imperfect	BCKAOw
		Fruitvale (30)	FLUV	GL.DYB	LS	28	Imperfect	BCFRUw
16	121773	Bonner (100)	COLL	GLSM.HFP	L	N/A	Imperfect	BCBNRwlia

Map Polygon #	SIFT ID	Soil Name (%)	Parent Material	Soil Classification	Texture	Coarse Fragment (%)	Drainage	Soil System
17	121607	Undifferentiated bedrock (60)	-	-	-	-	-	BCRKL
		Bonner (20)	COLL	GLSM.HFP	L	N/A	Imperfect	BCBNRwlia
		Ymir (20)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
18	121745	Ymir (100)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
20	121783	Mount Cond (70)	COLL	GLSM.HFP	L	35	Imperfect	BCCRYw
		Carney (30)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
21	121754	Glacier (100)	-	-	-	-	-	BCGLI
22	121811	Carney (100)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
23	121846	Cataract (60)	COLL	GL.HFP	SL	27	Imperfect	BCCTAw
		Stubbs (40)	TILL	O.HFP	LS	29	Moderately well to well	BCSTSw
24	121791	Brouse (60)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
		Bonner (40)	COLL	GLSM.HFP	L	N/A	Imperfect	BCBNRwlia
25	121685	Glacier (100)	-	-	-	-	-	BCGLI
26	121688	Ymir (100)	COLL	O.HFP	S	47	Moderately well to well	BCYMI
27	121849	Brouse (80)	COLL	GL.HFP	SL	N/A	Imperfect	BCBRUwli
		Carney (20)	COLL	GL.HFP	L	30	Imperfect	BCCRYw
28	121861	Cataract (70)	COLL	GL.HFP	SL	27	Imperfect	BCCTAw
		Steenhoff (30)	TILL	LU.HFP	SIL	N/A	Well	BCSTN

*Soil information from the BC Soil Information Finder Tool (Government of Canada, 2018) and (Wittneben, 1980).

3.2.4.1 Soil Associations

Soil associations within the proposed Zincton CRA are described below based on Soil Resources of the Lardeau Map Area (Wittneben, 1980):

Brouse soil: Forested areas with short frost-free periods and moderate to high precipitation. Brouse parent material is mixed colluvium and glacial till overlying fine-grained bedrock (slate, shale, and some andesitic volcanic rocks). Underlying bedrock is soft and in places partially weathered. Soils occupy steep, forested, upper mountain slopes at elevations between 1,371 to 1,768 m. Textures are typically gravelly sandy loam or gravelly loam. Soil is well-drained O.HFP at upper elevations and O.DYB at lower elevations. Imperfectly drained seepage phases throughout all soil formations.

Blaylock soil: Forested with old growth and occurs at 609 to 1,370 m elevation. Parent material is shallow mantle of colluvium and glacial till overlying medium-grained, argillaceous, and schistose bedrock. Typical landforms are steeply sloping and occur mid-slope on mountainsides. Textures are generally gravelly sandy loam and stone content is moderate to excessive. Soils contain O.HFP with inclusions of SM.HFP at higher elevations and O.DYB at lower elevations. Soils are well drained, except at local seepages or impeded drainages where soils can be moderately well to imperfectly drained.

Bonner soil: Occurs at elevations of 1,700 to 2,040 m. Typical climate is a short frost-free period (less than 30 days) and long-lasting snows. Boner soils have low capability for forest growth with grazing

potential near treeline. The parent material is thin mantle (less than 1.5 m thick) of steeply-sloping colluvium overlying medium-grained (argillic) bedrock. It occurs at mountain ridges, upper slopes and in cirque depressions. Textures range from silt loam to gravelly sandy loam, are well drained with O.HFP development. Soils are very strongly to strongly acidic. Upper elevations have organic matter accumulation sufficient for SM.HFP development.

Burkitt soil: Developed from colluvium and glacial till over fine-grained bedrock. They occupy the mid-positions of steep mountain slopes between 1,066 to 1,463 m. Soils are forested with textures of gravelly sandy loam to gravelly silt loam. Soil and colluvium are generally less than 1.5 m and well-drained. A few small areas with SM.HFP occur near Retallack in a burned area where grasses and trembling aspen establishment has led to the formation of an organic matter rich Ah horizon. Climate has a mean annual precipitation of 63 to 115 cm and mean annual temperature of 5°C.

Carney soil: Forested and occupies elevations of 1,370 to 1,770 m. They developed from deep, steeply sloping colluvium derived from medium-grained bedrock (argillite, argillaceous quartzite, minor phyllite, and slate) on valley walls of hilly and mountainous topography. Colluvium is loose, permeable, and medium textured, generally deeper than 1.5 m and overlies bedrock or till. Soils are O.HFP with inclusions of Degraded Dystric Brunisol (D.DYB), O.HFP and SM.HFP. Well drained as gravelly loam to gravelly sandy loam and gravelly silt loam. Environment is cool and moist with an annual precipitation of 127 cm. Soils support mature Engelmann spruce at lower elevations and alpine fir in upper elevations.

Cataract soil: Forested and occurs at 914 to 1,370 m. Annual precipitation ranges from 114 to 140 cm. Parent material is medium to moderately coarse textured, loose, permeable colluvium, generally deeper than 1.5 m. Cataract soil occurs on middle and lower slopes of hilly and mountainous terrain. Textures are gravelly loam or gravelly silt loam and are well drained, while a few coarser textured areas are rapidly drained. Typical soils are O.HFP with SM.HFP in areas with many seepage phases and high amounts of organic matter. Lower elevations have O.DYB soil.

Curtis soil: Occurs at moderately high elevations (1,066 m to 2,134 m) in small pockets northeast of Kootenay Lake. They occur on very steeply sloping colluvium deposited snowchutes and avalanche tracks. Material consists of coarse, boulder, loose and permeable. Bedrock is generally quartz, granite or granodiorite. Textures are gravelly sandy loam or gravelly loamy sand and are generally deeper than 1.5 m. Soils are mainly SM.HFP with some O.HFP and Cumulic Regosol occurring with seepage phases. Soils are well to moderately well drained, except some seepage phases are imperfect. Vegetation is mostly deciduous. Upper elevations have short, cool growing seasons, deep winter snowfalls, strong winds and cold soil temperatures.

Fruitvale soil: Forested and occurs in scattered locations mainly along waterbodies of the region. They developed from fluvial fan deposits radiating outwards from where streams leave mountain areas along moderate to steep slopes. Fans usually contain many short, abandoned stream channels and a few occupied ones. Elevations are 450 to 915 m. Parent material is poorly sorted, partially stratified, loosely compacted, permeable, and non-calcareous. Textures near the fan apexes are coarse and stony, while at the fan apron textures are finer as gravelly loam, sandy loam, silt loam and occasionally clay loam. Drainage is well to rapidly drained. Soils are mainly O.DYB with inclusions of Orthic Regosols in areas of frequent freshet flooding and O.HFP at higher elevations. Cold air drainage from higher elevations causes a short (>150 days) frost-free period and precipitation is annually 63 to 114 cm.

Kaslo soil: Forested and found in river and creek valleys at elevations of 425 to 1,220 m. Parent materials are level to rolling glaciofluvial deposits, occurring as hummocks, mounds, and terraces along valley sides. Texture is moderately coarse, very stony, slightly compacted with variable permeability and depth and rapidly drained. Soils are O.DYB with inclusions of D.DYB and seepage phases. Climate is moderately dry and warm.

Kuskanax soil: Overmature forested that occurs in the upper parts of drainages of most valleys at 1,066 to 1,676 m, similar to Kaslo. Topography is level to rolling with terrace remnants, ice contact deposits and other glaciofluvial deposits. Deposits are mainly sand and gravel and are stony, loose, variable

permeability and depth. Drainage is rapid except for seepage phases which is imperfect. Soils are O.HFP. Climate is cool and moist.

Mount Cond soil: Occupies elevations of 1,066 to 2,134 m. These soils occur on steeply sloping snowchutes and avalanche tracks where gravity and avalanche activity have deposited colluvium derived mainly from shale, argillite, slate and other medium and fine-grained rock. The colluvium is mostly deeper than 1.5 m and medium to moderately coarse textured as gravelly loam with variable amounts of stones and boulders. Soils are SM.HFP which has a deep Ah horizon over Bf horizons. Drainage is moderately well to imperfect. Mount Cond soils are generally treeless but may have shrubs and forbs.

Rossland soil: Above timberline higher than 1,980 m elevation on upper slopes, ridges, depressions and cirque basins. Parent material is colluvium with a high degree of frost action. Material is shallow, moderately coarse to medium textured, permeable, loose, stony and bouldery. Medium-grained, non-calcareous hard or weathered bedrock is found within 1 to 1.5 m from the surface. Soil development is typically SM.HFP and is well to moderately well drained. Climate has a very short, cool growing season, cold temperatures, deep snowfall and strong winds. Shallow turfy soils support shrubs, forbs, sedges and grasses.

Steenhoff soil: Forested and occurs at elevations between 914 and 1,465 m. Parent material is moderately fine-textured basal till with textures of loam to clay loam and moderately stony, similar to Stubbs soil. Soil overlies bedrock-controlled ridges with humps and depressions varying in size. Soils are well drained, except in depressions and some seepage sites, where it is imperfect. Soils are Luvisolic HFP (L.HFP) with clay-accumulation horizons and also significant inclusions of O.HFP, Brunisolic Gray Luvisols (lower elevations), and seepage phases. Annual precipitation is 63 to 115 cm and the frost-free period is 120-150 days.

Stubbs soil: Mature forested and ranges from 1,066 to 1,463 m elevation. Soils occur on middle to upper mountain slopes covered by morainal (till) deposits. Topography is moderately to steeply sloping and parent material is medium to moderately fine textured, stony glacial till. These well-drained soils are mainly O.HFP with inclusions of SM.HFP at seepage sites and L.HFP in finer-textured areas. Climate is moist and cool.

Ymir soil: Range from 450 to 2,075 m elevation near timberline. Soils are found on non-vegetated, very steeply sloping colluvial deposits (talus) that accumulates at the base of steep slopes or cliffs. Soils are permeable and coarse with large portions or angular stones and boulders. Generally, there is finer material at the apex and larger rock at the toe. Rock fragments are non-calcareous, medium and coarse grained, composed of granites, granodiorites, argillites and schists. Soils are Orthic Regosols, with O.HFP in more stable areas.

3.2.5 Hydrology

The project area is divided into two major watersheds, the Slocan River Watershed which lies to west and includes London Ridge and the Kootenay Lake Watershed which lies to the east and includes the Whitewater Ridge to the north and Bear Lake and Fish Lake to the south (BC Government, 2021b; Ministry of Forest, Lands, Natural Resource Operations and Rural Development, 2021) (Map 16). Within the Slocan River Watershed O.K. Creek, McEllis Creek and Chatham Creek and their tributaries drain the west slope of London Ridge into Kane Creek which marks the western boundary of the project area. Kane Creek in turn drains into Carpenter Creek which flows directly into Slocan Lake. Within the Kootenay Lake Watershed Watson Creek and its tributaries drain the eastern slope of London Ridge into Bear Lake and Fish Lake which flow into the Kaslo River. Goat Creek, Murray Creek and Whitewater Creek and all associated tributaries drain the southern slope of the Whitewater Ridge into Kalso River which flows into Kootenay Lake (BC Government, 2021b; Ministry of Forest, Lands, Natural Resource Operations and Rural Development, 2021).

3.2.5.1 Slocan River Watershed

The Slocan River Watershed is approximately 340,000 ha in size (BC Government, 2021b; Ministry of Forest, Lands, Natural Resource Operations and Rural Development, 2021). Within the proposed project area, the watershed includes O.K. Creek, McEllis Creek and Chatham Creek and their tributaries which drain into Kane Creek which drains into Carpenter Creek which flows directly into Slocan Lake.

Additional named waterbodies in the Slocan River Watershed that occur within the three kilometers of the proposed CRA boundary include Rambler Creek which drains into Dardanelles Creek which drains into McGuiligan Creek which drains into Seaton Creek which in turn flows into Carpenter Creek as well as Shea Creek and Howson Creek also drain into Carpenter Creek (Map 16).

The proposed Zincton CRA drainages within the Slocan River Watershed are summarized in Table 4.

Table 4: Slocan River Watershed Subbasins within the Zincton project Area

Waterbody Name	Drainage Area (ha)	Mean Annual Discharge (m3/s)	Annual Runoff (m3/yr)
Watercourse #14	390	0.188	5,924,439
Watercourse #3	228	0.096	3,044,573
Watercourse #16	261	0.101	3,191,432
Marten Creek	2087.59	0.777	24,521,978
Watercourse #15	194	0.065	2,044,662
Watercourse #4	158	0.047	1,480,732
Watercourse #13	67.3	0.019	587,907
O.K. Creek	162.18	0.053	1,681,776
McEllis Creek	165.09	0.05	1,576,835
Chatham Creek	140.23	0.041	1,292,305
Watercourse #5	226	0.07	2,193,638
Watercourse #10	252	0.075	2,358,019
Watercourse #9	167	0.046	1,456,811
Watercourse #7	1.29	0.034	1,064,554
Watercourse #12	163	0.045	1,441,546
Kane Creek	8172.01	2.86	90,268,274
Watercourse #2	205	0.065	2,044,943
Watercourse #11	99.2	0.032	1,010,446
Watercourse #1	102	0.024	749,480
Watercourse #6	119	0.036	1,124,507
Rambler Creek	215.04	0.086	2,719,796
Dardanelles Creek	451.02	0.169	5,334,751
McGuigan Creek	943.15	0.324	10,213,244
Seaton Creek	2713.82	0.735	23,205,561
Shea Creek	147.2	0.037	1,181,442
Watercourse #8	120	0.028	879,925
Howson Creek	722.25	0.214	6,764,913
Carpenter Creek	20630.46	6.47	204,239,625

3.2.5.2 Kootenay Lake Watershed

The Kootenay Lake watershed is approximately 940,000 ha in size (BC Government, 2021b; Ministry of Forest, Lands, Natural Resource Operations and Rural Development, 2021). Within the proposed CRA the watershed includes Watson Creek which flows into Bear Lake which connects to Fish Lake and drains into the Kaslo River. Goat Creek, Murray Creek and Whitewater Creek also drain the project area and which both flow into the Kaslo River which in turn flows into Kootenay Lake.

Additional named waterbodies in the Kootenay Lake Watershed that occur within three kilometers of the CRA boundary include Stenson Creek, Lyle Creek, Rossiter Creek and Robb Creek all of which drain directly into the Kaslo River (Map 16).

The proposed Zincton CRA drainages within the Kootenay Lake Watershed are summarized in Table 5.

Table 5: Kootenay Lake Watershed Subbasins within the Zincton project Area

Waterbody Name	Drainage Area (ha)	Mean Annual Discharge (m3/s)	Annual Runoff (m3/yr)
Watson Creek	151.87	0.042	1,322,353
Bear Lake	300	0.072	2,278,890
Fish Lake	600	0.137	4,321,560
Goat Creek	1090.61	0.363	11,445,537
Stenson Creek	1324.81	0.397	12,518,098
Murray Creek	363.3	0.094	2,973,914
Whitewater Creek	1082.46	0.381	12,025,218
Lyle Creek	878.48	0.315	9,928,643
Robb Creek	719.49	0.213	6,732,394
Rossiter Creek	1467.72	0.464	14,641,198
Kaslo Creek	45081.37	13.1	414,757,188

3.2.5.3 Water Licences

Water licences are held on Kane Creek, Seaton Creek, Goat Creek, Murray Creek, Whitewater Creek, Kaslo River, Fish Lake, Bagration Spring, Audubon Spring and Cindy Spring by various users including private individuals, private corporations and provincial government ministries (BC Government, 2021e). These are listed in Table 6 and displayed in Map 16.

Table 6: Water Licences with the Proposed Zincton CRA and 3 km Study Area

Map ID	Licence No	WR Map/Point Code	Stream Name	Purpose	Quantity	Units	Licensee	Water District/ Precinct	Licence Status	Process Status	Priority Date	Issue Date	Term	Type
1	C124684	3961 E (PD24869)	Bagration Spring	Domestic	2.273	MD	BOGUSLAVSKY ANNA PO BOX 96 NEW DENVER BC V0G1S0	KAS - KASLO	Current	N/A	1974.06.28	2009.04.15	Long	Surface Water
2	C123132	3961 (PD81039)	Murray Creek	Power: Residential	0.008	MS	HIGNETT SEAN DAVID 106-59 22 AVENUE SW CALGARY AB T2S3C7	KAS - KASLO	Current	N/A	2007.08.14	2009.07.22	Long	Surface Water
3	500542	PD192699 - 3961	Whitewater Creek	c	120	MY	MINISTRY OF TRANSPORTATION AND INFRASTRU 4TH FLOOR-310 WARD STREE NELSON BC V1L4S5	NEL - NELSON	Current	N/A	2018.02.02	2019.03.06	Long	Surface Water
4	C047282	3961 G (PD24872)	Goat Creek	Commercial Enterprise	6.819	MD	TRANSPORTATION & INFRASTRUCTURE MIN OF 310 WARD ST NELSON BC V1L5S4	KAS - KASLO	Current	N/A	1975.03.07		Long	Surface Water
5	C111126	3961 F (PD24870)	Audubon Spring	Commercial Enterprise	15.911	MD	0792107 B.C. LTD. O/A RATALLACK LODGE PO BOX 147 NEW DENVER BC V0G1S0	KAS - KASLO	Current	N/A	1996.05.31	1998.07.20	Long	Surface Water
6	500542	PD192700 - 3961	Kaslo River	Misc. Industrial	250	MY	MINISTRY OF TRANSPORTATION AND INFRASTRU 4TH FLOOR-310 WARD STREE NELSON BC V1L4S5	NEL - NELSON	Current	N/A	2018.02.02	2019.03.06	Long	Surface Water
7	C130398	PD185298 - 3961	Cindy Spring	Domestic	2.273	MD	WALKER CINDY PO BOX 467 NEW DENVER BC V0G1S0	KAS - KASLO	Current	N/A	2012.07.24	2013.06.06	Long	Surface Water

Map ID	Licence No	WR Map/Point Code	Stream Name	Purpose	Quantity	Units	Licensee	Water District/ Precinct	Licence Status	Process Status	Priority Date	Issue Date	Term	Type
8	C100373	5450 J3 (PD26926)	Seaton Creek	Power: General	1	MS	ANKENMAN JEFF BOX 141 SILVERTON BC V0G2B0	NEL - NEW DENVER	Current	N/A	1988.10.13	1994.06.06	Long	Surface Water
9	C130407	PD185591 - 3961	Murray Creek	Domestic	2.273	MD	WALKER CINDY PO BOX 467 NEW DENVER BC V0G1S0	KAS - KASLO	Current	N/A	2013.01.15	2013.06.06	Long	Surface Water
10	500542	PD192945 - 3961	Fish Lake	Misc. Industrial	120	MY	MINISTRY OF TRANSPORTATION AND INFRASTRU 4TH FLOOR-310 WARD STREE NELSON BC V1L4S5	NEL - NELSON	Current	N/A	2018.02.02	2019.03.06	Long	Surface Water
11	C109252	3961 H (PD70514)	Whitewater Creek	Power: Commercial	0.044	MS	0792107 B.C. LTD. O/A RATALLACK LODGE PO BOX 147 NEW DENVER BC V0G1S0	KAS - KASLO	Current	N/A	1995.01.31	2000.08.23	Long	Surface Water
12	500542	PD192942 - 5452	Kane Creek	Misc. Industrial	120	MY	MINISTRY OF TRANSPORTATION AND INFRASTRU 4TH FLOOR-310 WARD STREE NELSON BC V1L4S5	NEL - NELSON	Current	N/A	2018.02.02	2019.03.06	Long	Surface Water
13	File No: 3006480	N/A	Kaslo River	Commercial Enterprise	36159.75		N/A		Current	N/A			Short	Surface Water

Map 12: Biogeoclimatic Zones

Map 13: Geology

Map 14: Terrain Geomorphology

Map 15: Soils

Map 16: Hydrology

3.3 Aquatic Environment

Several named and unnamed watercourses and associated tributaries occur within the proposed Zincton CRA. Some of these watercourses flow through areas of intense historical mining and are connected to known fish bearing watercourses (Map 17).

3.3.1 Fish and Fish Habitat

The fisheries and aquatic habitat on site can be divided into those within the Slocan River Watershed flowing to the west from the proposed CRA and those within the Kootenay Lake Watershed flowing to east from the proposed CRA.

Due to the steep slopes found throughout the proposed CRA fish and fish habitat is concentrated within the lower reaches and valley bottom watercourses (Map 17). Marten Creek, O.K. Creek, Kane Creek, Seaton Creek and Carpenter Creek are identified as fish bearing waterbodies within the Slocan River Watershed portion of the proposed CRA. Fish present within these waterbodies include rainbow trout (*Oncorhynchus mykiss*), westslope cutthroat trout (*O. clarki lewisi*), brook trout (*Salvelinus fontinalis*), bull trout (*S. confluentus*) and Kokanee (*O. nerka*) (Table 7).

Table 7: Slocan River Watershed Waterbodies within the Project Site and Fish Observation Records

Waterbody Name	Waterbody Type	Stream Length (km)	Fish Observations Records	Obstacles
MARTEN CREEK	Stream	5.8	Rainbow Trout	
O.K. CREEK	Stream	2.2	Rainbow Trout	
MCELLIS CREEK	Stream	2	-	
CHATHAM CREEK	Stream	1.8	-	
KANE CREEK	Stream	17.4	Rainbow Trout	Culvert, Cascades, Rocks
RAMBLER CREEK	Stream	2.4	-	
DARDANELLES CREEK	Stream	2.5	-	
MCGUIGAN CREEK	Stream	3.9	-	Cascade, Beaver Dam
SEATON CREEK	Stream	7.7	Rainbow Trout; Cutthroat (Westslope/Yellowstone); Brook Trout;	Cascade, Beaver Dam, Culvert, Debris
SHEA CREEK	Stream	1.8	Rainbow Trout	
HOWSON CREEK	Stream	4.9	-	Cascade
CARPENTER CREEK	Stream	24.9	Rainbow Trout Brook Trout Bull Tout Kokanee	Canyons, Cascades, Falls, Rocks,

In the Kootenay Lake Watershed, Whitewater Creek are identified as fish bearing. Bear Lake, Fish Lake and Kaslo River, though not found within the project area, are downstream fish bearing watercourse connected to watercourses that drain the subject area. It is likely that at a minimum the lower reaches of connected waterbodies may also be fish bearing. Stenson Creek, Lyle Creek and Rossiter Creek are

identified as fish bearing waterbodies with the Kootenay Lake watershed. The fish present within the Slocan River Watershed waterbodies of the project area are also present in the Kootenay Lake Watershed waterbodies (Table 8).

Table 8: Proposed Zincton CRA and 3km buffer Kootenay Lake Watershed Waterbodies and Fish Observation Records

Waterbody Name	Waterbody Type	Stream Length (km)	Lake Perimeter (km)	Lake Area (ha)	Lake Elevation (m)	Fish Observation Records	Obstacles
WATSON CREEK	Stream	2.4				-	
BEAR LAKE	Lake		1.5	1040	1085	Rainbow Trout	
FISH LAKE	Lake		1.2	550	1073	Rainbow Trout; Cutthroat (Westslope/Yellowstone); Brook Trout	
GOAT CREEK	Stream	5.1				Rainbow Trout	
STENSON CREEK	Stream	6.7				Rainbow Trout, Bull Trout	Falls, Cascades, Rock
MURRAY CREEK	Stream	1.7				-	
WHITEWATER CREEK	Stream	6.5				Rainbow Trout	
LYLE CREEK	Stream	4.8				Rainbow Trout Bull Trout	Falls
ROBB CREEK	Stream	4.9				-	
ROSSITER CREEK	Stream	7				Bull Trout	
KASLO RIVER	Stream	31.8				Rainbow Trout Bull Trout Cutthroat (Westslope/Yellowstone); Kokanee Brook Trout	

3.3.1.1 Rare and Endangered Fish Species

Bull trout and the westslope cutthroat, provincially blue listed species and designated as species of Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA) are known to occur within the proposed Zincton CRA and the 3 km study area surrounding the proposed CRA. Within the Slocan River Watershed bull trout are known to occur in Carpenter Creek and the westslope cutthroat are known to occur in Seaton Creek. In the Kootenay Lake Watershed, bull trout are known to occur in Stenson Creek, Lyle Creek and Kaslo River. The westslope cutthroat are known to occur in Fish Lake, and Kaslo River (BC Government, 2021d).

3.3.1.1.1 Bull Trout

Bull trout (*Salvelinus confluentus*) are not true trout, but are in fact char. They are often confused with Dolly Varden (*Salvelinus malma*) which have similar markings, skull morphology and distribution (BC Government et al., 2004). Through genetic studies, the separation between the two species was recognized by the American Fisheries Society in 1980 (BC Government et al., 2004). Bull trout are

characterized as having a large head and jaw relative to their long, slender body. When compared to Dolly Varden, bull trout have a larger, broader and flatter head and more ventrally flattened body (BC Government et al., 2004). Their colour ranges from green to greyish blue. Some lake residents have silver sides. The dorsal and peduncle regions are spotted with pale yellowish-orange spots. Bull trout are distinguished from other char and trout species native to western Canada by the absence of black spots on the dorsal fin (BC Government et al., 2004).

Bull trout fry prefer to stay near substrate to avoid strong current which can sweep them downstream. Juvenile bull trout feed on aquatic insects and amphipods in the benthic, pelagic and littoral zones (BC Government et al., 2004). Some bull trout are stream residents (fluvial) and tend to be smaller than migratory (adfluvial) bull trout. Adfluvial bull trout spawn in tributary streams but reside in lakes or reservoir while fluvial bull trout also spawn in tributaries but live in mainstem rivers. Adfluvial bull trout are also predominantly piscivorous which contributes to their rapid growth rate compared to fluvial bull trout which a predominantly insectivores (BC Government et al., 2004). Bull trout spawn in cool (5-9^{o}C) low gradient (1-1.5%) flowing water (0.03-0.8 m/s) on clean gravel and under cover in the form of undercut banks, overhanging riparian vegetation, debris jams and deep pools (BC Government et al., 2004). The optimal temperature range for bull trout eggs incubation is 2-4^{o}C. Ground water interaction with surface water is needed to create thermal stability at spawning sites and to prevent incubating eggs from freezing during the winter when stream temperatures can dip down to 0^{o}C (BC Government et al., 2004)

Bull trout are endemic to western Canada and the U.S. Pacific Northwest. In BC they are found in all major drainage basins on the mainland. However, they are on the provincial *Blue List*. Bull trout populations are declining in abundance in Canada and the U.S. (BC Government et al., 2004). In BC, the main threat to bull trout populations is fragmentation due to disruption of the migration patterns by obstructions such as perched culverts, water velocity through culverts and degraded habitats (BC Government et al., 2004). In BC, bull trout are protected under the provincial *Wildlife Act*, the provincial *Fish Protection Act*, the federal *Fisheries Act* and the *Species at Risk Act.*

3.3.1.1.2 Westslope Cutthroat Trout

Coastal cutthroat trout (*Oncorhynchus clarki lewisi*) is one of 14 subspecies of interior cutthroat trout (*O. clarki*). Cutthroat trout are distinguished by a red or orange streak under their jaw. In comparison to other trout, cutthroats have many spots all over the head and sides of the body and occasionally on the belly and fins (BC Government et al., 2004).

Westslope cutthroat is native to southeastern British Columbia and southwestern Alberta, western Montana, northern Idaho. Small disjunct populations are also found in Washington, Oregon and Wyoming (BC Government et al., 2004). Westslope cutthroat are opportunistic feeders and are known to consume terrestrial macroinvertebrates, lake zooplankton other fish and even small mammals. Westslope cutthroat spawn between April and August but peak in May and eggs incubate for 6-7 weeks. Following emergence fry migrate to other habitat or rear they natal streams (BC Government et al., 2004).

In BC, the westslope cutthroat is considered vulnerable and is on the provincial *Blue List*. In BC westslope cutthroat are protected under the provincial *Wildlife Act*, the provincial *Fish Protection Act,* the federal *Fisheries Act* and the *Species at Risk Act.*

3.3.2 Water/Sediment Quality

Geochemical Stream Survey sediment samples collected under the Regional Geochemical Survey (RGS) within the proposed Zincton CRA and within the 3 km study area surrounding the proposed CRA are derived from sediment to capture select subbasins (Map 17). These sample records were compared to the Upper Working Sediment Quality Guidelines (WSQG). Concentrations that exceed the Upper WSQGs are frequently associated with adverse biological effects (Ministry of Environment and Climate Change Strategy, 2020). The results of each sample method record are summarized below in Table 9, Table 10 and Table 11.

These samples provide representative geochemical data for the catchment basin upstream from the sample site. Geochemical Stream Survey sediment samples collected within the study area showed exceedances in comparison to BC's working water quality guidelines for freshwater aquatic life. Past Producer Mines may contribute to the high concentrations of elements detected in the sediment samples. Within the proposed Zinton CRA sample sites downstream of past producing mines and within the drainage basins of O.K. Creek and McEllis Creek, Kane Creek, Watson Creek, Goat Creek, Whitewater Creek all showed exceedances of various elements. These include Lead (Pb), Zinc (Zn), Cadmium (Cd), Nickel (Ni), Aresenic (As), Chromium (Cr) and Manganese (Mn) (Map 17). However, high concentration of elements which exceed the water quality guidelines were also detected upstream of all known past producing mines on Kane Creek upstream of the confluence with O.K. Creek (Map 17). This may indicate naturally high concentrations of undisturbed elements have washed into downstream waterbodies from precipitation and snow melt. Conversely sample sites down stream of the confluence of Seaton Creek and Carpenter Creek showed no exceedances despite the presence of several upstream and upslope past producing mine sites. This may indicate that the elements precipitate out into the sediment and do not stay suspended in the water column to travel far from the originating drainage basin.

Table 9: Geochemical Stream Survey Sediment Samples - Atomic Spectrum Absorption Spectrometry (AAS)

Element	WSQG	ID082K779096	ID082K777018	ID082K777017	ID082K777016	ID082K777007	ID082K777015	ID082K777025	ID082K777014	ID082K777012	ID082K777010	ID082K777011	ID082K777013	ID082K777023	ID082K777022	ID082K777019	ID082K777020
Ag (ppm)		3.00	0.40	0.80	5.80	0.60	1.40	1.50	2.60	8.40	8.00	0.20	1.00	1.40	1.60	0.20	-0.20
Co (ppm)		10	8	10	19	25	18	18	14	18	25	41	23	19	12	17	22
Cu (ppm)	197	56	22	26	148	56	60	44	22	70	78	92	52	58	50	38	46
Fe (%)	4.00	2.75	1.80	2.45	4.60	3.90	4.05	3.05	3.00	3.85	4.10	6.10	4.10	3.30	2.45	3.10	2.80
Hg (ppb)	486	70	30	30	140	20	20	10	40	60	70	30	20	40	30	30	10
Mn (ppm)	1100	1750	685	700	1650	1050	835	540	1500	1100	1100	1600	730	955	585	685	540
Mo (ppm)		6	-2	5	10	2	14	5	5	6	-2	-2	-2	10	8	4	2
Ni (ppm)	75	23	22	37	70	54	130	55	83	49	88	87	37	68	41	44	70
Pb (ppm)	91.3	2450	34	37	1750	100	49	27	56	1500	1300	34	40	100	30	16	11
Sn (ppm)		14	2	-2	100	2	3	-2	-2	34	11	-2	-2	2	-2	-2	2
Zn (ppm)	315	2800	122	230	9400	220	3680	136	810	3080	1980	112	164	460	260	104	66

Table 10: Geochemical Stream Survey Sediment Samples - Instrumental Neutron Activation Analysis (INA)

Element	WSQG	ID082K779096	ID082K777018	ID082K777017	ID082K777016	ID082K777007	ID082K777015	ID082K777025	ID082K777014	ID082K777012	ID082K777010	ID082K777011	ID082K777013	ID082K777023	ID082K777022	ID082K777019	ID082K777020
Au (ppb)		200	4	6	27	16	17	17	4	27	73	33	23	17	15	15	14
Au1 (ppb)																8	
As (ppm)	17.00	25.00	16.00	13.00	1330.00	25.00	17.00	27.00	18.00	44.00	104.00	27.00	63.30	31.00	22.00	31.00	31.00
Ba (ppm)		890	810	850	1000	790	900	710	820	690	500	320	540	1100	990	720	600
Br (ppm)		4.60	24.00	24.00	14.00	10.00	14.00	1.70	26.00	6.30	4.10	11.00	5.00	11.00	7.60	4.50	3.10
Ce (ppm)		66	57	82	81	53	120	84	74	120	99	24	100	95	64	79	43
Co (ppm)		16	13	15	27	36	24	33	19	26	32	57	30	27	16	24	45
Cr (ppm)	90	63	39	55	80	180	110	230	87	130	180	190	100	95	86	110	360
Cs (ppm)		5.30	14.00	5.30	6.20	5.40	7.80	3.60	6.30	10.00	11.00	5.00	10.00	5.80	4.00	4.80	3.90
Fe (%)	4.00	3.70	2.90	3.90	6.20	5.30	4.80	5.20	3.60	5.10	4.50	7.60	5.40	4.60	3.00	4.10	5.60
Hf (ppm)		11	5	7	8	4	6	6	4	7	7	3	6	7	9	4	3
La (ppm)		38	33	49	58	33	71	50	46	72	59	14	60	57	43	44	25
Lu (ppm)		0.3	-0.2	-0.2	0.3	0.3	0.3	0.4	-0.2	-0.2	-0.2	0.5	0.4	-0.2	-0.2	-0.2	0.3
Mo (ppm)		8	2	6	12	3	16	5	10	9	-1	-1	2	14	7	5	-1
Na (%)		1.00	1.10	1.40	1.10	1.70	1.10	1.80	1.30	1.20	1.10	1.70	1.50	1.20	1.10	1.30	1.70
Ni (ppm)	75	36	26	40	89	92	150	94	100	70	150	130	51	95	51	69	180
Rb (ppm)		86	75	75	86	67	100	76	79	120	130	50	100	110	77	83	55
Sb (ppm)		10.20	2.20	2.70	20.60	2.30	2.20	4.70	5.60	9.20	18.30	1.30	7.00	5.90	5.50	4.70	2.60
Sc (ppm)		13.00	13.00	17.00	14.00	22.40	15.00	25.30	12.00	15.00	18.00	31.10	21.40	15.00	11.00	16.00	30.20
Sm (ppm)		6.50	4.60	6.20	7.30	5.40	8.90	7.50	5.60	9.20	8.60	3.60	8.30	7.80	5.50	6.70	5.60
Ta (ppm)		1.10	1.00	1.30	0.90	0.80	1.30	1.00	0.90	1.70	1.50	-0.50	1.20	1.50	1.10	1.10	0.80
Tb (ppm)		1.10	0.90	1.10	0.80	1.20	1.60	1.50	1.10	1.50	1.60	1.20	1.70	1.60	1.40	1.40	1.30
Th (ppm)		8.40	6.70	10.00	11.00	6.90	14.00	9.40	8.80	15.00	16.00	2.90	13.00	13.00	9.00	10.00	5.30
U (ppm)		3.80	3.40	5.20	6.20	3.20	4.90	3.20	4.00	5.50	5.00	1.40	4.00	6.20	4.50	3.90	2.10
W (ppm)		-2	-2	-2	8	-2	3	-2	-2	4	3	-2	-2	-2	-2	-2	-2
Yb (ppm)		-2	-2	3	3	3	3	3	-2	3	3	3	3	3	-2	3	-2
Zr (ppm)		560	300	300	560	-200	280	220	-200	380	290	-200	330	340	450	340	-200
WT (g)		29	17	14	29	21	17	24	11	25	17	18	26	14	6	9	23

Table 11: Geochemical Stream Survey Sediment Samples - Inductively Coupled Plasma Mass Spectrometry (ICP)

Element	WSQG	ID082K779096	ID082K777018	ID082K777017	ID082K777016	ID082K777007	ID082K777015	ID082K777025	ID082K777014	ID082K777012	ID082K777010	ID082K777011	ID082K777013	ID082K777023	ID082K777022	ID082K777019	ID082K777020
Ag (ppb)		15846.00	910.00	665.00	57635.00	1104.00	1163.00	1576.00	2693.00	8369.00	13962.00	233.00	829.00	1645.00	1735.00	414.00	104.00
Al (%)		1.08	1.31	1.05	0.70	1.75	0.84	1.11	0.74	0.95	1.51	3.15	0.85	0.89	0.39	1.16	1.48
As (ppm)	17.00	21.50	12.50	8.70	1122.80	26.30	11.90	20.50	13.20	33.00	98.30	20.40	48.20	20.50	19.70	24.90	22.10
Au (ppb)		143.50	2.50	1.60	17.20	9.50	4.80	3.20	66.10	37.20	47.50	50.80	7.10	7.80	5.50	1.70	4.80
B (ppm)		-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00
Ba (ppm)		63.90	67.80	44.40	35.20	186.60	33.10	49.80	39.10	24.70	43.10	40.90	21.20	58.70	48.90	60.60	70.50
Be (ppm)		0.50	0.60	0.40	0.60	0.40	0.40	0.30	0.30	0.30	0.50	0.40	0.30	0.50	0.50	0.30	0.30
Bi (ppm)		0.29	0.22	0.31	0.40	0.34	0.52	0.29	0.47	0.59	0.48	0.16	0.42	0.63	0.33	0.27	0.12
Ca (%)		0.40	1.54	0.85	0.74	0.62	0.72	0.39	0.99	0.68	0.43	0.52	0.36	0.77	1.20	0.27	0.37
Cd (ppm)	4.20	13.75	1.88	3.93	66.20	2.59	29.58	1.27	15.45	16.20	15.94	0.62	1.26	6.89	4.89	0.93	0.51
Ce (ppm)		36.60	20.80	27.30	17.70	20.70	16.90	15.60	12.90	17.20	24.50	10.10	8.90	20.20	15.30	16.00	10.50
Co (ppm)		11.50	8.50	10.80	19.90	27.40	17.50	19.10	13.90	18.50	24.10	38.70	21.10	18.00	13.00	17.00	24.20
Cr (ppm)	90.00	17.00	23.20	16.50	14.50	94.10	23.70	53.90	23.20	26.90	105.20	155.60	27.10	16.60	7.20	43.20	93.70
Cs (ppm)		2.43	11.39	2.89	2.83	3.75	2.66	1.53	2.69	4.26	4.46	3.75	4.25	1.42	0.95	1.61	2.12
Cu (ppm)	197.00	64.08	32.49	32.54	163.58	65.90	72.07	49.39	52.07	75.01	83.36	96.29	56.47	68.49	61.89	48.15	49.03
Fe (%)	4.00	3.01	1.87	2.53	4.83	4.72	4.11	3.42	2.96	4.10	4.59	5.77	4.39	3.65	2.86	3.58	3.24
Ga (ppm)		2.90	4.40	3.20	2.30	5.20	2.70	3.50	2.30	2.80	4.20	9.60	2.30	2.40	1.20	3.30	4.20
Ge (ppm)		-0.1	-0.1	-0.1	-0.1	-0.1	0.2	0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Hf (ppm)		-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	0.03	-0.02	-0.02	0.03	0.03	-0.02	-0.02
Hg (ppb)	486.00	80.00	39.00	46.00	171.00	30.00	42.00	19.00	45.00	59.00	67.00	29.00	21.00	54.00	44.00	40.00	14.00
In (ppm)		0.22	0.06	0.06	-0.02	0.06	0.12	0.03	0.07	-0.02	0.40	0.08	0.04	0.05	0.05	0.03	0.03
K_ICP_%		0.08	0.16	0.07	0.06	0.08	0.03	0.05	0.04	0.03	0.06	0.16	0.02	0.05	0.04	0.03	0.10
La (ppm)		18.10	10.80	14.60	8.80	10.60	8.90	7.80	6.80	8.90	11.20	4.50	4.00	10.00	8.00	8.40	4.80
Li (ppm)		17.10	24.50	17.00	8.80	16.60	10.60	11.10	7.00	13.30	18.10	21.70	9.10	11.60	4.20	15.10	12.10
Mg (%)		0.68	0.85	0.44	0.49	1.54	0.39	1.09	0.32	0.60	1.03	2.73	0.60	0.44	0.22	0.74	1.77
Mn (ppm)	1100.00	2036.00	806.00	812.00	1775.00	1252.00	852.00	552.00	1465.00	1148.00	1112.00	1546.00	707.00	915.00	595.00	692.00	562.00
Mo (ppm)		4.35	1.44	5.45	9.89	3.72	13.92	4.65	7.99	6.41	1.88	1.01	2.28	10.64	7.27	4.52	1.70
Na (%)		0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01
Nb (ppm)		0.14	0.73	0.51	0.23	0.17	0.14	0.24	0.22	0.12	0.09	0.21	0.07	0.13	0.08	0.13	0.23
Ni (ppm)	75.00	31.70	29.30	50.10	93.00	76.40	150.10	73.70	106.30	64.10	121.20	97.70	47.30	86.30	53.40	52.70	97.00
P (%)		0.09	0.10	0.09	0.13	0.13	0.10	0.08	0.11	0.11	0.10	0.06	0.07	0.10	0.22	0.07	0.06
Pb (ppm)	91.30	2113.65	40.23	30.05	1687.06	127.37	49.51	31.76	57.07	1406.20	1384.77	31.30	33.09	111.80	33.10	19.15	11.83
Pd (ppb)		16	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
Pt (ppb)		-2	-2	-2	-2	-2	2	2	3	-2	3	-2	-2	-2	-2	-2	3
Rb (ppm)		9.50	23.90	7.60	6.20	8.10	3.00	5.70	5.20	3.90	5.00	14.90	2.10	5.00	3.20	4.00	8.70
Re (ppb)		-1	7	8	7	-1	5	-1	4	5	-1	-1	-1	2	2	-1	-1
S (%)		0.06	0.07	0.08	0.83	0.06	0.05	0.10	0.08	0.16	0.06	0.03	0.12	0.11	0.10	0.04	0.04
Sb (ppm)		7.38	1.22	1.66	11.35	1.01	1.03	2.90	3.21	4.56	7.10	0.48	3.34	2.82	3.97	2.08	0.91
Sc (ppm)		2.30	1.80	1.50	1.80	7.80	2.30	2.80	1.20	2.50	6.10	13.30	3.80	2.10	2.30	3.20	3.40

Element	WSQG	ID082K779096	ID082K777018	ID082K777017	ID082K777016	ID082K777007	ID082K777015	ID082K777025	ID082K777014	ID082K777012	ID082K777010	ID082K777011	ID082K777013	ID082K777023	ID082K777022	ID082K777019	ID082K777020
Se (ppm)		4.20	4.20	6.70	10.00	2.50	9.50	2.10	6.70	3.60	0.70	0.80	1.80	5.90	6.00	2.10	0.80
Sn (ppm)		20.80	0.40	0.30	39.90	0.40	0.60	0.20	0.20	8.70	4.60	0.20	0.20	0.20	0.10	0.10	0.20
Sr (ppm)		32.80	96.40	82.30	55.20	34.40	47.40	33.30	72.70	45.80	47.40	17.00	23.50	64.50	71.70	29.90	20.20
Ta (ppm)		-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
Te (ppm)		0.05	0.06	0.20	0.09	0.09	0.14	0.03	0.14	0.17	0.09	0.06	0.21	-0.02	0.18	0.06	0.15
Th (ppm)		3.70	1.40	1.90	3.20	3.00	3.20	2.60	0.80	4.50	6.00	1.20	2.10	3.10	1.80	2.60	1.60
Ti (%)		0.024	0.044	0.028	0.019	0.073	0.006	0.068	0.012	0.009	0.025	0.118	0.021	0.007	0.006	0.015	0.115
Tl (ppm)		0.12	0.21	0.13	0.13	0.08	0.06	0.06	0.17	0.05	0.06	0.10	0.03	0.13	0.12	0.05	0.07
U (ppm)		0.80	1.50	3.30	2.30	1.70	1.80	0.80	1.80	1.80	1.30	0.70	0.90	1.90	1.20	1.20	0.60
V (ppm)		18.00	30.00	26.00	15.00	82.00	15.00	34.00	14.00	15.00	34.00	152.00	23.00	13.00	7.00	25.00	55.00
W (ppm)		-0.10	-0.10	0.10	2.10	0.10	0.30	0.10	0.30	-0.10	-0.10	0.30	-0.10	-0.10	-0.10	-0.10	0.10
Y_ (ppm)		10.01	11.72	7.11	10.06	10.42	6.05	5.44	5.97	7.38	7.51	8.21	4.18	8.00	12.81	4.88	4.65
Zn (ppm)	**315.00**	2965.30	151.50	194.40	8783.40	279.50	3267.60	141.30	859.00	2862.30	1931.80	117.00	154.90	478.50	282.20	118.70	69.30
Zr (ppm)		0.20	0.80	1.00	0.30	0.80	0.70	0.60	0.40	0.60	1.30	1.00	0.40	1.30	0.90	0.70	0.90

Map 17: Aquatic Environment

3.4 Terrestrial Environment

3.4.1 Vegetation

3.4.1.1 Vegetation Associations

The vegetation of the proposed Zincton CRA is diverse, extending over a wide range of elevations and is composed of mainly Mature Forest. The proposed Zincton CRA ranges from the low valley bottom of the Interior Cedar-Hemlock (ICH), to the subalpine Engelmann Spruce-Subalpine Fir (ESSF), extending to mountain peaks within the Interior Mountain-heather Alpine (IMA) biogeoclimatic zones. Terrestrial Ecosystem descriptions were interpolated from existing BC Vegetation Resource Inventory data and soil survey information to estimate the vegetation associations within the study area. Due to a lack of vegetation inventory data on the shrub, herb and moss layers, zones above treeline, avalanche chutes, areas of disturbance, riparian and wetland areas were not all fully classified into the respective site series and subdivisions. Classifications were based on information from the *Field Guide to Ecosystem Classification and Identification for Southeast British Columbia* (MacKillop, D. and A. Ehman, 2016) and vegetation age class descriptions are provided in Table 12.

The proposed CRA contains a variety of vegetation that includes dry, wet, and mesic forest sites, wetlands, subalpine parkland and alpine areas. Disturbance exists on site from roads, mining, forestry, and fires, all of which influence the existing vegetation.

Fire affected areas are not identified in the proposed CRA (Map 18), but past fires have likely influenced some young forest stands within the ICH zone on site.

The proposed CRA covers approximately 5,150 ha and is composed of mainly Mature Forest which covers 51.3% of the site. Second most is Shrub, covering 15.0% of site, then Sparse/Bryoid at 14.1%, Young Forest at 8.1%, Herb at 6.5%, Old Forest at 2.2%, non-vegetated at 1.9%, and Pole/Sapling at 0.8%. Vegetation with the potential to occur within the CRA are presented in Table 13. Non-vegetated refers to lake, river, glacier, roads, and disturbed mining sites.

Table 12: Vegetation Age Class Descriptions

Structural Stage Code	- Interpretation
1 Sparse/Bryoid	- Community is in initial stages of primary and secondary development - Bryophytes and lichens often dominant - Times since disturbance typically <20 years but may be 50-100 + years in areas with little or no soil - Shrub and herb cover <20 % of total area - Tree cover < 10 % of total area
2a/b/c/d Herb	- Early successional stage or edaphic herb community - 2a forb dominated - 2b graminoid dominated, including grasses, sedges, reeds and rushes - 2c aquatic plant dominated, but not 2b plants - 2d dwarf shrub dominated, low growing woody shrubs
3a/b Shrub	- Shrub dominated communities maintained by environmental conditions or disturbance - 3a low shrub < 2 metres tall - 3b tall shrub < 10 metres tall - Tree cover <10 %
4 Pole/Sapling	- Densely stocked trees - Self-thinning not yet evident - Time since disturbance usually < 40 years

Structural Stage Code	- Interpretation
5 Young Forest	- Stocking density persists - Self-thinning not yet evident - Time since disturbance usually 40-80 years (sometimes begins as early as 30)
6 Mature Forest	- Trees established after the last disturbance have matured - The second cycle of shade-tolerant trees may have become established - Time since disturbance generally 80–250 years
7 Old Forest	- Structurally complex stands composed mainly of shade-tolerant and regenerating tree species - Snags and coarse woody debris in all stages of decomposition typical - Time since disturbance >250 years
Modifiers: B – Broadleaf C – Coniferous M – Mixed	- Broadleaf stands composed of > 75 % broadleaf tree cover - Coniferous stands composed of > 75 % coniferous tree cover - Mixed stands neither coniferous nor broadleaf compose > 75 % of the total tree cover

Table 13: Vegetation Species Potentially Occurring on Site

Common Name	*Scientific Name*
Trees	
Western redcedar	*Thuja plicata*
Western hemlock	*Tsuga heterophylla*
Mountain hemlock	*Tsuga mertensiana*
Douglas-fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
Hybrid Engelmann / white spruce	*Picea engelmannii x glauca*
Subalpine fir	*Abies lasiocarpa*
Engelmann spruce	*Picea engelmannii*
Lodgepole pine	*Pinus contorta*
Western white pine	*Pinus strobus*
Western larch	*Larix occidentalis*
Douglas-fir	*Pseudotsuga menziesii*
Western redcedar	*Thuja plicata*
Western hemlock	*Tsuga heterophylla*

Common Name	***Scientific Name***
Hybrid white spruce	*Picea glauca x engelmannii*
Trembling aspen	*Populus tremuloides*
Whitebark pine	*Pinus albicaulis*
Black cottonwood	*Populus balsamifera* ssp. *trichocarpa*
Paper birch	*Betula papyrifera*
Shrubs	
Sitka alder	*Alnus viridis*
Red elderberry	*Sambucus racemosa*
Black twinberry	*Lonicera involucrata*
Mountain-ash	*Sorbus subg. Sorbus*
Soopolallie	*Shepherdia canadensis*
Western yew	*Taxus brevifolia*
Falsebox	*Paxistima myrsinites*
Red-osier dogwood	*Cornus stolonifera*
Black gooseberry	*Ribes lacustre*
Douglas maple	*Acer glabrum*
Thimbleberry	*Rubus parviflorus*
Devil's club	*Opplopanax horridus*
Black huckleberry	*Vaccinium membranaceum*
Oval-leaved blueberry	*Vaccinium ovalifolium*
Utah honeysuckle	*Lonicera utahensis*
Junipers	*Juniperus*
Saskatoon	*Amelanchier alnifolia*
Tall Oregon-grape	*Mahonia repens*
Birch-leaved spirea	*Spiraea betulifolia*

Common Name	***Scientific Name***
Baldhip rose	*Rosa gymnocarpa*
White-flowered rhododendron	*Rhododendron albiflorum*
Prince's pine	*Chimaphila umbellata*
Shrubby penstemon	*Penstemon fruticosus*
Mountain heathers	*Cassiope* sp.
Forbs	
Mountain-avens	*Dryas octopetala*
Canby's lovage	*Ligusticum canbyi*
Mountain arnica	*Arnica montana*
Wild strawberry	*Fragaria vesca*
Saxifrages	*Saxifraga* sp.
Moss campion	*Silene acaulis*
Thread-leaved sandwort	*Arenaria capillaris*
Wild sarsaparilla	*Aralia nudicaulis*
Sweet-cicely	*Myrrhis odorata*
Arrow-leaved groundsel	*Senecio triangularis*
Globeflower	*Trollius albiflorus*
Sitka valerian	*Valeriana sitchensis*
Louseworts	*Pedicularis*
Mitreworts	*Mitella*
White hawkweed	*Hieracium albiflorum*
False hellebore	*Veratrum viride*
Western tea-berry	*Gaultheria procumbens*
Bracken fern	*Pteridium aquilinum*
Lady fern	*Athyrium filix-femina*
Oak fern	*Gymnocarpium dryopteris*
Spiny wood fern	*Dryopteris expansa*

Common Name	***Scientific Name***
Parsley fern	*Cryptogramma crispa*
Fragile fern	*Cystopteris fragilis*
Cliff ferns	*Woodsiaceae*
Stonecrops	*Sedum*
False Solomon's-seal	*Smilacina racemosa*
Clasping-leaved twistedstalk	*Streptopus roseus, S. amplexifolius*
Queen's cup	*Clintonia uniflora*
Bunchberry	*Cornus canadensis*
Round-leaved violet	*Viola orbiculata*
One-leaved foamflower	*Tiarella unifoliata*
Rattlesnake plantain	*Goodyera oblongifolia*
One-sided wintergreen	*Orthilia secunda*
Partridge-foot	*Luetkea pectinata*
Pinegrass	*Calamagrostis rubescens*
Five-leaved bramble	*Rubus pedatus*
Electrified cat's-tail	*Rhytidiadelphus triquetrus*
Wood-rushes	*Luzula*
Sitka valerian	*Valeriana sitchensis*
Sweet-scented bedstraw	*Galium triflorum*
Bluejoint reedgrass	*Calamagrostis canadensis*
Horsetail	*Equisetum hyemale*
Mountain hairgrass	*Digitaria cognata*
Grasses	*Poaceae*
Sedges	*Cyperaceae*
Bladder-worts	*Utricularia*
Pondweed	*Potamogeton*
Yellow pond lily	*Nuphar lutea*

Common Name	*Scientific Name*
Mosses and Lichens	
Pipecleaner moss	*Rhytidiopsis robusta*
Ragged-mosses	*Brachythecium*
Rock-mosses	*Grimmia*
Bent-leaf moss	*Rhytidiadelphus squarrosus*
Peat-mosses	*Sphagnum* sp.
Heron's-bill mosses	*Dicranum fuscescens*
Red-stemmed feathermoss	*Pleurozium schreberi*
Step moss	*Hylocomium splendens*
haircap mosses	*Polytrichum*
Clad lichens	*Cladonia*
Cladinas	*Cladina*
Leafy mosses	*Hypnales*
Leafy liverworts	*Jungermanniales*
Pelt lichens	*Peltigeras*
Knight's plume	*Ptilium crista-castrensis*

3.4.1.2 Biogeoclimatic Zone Classification

Biogeoclimatic units represent groups of ecosystems under the influence of the same regional climate. Subzones can be grouped into zones and divided into variants. Each biogeoclimatic subzone has a distinct climax (or near-climax) plant association on zonal sites. Zonal sites have deep, loamy soils, and occupy midslope positions with mesic moisture regimes. The zonal climax vegetation is thought to best reflect the regional climatic conditions of the subzone. Ecosystems within a subzone are influenced by one type of regional climate. Edaphic (soil) and topographic conditions influence the climax vegetation of sites drier or wetter than the zonal condition. Variants are defined due to geographic variation within a subzone and reflect differences in regional climate (BC Ministry of Forests, 2002).

The subject site lies within the south-central Columbia Mountains (Map 12). It is generally not possible to identify subzones and variants based on zonal or mesic sites in this region, as true zonal sites are uncommon. Instead, vegetation must be evaluated on submesic or drier sites to help differentiate between adjacent biogeoclimatic subzones/variants (MacKillop, D. and A. Ehman, 2016).

The proposed Zincton CRA includes three Biogeoclimatic zones and contains elevations ranging from valley bottom to alpine: Interior Cedar – Hemlock (ICH), Engelmann Spruce – Subalpine Fir (ESSF), and Interior Mountain-heather Alpine (IMA). These zones are further classified into six subzones and variants:

- Interior Cedar – Hemlock, moist warm subzone, Slocan variant (ICHmw2);
- Engelmann Spruce – Subalpine Fir, Wet Hot subzone, Columbia variant (ESSFwh1);
- Engelmann Spruce – Subalpine Fir, Wet Cold subzone, Selkirk variant (ESSFwc4);
- Engelmann Spruce – Subalpine Fir, Wet Cold Woodland subzone (ESSFwcw);
- Engelmann Spruce – Subalpine Fir, Wet Cold Parkland subzone (ESSFwcp);
- Interior Mountain-heather Alpine, Undifferentiated subzone (IMAun).

The ICH Zone occupies the lower slopes of the south-central Columbia Mountains. The ICH has the greatest tree species diversity of all biogeoclimatic zones in British Columbia, commonly called the "Kootenay mix". Common trees within ICH of all variants are western redcedar, western hemlock, Douglas-fir, western larch, lodgepole pine, western white pine, paper birch, trembling aspen, and black cottonwood. The ICHmw2 is one of the largest ICH subzone/variants in the south-central Columbia Mountains and occurs above the ICHdw on lower slopes of the southern Columbia Mountains. It can be found in valley bottoms north of the ICHdw (BC Ministry of Forests, 2002); (MacKillop, D. and A. Ehman, 2016).

The valley bottoms and lower to mid slopes fall within the Interior Cedar Hemlock (ICH), moist wet subzone, Slocan variant. The lowest elevations include river designations for larger creeks with some wetland and floodplain habitat in the surrounding areas. The structural stages of the ICH zone range from 1 (Sparse/Bryoid) to 7 (Old Forest). Changes proposed in this zone include the village/base, lifts and egress trails for the study area. The CRA only proposes lifts and egress trails.

The project site includes disturbance throughout the ICH as dirt roads, fires, logging and mining. There is one non-vegetated polygon due to mining disturbance. Logging sites were classified as young forests due to regeneration of the disturbed areas.

The ESSF Zone is the largest zone in the Nelson Forest Region. ESSF occurs at higher elevations (above ICH). Closed canopy forests of subalpine fir and Engelmann spruce are common at lower and middle elevations. Subalpine parkland consisting of tree islands interspersed with herb-dominated meadows is common at upper elevations. Deciduous trees are uncommon within ESSF (BC Ministry of Forests, 2002).

The higher elevations of the proposed Zincton CRA are classified as the Engelmann Spruce – Subalpine Fir (ESSF) zone, or commonly as subalpine. The CRA contains several different subzones including: wet hot Columbia variant, wet cold Selkirk variant, wet cold woodland, and wet cold parkland Central Columbia Mountains variant. Old growth forest is common in the lower elevation wet hot Columbia variant. Upper elevations of wet cold woodland and wet cold parkland commonly contain slow growth stunted krummholz forests and shrublands.

ESSFwh1 is a transitional zone that occurs between ESSF and ICH, where typical tree species are subalpine fir, Engelmann spruce, western hemlock and western redcedar on mesic sites, and Douglas-fir, western larch, lodgepole pine and occasionally western white pine on drier sites (MacKillop, D. and A. Ehman, 2016). Old growth stands are very common.

ESSFwc4 is located on the upper slopes of the Monashee and Selkirk Mountains south of Revelstoke (BC Ministry of Forests, 2002). ESSFwc4 ranges from 1,650-1,950 m elevation on south aspect slopes and 1,600-1,950 m elevation on north aspect slopes. ESSFwcw occurs above the ESSFwc4 subzone and below ESSFwcp. ESSFwcp occurs at 1,950-2,440 m elevation on south slopes and 1,950-2,400 m elevation on north aspect slopes. ESSFwcp occurs above the ESSFwcw subzone (MacKenzie and Meidinger, 2021).

The IMA Zone occupies the entire Columbia Mountains, the southern Rocky Mountains, and the lee side of the Coast and Cascade Mountains. IMA is the smallest of the alpine zones as it occurs above 2,500 m elevation in the dry south and above 1,800 m in the north. (BC Ministry of Forests and Range, 2006). This is the coldest, snowiest, harshest environment in the south-central Columbia Mountains. Temperatures are cold most of the year and high winds are typical. Very deep snow lasts for half the

calendar year. Snow accumulation begins in October and lasts through to June or July. There are no trees, aside from "shin tangle", very low-growing krummholz-form trees. Currently, no subzone/variant differentiation is completed for IMA.

The alpine is classified as Interior Mountain-heather Alpine, undifferentiated subzone. Terrestrial Ecosystem Mapping (Map 18) has classified the alpine into various site series based on rock, glacier, herb, shrub and krummholz vegetation. This area experiences the harshest climate and the shortest growing season, as a result, vegetation is slow growing. Lower elevations of the alpine zones contain whitebark pine habitat.

The Biogeoclimatic zones are displayed above in Map 12. The different site series are further classified into Terrestrial Ecosystem Units based on the structural stage of the vegetation, the terrain of the site, and subtle changes in microclimate, soil conditions and associated vegetation.

3.4.1.3 Terrestrial Ecosystem Mapping

The Terrestrial Ecosystem Mapping (TEM) was interpreted from existing satellite imagery, BEC descriptions, and provincial VRI data. TEM codes for polygon areas were identified based on vegetation attributes and soil survey literature. Structural stages range from 1 to 7, and site series range from dry to wet forests within each biogeoclimatic subzone/variant. The polygon TEM codes are described in the following sections. Non-vegetated TEM units are described with a two-digit alphabetic code. Structural stage modifiers and other descriptive modifiers were not used due to a lack of sufficient data. Forested polygons are described with the following format:

Site series		Structural stage		Stand composition modifier
ICHmw2/	**101**	**a**	**5**	**C**
Biogeoclimatic subzone/variant		Site modifiers		

Map 18 legend below provides TEM codes in the above format, and codes are not included where irrelevant or where there is a lack of sufficient data. Where there is no way to differentiate a polygon between two site series the TEM code will list both, such as ICHmw2/ 101/104 a5C.

Table 14: TEM Site Modifiers

Code	Criteria
j	Gentle slope – The site series occurs on gently sloping topography (less than 25%)
k	Cool aspect – The site series occurs on cool, northerly or easterly aspects (285°–135°), on moderately steep slopes (25%–100% slope in the interior).
q	Very steep cool aspect – The site series occurs on very steep slopes (greater than 100%) with cool, northerly or easterly aspects (285°–135°).
r	Ridge – This site series occurs throughout an area of ridged terrain, or it occurs on a ridge crest.
w	Warm aspect – This site series occurs on warm, southerly or westerly aspects (135°–285°), on moderately steep slopes (25%–100% slope in the interior).
z	Very steep warm aspect – The site series occurs on very steep slopes (greater than 100%) on warm, southerly or westerly aspects (135°–285°).

GL: Glacier

Glacier is a mass of perennial snow and ice with definite lateral limits. It typically flows in a particular direction.

MI: Mining

Disturbed polygons due to mining activities are described as Mine (MI) which is a non-vegetated or sparsely vegetated area. This is a disturbed polygon that was previously used for mineral and/or material extraction.

RP: Road

RP is a non-vegetated polygon representing road surface. This is an area cleared and compacted for vehicle transport. This area within the subject site contains areas of unpaved road built for forestry or mining purposes.

Ro: Rock Outcrop

Occur where the dominant substrate is exposed bedrock. Soil development is very limited. Drought-tolerant bryophytes and lichens are often prominent, while herbs and shrubs are usually restricted to pocket of soil or cracks in the rock surface. Mosses and lichens frequently dominate plant communities on rock outcrops. Diversity in species composition and variability in cover are very high because of differences in geology, the shape and configuration of naturally occurring rock and other substrates, and climate variability. Shrub and herb coverage is highly variable.

Rt: Rock Talus

Talus ecosystems are comprised of rock debris and include stable slopes comprised of boulders, and unstable slopes made of smaller cobbles and gravels that are actively moving due to gravity. Talus sites are distinct in that they have minimal soil in the spaces between rocks. Lack of soil and/or mobility of rock substrates are limiting factors for the establishment and growth of vascular plants. There is often high lichen and bryophyte cover. Herb and shrub species are infrequently similar to those in adjacent Ro communities. Some stable talus slopes have low to moderate cover of deciduous trees or shrubs.

Vegetation communities are strongly linked to climate and rock material. Slopes are comprised of hard rocks such as granitics, volcanics, and metamorphic gneiss weather very slowly and have limited soil. This limits the establishment of vascular plants.

Vs: Shrub Dominated Avalanche Ecosystem

This code describes a shrub dominated Avalanche Ecosystem (Vs). The avalanche ecosystems experience repeated snow avalanches and contain diverse vegetation communities and highly varied disturbance regimes. This extends from mountain tops through steep forested terrain, to valley bottoms, and provides ecosystem diversity. There are generally three areas of an avalanche path: the initiation zone, the chute, and the run-out zone. Large amounts of snow are generally deposited in the run-out zone. This leads to late snowmelt, which shortens growing seasons and favours plant species adapted to higher elevations.

Shrub dominated avalanche ecosystems have abundant deciduous shrubs and are most frequently associated with the chute and lateral portions of the run-out zone where deep snow accumulation occurs infrequently, and site conditions are mesic to wet. The most commonly occurring site series of ESSFwcw and ESSFwc4 are Vs01 and Vs03 which are both Sitka alder dominated with red elderberry. Site series is unknown due to a lack of shrub and herb vegetation data.

Vt: Avalanche Treed Class

Avalanche treed ecosystems are dominated by shrub-sized trees that are continually pruned by snow slides that prevent them from becoming forests. This does not include young forests that are regenerating following single extreme events; such sites are seral forested ecosystems. Trees in Vt show

evidence of breakage, pruning, and bark damage from repeated avalanche events. Treed avalanche classification is under development.

Ww: Mineral Wetland: Shallow water class

These wetlands are permanently flooded by still or slow-moving water and are dominated by submerged and floating-leaved aquatic plants. There are grass-like plants such as sedges or cattails, but their cover does not exceed 10%. Ww ecosystems are most common at the edges of ponds and lakes and are often bordered by marshes or swamps where emergent vegetation is >10%. Plant communities are species-poor, usually dominated by yellow pond lily, although bladder-worts or pondweeds can be present and occasionally dominate plant communities. Water levels vary from 0.5 to 2 m but can be as deep as 5 m in clear waters. Ww provides important fish and wildlife habitat and are sensitive to nutrient loading and sedimentation.

Sk: Subalpine Shrub Group: Krummholz

The wet cold parkland subzone of ESSF covers an extensive area throughout the Columbia Mountains. The ESSFwcp4 occurs in the south-central Columbia Mountains. Krummholz forests are trees of stunted growth, but they may exceed 10 m in height, especially at lower elevations. Subalpine fir, with lesser amounts of Engelmann spruce, are the most common ecosystem across the ESSFwcp. On drier sites, whitebark pine and alpine larch are common.

Sc: Subalpine Shrub Group: Shrubland/Shrub carr

This class is for deciduous, shrub-dominated ecosystems that develop on frost-prone sites that would otherwise support conifer trees. These ecosystems can be widespread in the parkland but also occur in frost-prone hollows at lower elevations in the woodland and upper ESSF.

Ah: Alpine Heath

This alpine classification is a mountain-heather – dominated ecosystem on snow-accumulating sites with stable substrates. Moderate snow accumulations are of intermediate depth between tundra and late snow ecosystems. Site conditions are typically mesic and drier. Mountain-heather species are always prominent, with white mountain-heather and pink mountain-heather most common. Yellow mountain-heather also occurs. Alpine heath ecosystems are most common in ESSFwcp and IMA but can also occur in ESSFwcw.

At: Alpine Tundra

This alpine ecosystem is relatively well-vegetated with mixed life-form composition, commonly with an abundance of dwarf shrubs and sedges mixed with forbs and grasses. These ecosystems occur on relatively exposed, cold, circum-mesic sites with moderate snow cover. Alpine tundra is common on drier, warm aspects in the cool, wet climates of the IMA and parkland in the south-central Columbia Mountains but may occur on neutral and cool aspects in some ESSF subzones.

Af: Alpine Fellfield

This ecosystem contains alpine rock features that can be further divided into subclasses based on substrate. The ecosystem subclasses are Rock (Af-r), Scree (Af-s), Felsenmeer (Af-n), and Fellfield (Af-f). Af-r occurs on exposed bedrock and Af-s occurs on mobile, rock substrate. Af-n occurs on boulder fields and Af-f occurs on substrates of mixed rock and exposed mineral soil where freeze-thaw conditions physically push plants out of the soil. Fellfields are commonly populated by cushion plants (tufted perennials), although rockier sites are usually dominated by mosses and lichens. Common herb species include moss campion, thread-leaved sandwort, and saxifrages.

ESSFwcp4

The ESSFwcp (parkland) subzone occurs above ESSFwcw and is subdivided based on geography. ESSFwcp2 and wcp3 reside in the North Columbia Mountains, whereas ESSFwcp4 is located in the

Central Columbia Mountains. Krummholz forests of subalpine fir, with lesser amounts of Engelmann spruce are common across ESSFwcp. On drier sites, whitebark pine is common. In ESSFwcp4, alpine larch is also common. In Krummholz forests, trees have stunted growth but commonly exceed 10 m in height, especially at lower elevations. Common ecosystems are alpine interspersed with Krummholz (Sk). Avalanches are common in steep terrain.

ESSFwh1/101: BlHw – Rhododendron – Foamflower

ESSFwh1/101 site series is the mesic or zonal conditions for this biogeoclimatic subzone/variant. It typically occurs on mid slopes of neutral to cool aspects with moderate-textured soils. This may also occur on lower slopes of warm aspects with extensive shading from adjacent mountains or with coarse soils. Soils are HFP or O.DYB with well to moderately well drained silt loam, fine sandy loam, or sandy loam textures, and moderate coarse fragment content. Humus are moderately thick, Soil Moisture Regime (SMR) is fresh (mesic) and Soil Nutrient Regime (SNR) is poor to rich.

The overstorey and understorey tree layers are typically Engelmann spruce, western hemlock and subalpine fir; western redcedar maybe present. Shrub cover is moderate to extensive with black huckleberry and white-flowered rhododendron dominant. Oak fern, foamflower, queen's cup, and five-leaved bramble are present in herbs. Mosses are varied and include pipecleaner, heron's-bill, and ragged-mosses.

ESSFwh1/103: BlFd – Huckleberry – Falsebox

ESSFwh1 site series 103 is a dry to very dry forest which typically has steep mid-upper slopes, sometimes at a crest, and warm aspect with coarse and/or shallow soils. They occasionally occur on neutral aspects in broad valleys with higher sun exposure and/or on sites with very coarse soils. Soils are usually derived from colluvium but may be glaciofluvial on valley side-walls and terraces. Dystric Brunisols are common. Soil texture is sandy loam with moderate to high coarse fragments. SMR is slightly dry to fresh (subxeric to submesic) and SNR is poor to medium.

Douglas-fir and western larch are often dominant or codominant with Engelmann spruce, subalpine fir and lodgepole pine. Subalpine fir is often abundant in the regeneration layer. Black huckleberry and falsebox are abundant in shrubs, but white-flowered rhododendron is often absent or present with sparse cover. Utah honeysuckle is common. Small amounts of prince's pine, white hawkweed, queen's cup, and one-sided wintergreen are usually present.

ESSFwh1/104: BlHw – Huckleberry – Pipecleaner moss

The 104 site series is a slightly dry to mesic forest that typically occurs on mid slopes of warm aspects with medium- to moderately coarse-textured soils. Due to compensating factors, it can also occur on upper, shedding sites on cool to neutral aspects or with coarse- to very coarse-textured soils. Soils are well-drained Dystric Brunisols or Humo-Ferric Podzols with loamy to sandy loam textures and moderate to high coarse fragment content. SMR is subxeric to submesic and SNR is poor to medium.

Vegetation is forested and typically contains western hemlock, Engelmann spruce, and subalpine fir. Western hemlock can range from dominant with high cover to sparse; western redcedar may be present in the overstorey or understorey, while Douglas-fir and western larch may occur at low densities. Shrub cover is typically moderate, while herb cover is varied but usually low. Typically includes black huckleberry, falsebox, and white-flowered rhododendron, with small amounts of queen's cup, one-sided wintergreen, foamflower, violets, and rattlesnake-plantain. Mosses vary, with pipecleaner moss and heron's-bill mosses most common.

ESSFwh1/110: Se – Devil's club – Lady fern

ESSFwh1/110 site series typically occur on lower slope, receiving sites with prolonged seasonal seepage (depth within 50-75 cm). Sites occasionally occur mid slope where restricting layers hold seepage closer to the surface, or on coarse-textured toe slopes, often associated with riparian areas. Soils are typically silt or sandy loam textures with moderate coarse fragment content. Humus forms are Mors or Moders.

Forests are moist to wet with high tree productivity and a gentle to moderate slope. SMR is moist to very moist (subhygric to hygric) and SNR is medium to rich.

Engelmann spruce and subalpine fir are the dominant tree species in the overstorey and understorey, although western hemlock and western redcedar can also be abundant. Devil's club, thimbleberry, and black gooseberry are common shrubs, and white-flowered rhododendron is typically sparse. Lady fern, oak fern, foamflower, and spiny wood fern are abundant, along with small amounts of mitreworts, clasping twistedstalk, false hellebore, and valerian. Leafy mosses and ragged-mosses are typical.

ESSFwh1/111: SeBl – Horsetail – Canby's lovage

111 are uncommon forests in the ESSFwh1. They occur on level sites and gentle, lower and toe slopes with a high water table within the top 30 cm of soil. Stands are often associated with riparian areas and frequently experience cold air. Soils are usually imperfectly to poorly drained Gleysols; organic veneers are common. These sites occur adjacent streams or lakes.

Subalpine fir and Engelmann spruce dominate the tree layer. Horsetails and arrow-leaved groundsel are typically present, along with Canby's lovage, globeflower, Sitka valerian, lady fern, mitreworts, and false hellebore. Shrub cover is variable, with black and oval-leaved huckleberries, minor amounts of white-flowered rhododendron, and occasionally black twinberry. Leafy mosses are common, along with bent-leaf moss and ragged-mosses. Peat-mosses may be present.

ESSFwc4/101: Bl – Rhododendron – Oak fern

101 is the mesic/zonal site series of ESSF wet cold 4. These forests are typically mid-slope with neutral to cool aspects and medium-textured soils, or on lower slopes with warm aspects and/or coarse-textured soils. Soils are typically derived from morainal materials and have sandy loam textures. Where finer parent materials predominate, loam and silt loam textures are most common. Most soils are Orthic Humo-Ferric Podzols or Dystric Brunisols, with Mor humus forms. SMR is fresh to moist (submesic to mesic) and SNR is poor to medium.

Engelmann spruce and subalpine fir are dominant tree species. Herb, shrub, and moss layers are typically moderate to lush, with common shrubs, including white-flowered rhododendron and black huckleberry, and sparse black gooseberry. Typical herbs are oak fern, foamflower, Sitka valerian, false hellebore, five-leaved bramble, and mountain arnica. Ragged-mosses are usually dominant, with varying amounts of leafy liverworts, heron's-bill mosses, pipecleaner moss, and leafy mosses.

ESSFwc4/102: BlPa – Huckleberry – Clad lichen

102 are dry forests that occur on warm-aspect sites with shallow soils and exposed bedrock or extensive blocky talus. Sites comprise a mixture of moss- and lichen-covered rocks, bare rock, and thin soil veneers. Soil textures vary considerably based on bedrock type. Where granodiorite is the dominant rock type, soils have sandy loam to loamy sand textures; where finer rock types predominate, soils have silt loam or loam textures. The occurrence of this site series is very dependent on soil depth, and often occurs as a mosaic with rock outcrops or talus. SMR is moderately to slightly dry (xeric to subxeric) and SNR is very poor to poor.

Trees are Engelmann spruce and subslpine fir, and occasionally whitebark pine. Herb cover is sparse and shrub and moss layers have moderate coverage. The shrub layer is dominated by black huckleberry, with lesser amounts of white-flowered rhododendron and small amounts of mountain-ash and/or Utah honeysuckle. Whitebark pine and lodgepole pine regeneration often occurs at low densities. Heron's-bill mosses, rock-mosses, and clad lichens are common.

ESSFwc4/103: Bl – Rhododendron – Huckleberry – Heron's-bill moss

103 is a dry to mesic forest that occurs on warm-aspect mid slopes with coarse- to moderately coarse-textured soils, upper slopes of neutral to cool aspects with coarse soils, and lower slopes with blocky or very coarse-textured soils. Soils are typically sandy loam textures and are derived from morainal or

colluvial materials. Coarse fragment content is usually moderate to high but can be fragmental, particularly on cool to neutral and/or lower slopes. Orthic Humo-Ferric Podzols and Dystric Brunisols with Mor humus forms are common. SMR is slightly dry to fresh (subxeric to submesic) and SNR is poor to medium.

Dominant trees are Engelmann spruce and subalpine fir. Shrub cover is typically high, with abundant white-flowered rhododendron, black huckleberry, and subalpine fir regeneration. Herb cover is often sparse, with low to moderate cover of foamflower, mountain arnica, one-sided wintergreen, five-leaved bramble, and/or wood-rushes. Leafy liverworts, along with heron's-bill, pipecleaner, and ragged-mosses dominate the moss layer.

ESSFwc4/110: BlSe – Lady fern – Oak fern

110 forests typically occur on lower, receiving slopes but occasionally occur on mid-slope receiving sites with seepage, and on coarse-textured toe slopes that receive abundant moisture. Seepage usually occurs within 75 cm of soil surface. Soils are Gleyed Humo-Ferric Podzols or Gleyed Dystric Brunisols with silt loam or sandy loam textures. Associated with riparian areas. SMR is moist (mesic to subhygric) and SNR is medium to rich.

Engelmann spruce and subalpine fir dominate the tree layers. Black huckleberry and white-flowered rhododendron are the dominant shrubs, with lesser amounts of black gooseberry. Indicator herbs include abundant oak fern, Sitka valerian, foamflower, and lady fern. Ragged-mosses and leafy mosses are the most common bryophytes.

ESSFwcw/101: Bl – Rhododendron – Valerian

101 is the mesic site series for the wet cold woodland variant. This occurs on medium to moderately coarse-textured soils on mid slopes of neutral and cool aspects. Due to compensating factors, this site series is also common on upper slopes with deep soils and lower, receiving slopes with coarse-textured soils.

Subalpine fir dominates the tree layers, along with minor amounts of Engelmann spruce. Black huckleberry is abundant, while white-flowered rhododendron is typically present. Mountain arnica and Sitka valerian are abundant and characteristic. Low to moderate cover of mitreworts, wood-rushes, false hellebore, and/or mountain hairgrass is also common. Ragged-mosses are usually present along with leafy liverworts and heron's-bill mosses.

ESSFwcw/102: BlPa – Huckleberry – Clad lichen

102 is a very dry forest that occurs on rocky sites with very shallow soils and abundant exposed talus and/or bedrock. Sites are often a complex of very shallow soils and bare, or moss covered, rock.

Subalpine fir is typically dominant and whitebark pine is widely distributed, usually as scattered stems. Understorey vegetation varies, but black huckleberry, white-flowered rhododendron, heron's-bill mosses, haircap mosses, clad lichens, and rock-mosses are usually present. Herbs are very sparse or restricted to small patches of deeper soils among the rocks, and include wood-rushes, mountain-heathers, and very minor amounts of other species.

ESSFwcw/103: Bl – Rhododendron – Wood-rush

103 occupies mid to upper, steep, warm slopes with shallow, coarse-textured soils. It also occurs on shallow crests and dry, shedding sites on neutral aspects. Soils are usually well to rapidly drained, with moderate to very high coarse fragment content. They are typically derived from colluvial materials on steep slopes but may be from morainal or glaciofluvial materials, particularly on crests.

Subalpine fir is the most dominant tree species, although Engelmann spruce is often present with low cover. White-flowered rhododendron and black huckleberry are widespread. Understorey forbs are typically sparse; wood-rushes are usually present, often with very small amounts of arnicas, mountain-

heathers, and, in the northern half of ESSFwcw, partridge-foot. Leafy liverworts and heron's-bill mosses dominate the moss layer.

ESSFwcw/104: Bl – Mountain-heather

104 is a slightly dry to mesic forest that typically occurs on submesic sites, including those on shedding, cool to neutral sites with deep, coarse soils, and on gentle to moderate mid slopes of warm aspects. Soils are usually deep, well to rapidly drained, with moderately high coarse fragment content and Mor humus forms. Orthic Humo-Ferric Podzols with sandy loam to silt loam textures are typical, depending on the parent materials.

Dominant tree is subalpine fir with lesser amounts of Engelmann spruce. Black huckleberry is usually abundant in the shrub layer, while white-flowered rhododendron cover is sparse to low. In the herb layer, white mountain-heather is abundant and wood-rushes are typically present in small to moderate amounts. Moss cover is usually high and is dominated by leafy liverworts and heron's-bill mosses.

ICHmw2/Fm04: Middle Bench Flood Class: Cottonwood – Redcedar – Dogwood – Lady fern

Middle bench ecosystems occur along lakes, streams and rivers, on sites that are briefly flooded (10-25 days) during freshet, which allows tree growth, but causes forests to be dominated by flood-tolerant broadleaf species, usually black cottonwood and sometimes trembling aspen. Vegetation is highly variable due to the dynamic nature of flooding on these sites. Soils have some horizon development, usually with buried layers resulting from repeated flooding. Nutrient availability is usually very high due to continuous inputs of oxygenated water through subirrigation.

Fm04 occurs in the wet "rainforest" climates of southeast C in the moist ICH. They occur on sandy or gravelly flats adjacent streams and rivers with relatively prolonged flood durations. Black cottonwood forms an open canopy with scattered hybrid white spruce, western redcedar, and paper birch. Devil's club is usually present and can be abundant. Other common shrubs include thimbleberry, black twinberry, and red-osier dogwood. Lady fern dominates the lush understorey herb communities, generally with oak fern, clasping twisted stalk, false Solomon's-seal, wild sarsaparilla, sweet-cicely, horsetails, sweet-scented bedstraw, foamflower, and bluejoint reedgrass.

ICHmw2/101: HwCw – Falsebox - Feathermoss

The 101 is the mesic/zonal site series of the moist warm 2 subzone/variant of the Interior Cedar Hemlock zone. 101 is typically mid slope of neutral to cool aspects with moderate-textured soils. Due to compensating factors, this can also occur on gentle, warm slopes with moderate- to fine-textured soils, and on lower slopes with coarse-textured soils. Soils textures are loamy to (fine) sandy loam with low to moderate coarse fragments. Humo-Ferric Podzols and Dystric Brunisols derived from morainal blankets are common, although stands occasionally occur on colluvium or glaciofluvial materials. SMR is slightly dry to fresh (submesic to mesic) and SNR is poor to rich.

Western hemlock and western redcedar stands are often dense and frequently have a component of Douglas-fir, western larch, and/or western white pine, especially in earlier seral stages. Black huckleberry, falsebox, and western yew are typical shrubs, while minor amounts of queen's cup, foamflower, twinflower, and bunchberry occupy the herb layer. Understoreys are often sparse, particularly where western hemlock creates abundant shade. Common mosses are red-stemmed feathermoss, pipecleaner moss, and step moss.

ICHmw2/102: Fd(Pl) – Falsebox – Pinegrass

102 is the driest site series of ICHmw2. This is a forested site with extensive exposed bedrock and occasionally blocky talus. Soils vary in depth, with deeper pockets of soil interspersed among very thin veneers and exposed rock. Humus forms are dry and thin, if present. Stands often occur in larger complexes with open, non-forested rock outcrops or talus areas, less than 10% tree cover, and near 103 site series where soil is deeper and coarse-textured. SMR is moderately dry (xeric to subxeric) and SNR is very poor to medium.

Douglas-fir forms the open canopy, often with lodgepole pine, especially in earlier seral stands. Shrub layer is variable and contains falsebox, birch-leaved spirea, saskatoon, snowberry, and regenerative Douglas-fir. Western redcedar and western hemlock may be present in minor amounts. Pinegrass rock ferns (parsley fern, fragile fern, cliff ferns), and wild strawberry are common, along with minor amounts of various rock outcrop species such as stonecrops and saxifrages. Rock-mosses, pelt lichens, heron's-bill mosses, and clad lichens are typical in the extensive moss and lichen layer.

ICHmw2/103: Fd – Douglas maple – Falsebox

103 forests occur on steep, warm, coarse, and/or shallow slopes and dry crests. Soils are typically well- to rapidly drained Eutric or Dystric Brunisols with moderate to high coarse fragment content and thin humus forms. Colluvial blankets and veneers are common surficial materials. SMR is moderately dry (xeric to subxeric) and SNR is poor to medium.

The open canopy consists of Douglas-fir, usually with some minor western larch, western white pine, or western redcedar. Trembling aspen and paper birch may be present in earlier seral stands. Shrubby understoreys of falsebox, Douglas maple, birch-leaved spirea, saskatoon, Oregon-grape, and baldhip rose are typical. Herb cover varies, with pinegrass varying from dominant to absent. Low cover of prince's pine, white hawkweed, and strawberry may occur.

ICHmw2/104: FdCw – Falsebox – Prince's pine

104 forests occur on moderately steep, warm-aspect slopes with deep, well-drained soils. Due to compensating factors, they can occur on upper, shedding sites on cool to neutral aspects with higher coarse fragments and/or coarser soils. Orthic Dystric Brunisols and weakly developed Orthic Humo-Ferric Podzols are common with Mor or Moder humus forms. SMR is moderately to slightly dry (subxeric to submesic) and SNR is poor to medium.

Tree cover is variable and diverse with Douglas-fir, western redcedar, western hemlock, and western larch common. Paper birch is often present in seral stands. Black huckleberry and falsebox characterize the shrub layer, although varying amounts of soopolallie and small amounts of birch-leaved spirea or baldhip rose are common. Dense hemlock and/or western redcedar regeneration may occur. Understorey herb cover is often sparse, although prince's pine and twinflower can have moderate to high cover; queen's cup, bracken fern, and western tea-berry may occur. The moss layer is highly variable, with red-stemmed feathermoss, pipecleaner moss, and step moss most abundant.

ICHmw2/110: CwHw – Oak fern

110 forests occur on receiving sites with moisture at depth. Typically found on lower slopes but also occur on middle slopes and water-restricting layers that maintain seepage at depth. Stands are usually associated with riparian areas. Soils are Gleysols or Gleyed Brunisols derived from morainal or fluvial materials. Soil texture can be variable, with coarser sandy loam and loamy sand on lower and toe slope positions and finer silt loam and loam soils on gentle, moisture-retaining mid-slope sites. Mottling is typically present at depth (upper 70-100 cm of soil). SMR is fresh to moist (mesic to subhygric) and SNR is medium to rich.

Western redcedar, western hemlock canopies are common, with moderate to abundant oak fern, foamflower, queen's cup, and five-leaved bramble in the understorey. Minor amounts of devil's club and oval-leaved blueberry typically occur. Leafy mosses, red-stemmed feathermoss, and pipecleaner moss are usually present.

ICHmw2/111: Devil's club – Lady fern

111 forests occur on receiving sites on lower and toe slopes with poor to imperfect drainage. Mottles are usually prominent, and seepage is typically present within the top 30-50 cm of the soil profile. Soils tend towards Gleysols, gleyed Brunisols, or, where flooding is common, Gleyed Cumulic Humic Regosols with multiple buried horizons. Typically associated with riparian areas. SMR is moist to very moist (subhygric to hygric) and SNR is medium to very rich.

Old-growth stands of high productivity commonly have western redcedar and western hemlock. Devil's club and/or lady fern and spiny wood fern are typical in the understorey. Minor amounts of hybrid white spruce or subalpine fir may be present. Other common species include abundant oak fern, queen's cup, and foamflower. Leafy mosses are common and often occur with ragged-mosses.

Terrestrial Ecosystem Legend and Map

Each TEM code by map polygon number is listed below in Table 15 and displayed in Map 18.

Table 15: TEM Codes and associated Terrestrial Ecosystem Polygon Number

TEM Code	Polygon Number
ESSF wc 4 / 101 k 6C	27, 30, 31, 32, 73
ESSF wc 4 / 101 w 6C	23, 29, 72, 78
ESSF wc 4 / 102 w 2C	18, 28
ESSF wc 4 / 102 w 6C	75
ESSF wc 4 / 102 wr 6C	20
ESSF wc 4 / 103 k 6C	17, 21, 69, 71
ESSF wc 4 / 103 w 3C	74
ESSF wc 4 / 103 w 5C	15
ESSF wc 4 / 103 w 6C	16, 19, 22, 66, 67, 68, 70
ESSF wc 4 / 103 wr 5C	11
ESSF wc 4 / 103/101 k 6C	14
ESSF wc 4 / 104 w 6C	26
ESSF wc 4 / 110 k 6C	24, 25
ESSF wc 4 / 5102 k 6C 5103 k 6C	2
ESSF wc 4 / 5103 w 2C 5RP	3
ESSF wc 4 / 5At w 3 5Sk w 5C	77
ESSF wc 4 / 7Sk k 6C 3103 k 6C	76
ESSF wc 4 / 8103 w 5C 2RP	63
ESSF wc 4 / 8At w 3 2Sk w 6C	64
ESSF wc 4 / 8Sc w 3 2Sk w 3C	4
ESSF wc 4 / Ah w 2	33
ESSF wc 4 / Rt w 1	61, 62, 103, 104
ESSF wc 4 / Vs k 3	12
ESSF wc 4 / Vs w 3	13, 65
ESSF wcp 4 / 5Sk w 2C 5Ro w	34
ESSF wcp 4 / 8Rt k 1 2GL	1
ESSF wcp 4 / 9Ro wrz 1 1Sc wrz 2	35
ESSF wcp 4 / Ah w 2	105
ESSF wcp 4 / Rt w 1	79
ESSF wcw / 101/104 k 6C	39
ESSF wcw / 102 k 6C	85
ESSF wcw / 102 w 5C	248
ESSF wcw / 102 w 6C	83

TEM Code	Polygon Number
ESSF wcw / 102/103 w 6C	93
ESSF wcw / 103 kr 6C	81
ESSF wcw / 103 w 5C	247
ESSF wcw / 103 w 6C	38, 86
ESSF wcw / 103 wr 6C	90
ESSF wcw / 104 k 6C	245
ESSF wcw / 104 w 2C	87
ESSF wcw / 104 w 6C	91
ESSF wcw / 104/101 k 6C	36
ESSF wcw / 5Ah k 3 5Sk k 6C	244
ESSF wcw / 5At w 3 5Af-r w 1	88
ESSF wcw / 5Sc k 3 5104/101 k 5C	7
ESSF wcw / 5Sc k 3 5Rt k 1	5
ESSF wcw / 6Sk k 6C 3Sc k 3 1RP	243
ESSF wcw / 8Af w 1 2Rt w 1	8
ESSF wcw / 8Af w 1 2Sk w 6C	92
ESSF wcw / 8Af-r w 1 2Sk w 1C	246
ESSF wcw / 8Af-s w 1 2Sk w 6C	82
ESSF wcw / Af-r w 1	80
ESSF wcw / Ro z 1	84
ESSF wcw / Rt w 1	6, 37, 89, 107
ESSF wcw / Rt wr 1	106
ESSF wh 1 / 101 k 6C	57
ESSF wh 1 / 101 w 3	9
ESSF wh 1 / 101 w 6C	52, 54, 56, 59, 98, 99, 100, 101, 182, 206, 249, 250, 253
ESSF wh 1 / 101 w 7C	10, 102
ESSF wh 1 / 101/104 k 6C	49
ESSF wh 1 / 101/110 w 4C	94
ESSF wh 1 / 103 k 6C	43, 50
ESSF wh 1 / 103 w 5C	41
ESSF wh 1 / 104 k 6C	44, 45, 46, 47
ESSF wh 1 / 104 k 6M	96
ESSF wh 1 / 104 w 5M	95
ESSF wh 1 / 104 w 6C	48, 51, 55, 97
ESSF wh 1 / 104/101 w 6C	58
ESSF wh 1 / 110 w 6C	42
ESSF wh 1 / 111 k 6C	60
ESSF wh 1 / 8101 w 6C 2LA	252
ESSF wh 1 / 9101 k 6C 1RP	53
ESSF wh 1 / 9101 w 5C 1RP	40

TEM Code	Polygon Number
ICH mw 2 / 101 k 3C	175
ICH mw 2 / 101 k 5C	126, 195
ICH mw 2 / 101 k 6B	128, 149, 227
ICH mw 2 / 101 k 6C	113, 114, 115, 118, 119, 137, 141, 155, 156, 159, 177, 178, 203, 241
ICH mw 2 / 101 k 6M	136, 164, 219
ICH mw 2 / 101 w 5M	190
ICH mw 2 / 101 w 6B	142, 198
ICH mw 2 / 101 w 6C	183, 207
ICH mw 2 / 101 w 6M	157
ICH mw 2 / 101/104 j 6M	200
ICH mw 2 / 101/104 k 2C	201
ICH mw 2 / 101/104 k 6M	147, 222
ICH mw 2 / 101/104 w 3B	111
ICH mw 2 / 103 w 3C	125, 214
ICH mw 2 / 103 wr 3B	237
ICH mw 2 / 103/104 w 5M	194, 238
ICH mw 2 / 103/104 w 6M	131
ICH mw 2 / 104 j 6C	240
ICH mw 2 / 104 k 2C	152
ICH mw 2 / 104 k 6B	143, 145
ICH mw 2 / 104 k 6C	151, 154, 180, 225, 229, 231, 233, 234
ICH mw 2 / 104 k 6M	138, 144, 148, 161, 162, 181
ICH mw 2 / 104 w 2C	213
ICH mw 2 / 104 w 3B	192
ICH mw 2 / 104 w 5B	191, 193, 236
ICH mw 2 / 104 w 6B	134, 135, 146, 150, 165, 221
ICH mw 2 / 104 w 6C	132, 169, 173, 176, 199, 204
ICH mw 2 / 104 w 6M	129, 130, 133, 153, 160, 197, 215, 218, 224, 228
ICH mw 2 / 104 w 7C	167
ICH mw 2 / 104 w C	217
ICH mw 2 / 104/101 w 6B	166
ICH mw 2 / 104/101 w 6C	116, 179
ICH mw 2 / 104/101 w 6M	220
ICH mw 2 / 104/101 w 7C	210
ICH mw 2 / 104/103 w 6C	189
ICH mw 2 / 110 j 6C	185
ICH mw 2 / 110 j 7C	186, 187
ICH mw 2 / 110/111 j 7C	188
ICH mw 2 / 3Sc w 3 3Sk w 3C 3Vs w 3	117
ICH mw 2 / 5101 w 6C 5104 w 6C	158

TEM Code	Polygon Number
ICH mw 2 / 5101/104 w 3 5Vs w 3C	140
ICH mw 2 / 5104 w 3C 5Vs w 3	108
ICH mw 2 / 5FM04 j 6M 4Ww 1RP	223
ICH mw 2 / 5MI 5104 w 6M	232
ICH mw 2 / 5RI 5FM04 j 6B	209
ICH mw 2 / 5RI 5FM04 j 6M	208
ICH mw 2 / 5Rt k 1 5104 k 6C	139
ICH mw 2 / 5Vt w 1 5Vs w 3	124
ICH mw 2 / 6103/104 w 6C 4Rt w 1	196
ICH mw 2 / 8104 w 6B 2Rt w 1	239
ICH mw 2 / 8104 w 6C 2RP	242
ICH mw 2 / 8111 j 6C 2RP	226
ICH mw 2 / 9101 w 6C 1RP	205
ICH mw 2 / 9104 j 6C 1RP	174
ICH mw 2 / 9104 w 6C 1RP	163, 168, 170, 171
ICH mw 2 / 9104 w 6M 1RP	216
ICH mw 2 / 9104/101 w 6C 1RP	172
ICH mw 2 / FM j 6B	235
ICH mw 2 / FM j 6M	184
ICH mw 2 / RP j	230
ICH mw 2 / Sk w 3C	202
ICH mw 2 / Vs j 3	251
ICH mw 2 / Vs k 3	109, 110, 112, 120, 121, 123
ICH mw 2 / Vs w 3	122, 127
IMA un / 7Rt w 1 3Ro w	211
IMA un / Ro k 1	212

Map 18: Terrestrial Ecosystems Map

3.4.1.4 Rare and endangered Plant Species and Ecological Communities

In BC, there are two governing bodies involved with the ranking of species and/or ecological communities at risk. At the national level, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) provides advice in regard to the *Species at Risk Act* (SARA), and at the provincial level, the Conservation Data Centre (CDC) manages the BC Status List.

The Canadian government created SARA in 2002 to complement the Accord for the Protection of Species at Risk (a national effort to identify and protect threatened and endangered wildlife and their associated habitats across the country). COSEWIC is the scientific body responsible for assigning the status of species at risk under SARA. This system uses the following terminology:

- Extinct (XX)
- Extirpated (XT)
- Endangered (E)
- Threatened (T)
- Special concern (SC)
- Not at risk (NAR)
- Data deficient (DD)

A species that is listed as Endangered, Extirpated or Threatened is included on the legal list under Schedule 1 of the *Act* and is legally protected under the *Act* with federal measures to protect and recover these species in effect.

The BC CDC designates provincial red or blue list status to animal and plant species, and ecological communities of concerns (B.C. Ministry of Environment, 2021). The red list includes indigenous species or subspecies considered to be endangered or threatened. Endangered species are facing imminent extirpation / extinction, whereas threatened groups or species are likely to become endangered if limiting factors are not reversed. The blue list includes taxa considered to be vulnerable because of characteristics that make them particularly sensitive to human activities or natural events. Although blue listed species are at risk, they are not considered endangered or threatened. Yellow listed species and all others not included on the red or blue lists and may include species which are declining, increasing, common, or uncommon. Table 16, Table 17, and Table 19 below include the CDC listed (i.e., rare and threatened) species and ecological communities that have the potential to occur on the subject site; species designated as SARA Schedule 1 are also noted. Species with the potential to occur in the study area are based on broad habitat preferences delineated by forest district and biogeoclimatic zone and refined by habitat type available in the subject site. Forest and anthropogenic terrain were selected as habitat types to identify potential listed species for the purposes of this report.

Potential occurrences are then designated as unlikely or possible based upon species specific habitat requirements and an on-site assessment of those habitats. Note that a field evaluation of the study area for each species was not possible due to access limitations, seasonal migration patterns, and the transient nature of some species.

3.4.1.4.1 Rare and Endangered Plant Species

The CDC iMap BC (BC Government, 2021f) lists one rare and endangered plant species occurring on the proposed Zincton CRA, the lance-leaved figwort (*Scrophularia lanceolata*) is provincially blue-listed and is not listed under SARA. The sighting was recorded in 1975 and no repeat sightings exist. A list of nineteen potentially occurring plant species at risk in the area of the subject site is provided below in Table 16. Based on species' range and habitat requirements, two other at-risk plant species were identified: piper's anemone (*Anemone piperi*) and whitebark pine (*Pinus albicaulis*). Whitebark pine is confirmed and its locations within the proposed CRA are known. The presence or absence of piper's anemone is unconfirmed.

Table 16: Plant Species at Risk Potentially Occurring within Project Area

Common Name *Scientific name*	**Status**		**Habitat Requirements**	**Potential Occurrence**
	BC List	**SARA Status**		
Piper's anemone *Anemone piperi*	Red	-	Habitat includes mesic to moist/wet coniferous forest and forest.	**Possible** – Occurs in ESSFwc subzone. Known occurrence nearby at Mount Buchanan.
Haller's apple moss *Bartramia halleriana*	Red	Threatened	Moss that avoids calcareous habitats. Occurs on salicaceous (acidic) rock types. Habitat is shaded, often north facing on damp cliffs or talus slopes. Found in Central east BC.	**Unlikely** – Does not occur within BGC subzones on site.
Michigan moonwort *Botrychium michiganense*	Blue	-	Unknown habitat requirements. Few scattered occurrences through BC.	**Unlikely** – Does not occur in BGC subzones on subject site.
Mountain moonwort *Botrychium montanum*	Blue	-	Habitat includes mesic coniferous forest, meadows and moist coniferous forests, low elevations to subalpine. Scattered occurrences throughout BC.	**Unlikely** – Closest known occurrence at Mabel Lake.*
Two-spiked moonwort *Botrychium paradoxum*	Blue	-	Habitat includes grassland, shrub, meadow. Montane to subalpine grasslands or forb-dominated meadows. Also CW forests.	**Unlikely** – Not found within BGC zones on site.
Peduncled sedge *Carex pedunculata*	Blue	-	Deciduous and mixed forests. Found only at southern BC border near Castlegar.	**Unlikely** – No known occurrences near site.
Heart-leaved springbeauty *Claytonia cordifolia*	Blue	-	Occurs in moist/wet conifer forest, deciduous forest, splash zone, riparian habitat, rock, sparsely vegetated rock, cliff or talus habitat. Occurs in ICHmw. No ICHmw on site.	**Unlikely** – Closest occurrence east of Kootenay Lake.*
Banded cord-moss *Entosthodon fascicularis*	Blue	Special Concern	Grassland/shrub, Garry oak maritime meadow habitat. On periodically humid or damp earth of terraces up to 700 m elevation. Occurs mostly on Vancouver Island and lower mainland, BC.	**Unlikely** – Closest known occurrence at Canada southern bounder south of Cranbrook.
Wild licorice *Glycyrrhiza lepidota*	Blue	-	Grassland, shrub/grassland, riparian forest and riparian herbaceous. Nine known occurrences in BC with two along Kootenay Lake.	**Unlikely** – Does not occur in any BGC subzones on project site.

Common Name *Scientific name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Whitebark pine *Pinus albicaulis*	Blue	Endangered	Montane forests and on thin, rocky, cold soils at or near timberline at an elevation of 1300-3700 m in the sub-alpine to alpine zones. Often found on soils lacking fine material. Suitable habitat on site. Listed occurrence within CRA.	**Confirmed** – Listed occurrences within the CRA by BC VRI and Environment Canada (2015).
Limber pine *Pinus flexilis*	Blue	-	Limber pine dominates on dry rocky sites at many elevations (1500-3600m) within its range. It can occur scattered throughout forested regions on more mesic sites, especially in low density, open areas. Often found at timberline within mesic to dry slopes in the subalpine zone.	**Unlikely** – Occurs along BC Alberta border, no known occurrences near site. Does not occur within BGC subzones on site.
California Jacob's ladder *Polemonium californicum*	Red	-	Open to shaded areas in woodlands 1600-3100 m. Alpine valleys and flats in granitic soils, boreal zones. Olympic Mountains, Washington, and Cascade Ranges, southern British Columbia.	**Unlikely** – Site is not within Cascade mountains.
Diverse-leaved cinquefoil *Potentilla glaucophylla var. perdissecta*	Blue	-	Alpine/tundra, tundra. Occurs in IMA. Widespread throughout BC.	**Unlikely** – No known occurrences within Columbia Mountains.
Leafless wintergreen *Pyrola aphylla*	Blue	-	BGC units unknown. Habitat requirements unknown.	**Unlikely** – Closest occurrence in BC is Manning Park.
Margined streamside moss *Scouleria marginata*	Red	Endangered	From lowlands to 700 m elevation. In or beside streams, attached to rocks and floating or exposed in low water.	**Unlikely** - Only known occurrence in BC south of Creston.
Lance-leaved figwort *Scrophularia lanceolata*	Blue	-	Moist to mesic roadsides, clearings, thickets and forest edges in the lowland and montane zones; rare on Vancouver Island	**Likely** – Recorded occurrence off of New Denver/Kaslo Road on site (CDC iMap).
Idaho blue-eyed grass *Sisyrinchium idahoense var. occidentale*	Red	-	Unknown habitat requirements. Unknown BGC zones.	**Unlikely** – Found in BC only at Osoyoos.

Common Name *Scientific name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Purple meadowrue *Thalictrum dasycarpum*	Blue	-	Wet meadows, streambanks and woodlands in the montane zone. Grassland, meadow, riparian herbaceous, riparian forest and riparian shrub habitat. Few known occurrences in BC. Occurs in ICH and ESSF subzones with dry soils.	**Unlikely** – Does not occur within any BGC subzones on site.
Ochroleucous bladderwort *Utricularia ochroleuca*	Blue	-	Insectivorous, perennial aquatic herb with both floating and immersed stems and leaves. Lakes, ponds, open water, wetland, fen, marsh. Oligotrophic and dystrophic lakes in montane zone. Occurs in ICHmw, widespread in BC.	**Unlikely** – Closest known occurrence in Armstrong, BC. *

Source: (B.C. Ministry of Environment, 2021). (* data from Klinkenberg, Brian, 2020)

3.4.1.4.1.1 Whitebark Pine

Whitebark pine is an evergreen coniferous tree of western North America. It is listed in British Columbia as blue (special concern), but is nationally listed as SARA Schedule 1 endangered. It is found in southern BC, typically east of the Coast-Cascade Mountains and is rare in north and central BC. Whitebark pine is typically found on thin, rocky, cold, mesic to dry soils at or near timberline at elevations of 1300-3700 m in the subalpine to alpine zones and is considered a keystone species. It is found in many biogeoclimatic zones in BC, in relation to the project site it is found in ICHmw, ESSFwc, ESSFwcw, ESSFwcp, and IMAun. The closest documented whitebark pine is on the east side of Kootenay Lake. Other occurrences are documented throughout the Columbia Mountains and suitable habitat is found on site (Klinkenberg, Brian, 2020; B.C. Ministry of Environment, 2021).

3.4.1.4.1.2 Lance-leaved figwort

The lance-leaved figwort is a perennial herb in southern BC. Its habitat is moist to mesic roadsides, clearings, tickets and forest edges in the lowland and montane zones. Known to occur in coniferous forests, grasslands, and meadows. There are only three to five known populations in BC. The CDC iMap lists one known occurrence of this species within the project area along the New Denver/Kaslo Road adjacent to the proposed CRA. However, this observation was from 1975 (BC Government, 2021f). Known habitat of the lance-leaved figwort is within the ICHmw subzone, which occurs at the lowest elevations of the CRA.

3.4.1.4.1.3 Piper's anemone

Piper's anemone is a perennial herb occurs exclusively in the ESSFwc subzone. This species has a concentrated population south of the Canada border with few known occurrences in southern BC. Habitat is moist forest in the montane zone. The closest known occurrence is near Kaslo on Mount Buchanan. However, this observation was from 1972 (Klinkenberg, Brian, 2020). This species has the potential to occur in the mid to high elevations on site.

Map 19: Rare and Endangered Plant Species

3.4.1.4.2 Rare and Endangered Ecological Communities

The term "ecological" is a direct reference to the integration of biological components with non-biological features such as soil, landforms, climate and disturbance factors. The term "community" reflects the interactions of living organisms (plants, animals, fungi, bacteria, etc.), and the relationships that exists between the living and non-living components of the community. Currently, the most common ecological communities that are known in BC are based on the Vegetation Classification component of the Ministry of Forests and Range Biogeoclimatic Ecosystem Classification, which focuses on the terrestrial plant associations of BC's native plants.

Three ecological communities of concern were found to occur within the study area (B.C. Ministry of Environment, 2021) as listed below in Table 17. However, after map analysis of terrestrial ecosystems, only one community occurs within the proposed CRA.

Western redcedar – western hemlock / common horsetail is the old classification for ICHmw2/07 which is most similar to the newly classified ICHmw2/111 and ICHmw2/112 site series. ICHmw2/111 covers an area of 21 ha within the project area. They are wet forest communities with rich and moist to very moist soil. They occur on receiving sites at lower/toe slopes with seepage and imperfect soil drainage. May contain old growth stands of highly productive western redcedar and western hemlock.

Subalpine fir / black huckleberry / bear-grass occurs at high elevations on steep, south-facing slopes where dry conditions prevail during the growing season as a result of summer moisture deficits. Terrestrial Ecosystem Mapping of the study area has revealed the potential for this ecological community but has not been confirmed by an on-site inventory. Predominantly, ESSFwc4/00 is associated with avalanche chutes and runout zones where bear-grass and huckleberries are abundant. It is possible the Vs (shrub dominated avalanche chutes) polygons, that cross the ESSFwc4 zone on south facing slopes, may contain the ecological community ESSFwc4/00. However, field investigations will be required for verification.

Sitka willow – Pacific willow / skunk cabbage is a swamp wetland that has not been identified in the project area.

Table 17: Ecological Communities at Risk Occurring on the Subject Site

Site Series Name **Common Name *Scientific name***	**Status** **BC List**	**BCG Zone**	**Structural stage**	**Size of polygon (ha)**
Subalpine fir / black huckleberry / bear-grass *Abies lasiocarpa / Vaccinium membranaceum / Xerophyllum tenax*	Blue	ESSFwc4/00 (Warm aspect)	Unknown	Unknown
Sitka willow – Pacific willow / skunk cabbage *Salix sitchensis – Salix lasiandra* var. *Lasiandra / Lysichiton americanus*	Red	ICH/Ws51	-	-

Site Series Name Common Name *Scientific name*	Status BC List	BCG Zone	Structural stage	Size of polygon (ha)
Western redcedar – western hemlock / common horsetail *Thuja plicata – Tsuga heterophylla / Equisetum arvense*	Blue	ICHmw2/07 (ICHmw2/111)	6, 7	21

3.4.2 Wildlife

This section discusses a range of species that commonly occur in the vicinity of the proposed Zincton CRA. In addition, wildlife habitat for five species potentially occurring in the area and of regional importance, are described herein. Detailed descriptions of the habitat use and baseline conditions are provided for: western toad, southern mountain caribou, mountain goat, grizzly bear and wolverine.

3.4.2.1 Mammals

Mammal species with the potential to occur in the proposed Zincton CRA can be present based on the three biogeoclimatic zones present.

ESSF Zone

Ungulates such as moose (*Alces alces*), mountain goat (*Oreamnos americanus*), caribou (*Rangifer tarandus*), and mule deer (*Odocoileus hemionus*) are distributed throughout the region; while Rocky Mountain elk (*Cervus canadensis nelsoni*), bighorn sheep (*Ovis canadensis*), white-tailed deer (*Odocoileus virginianus*), and stone sheep (*Ovis dalli stonei*) are more restricted in distribution. Typically, the ESSF is one of the most productive zones for grizzly bear (*Ursus arctos*). Conifer forests make up the most common habitat in the ESSF and are important for furbearers such as marten (*Martes americana*), fisher (*Pekania pennanti*), red squirrel (*Tamiasciurus hudsonicus*), black bear (*Ursus americanus*) and wolverine (*Gulo gulo*). Commonly observed small mammals include the hoary marmot (*Marmota caligata*), Columbian ground squirrel (*Urocitellus columbianus*), and porcupine (*Erethizon dorsatum*) (Coupe et al., n.d.)

ICH Zone

Grizzly bear and black bear are the most common large mammals, while large ungulates such as mule deer, white-tailed deer, and Rocky Mountain elk occur in the drier subzones in the southern portion of the province. Typically, bears and ungulates only use this zone during the summer and fall and migrate to the adjacent Interior Douglas-fir zone for the winter. Caribou, while rare, can occur throughout much of the ICH in the late summer and early fall before they move up in winter to ESSF forests with a deeper, denser snowpack. Moose are scattered throughout this zone in the winter (Ketcheson et al., n.d.)

IMA Zone

In summer, a variety of wildlife will use the alpine for forage, for breeding, and to escape predators and pests. Roosevelt elk and black-tailed deer will forage in meadows and rich tundra habitats in the lower alpine elevations. During the growing season mammals such as grizzly bear, gray wolf (*Canis lupus*), wolverine and hoary marmot may also use the alpine zone. Ungulates such as caribou, white-tailed deer, mountain goat, stone sheep and bighorn sheep may also utilize the alpine zone. In summer and fall seasons, elk, mule deer, and grizzly bear forage in the forb meadows (BC Ministry of Forests and Range, 2006).

3.4.2.2 Reptiles and Amphibians

Reptile and amphibian species with the potential to occur in the proposed Zincton CRA are identified based on known presence in two biogeoclimatic zones. No reptiles or amphibians are known to occur in the IMA zone.

ESSF Zone

Few reptiles occur in this zone and the only amphibians with the potential to be found are the western toad (*Anaxyrus boreas*), Oregon spotted frog (*Rana pretiosa),* Cascades frog (*Rana cascadae*), and long-toed salamander (*Ambystoma macrodactylum*) (Coupe et al., n.d.).

ICH Zone

Most of the amphibian and reptile species occur in the warmer valley bottoms, commonly adjacent to riparian areas, but they often spend long periods in damp forest litter or moist forest clearings. The long-toed salamander, western toad, pacific treefrog (*Pseudacris regilla*), and Oregon spotted frog may occur in the Columbia Mountains and adjacent highlands. Reptile distribution is even more restricted in this zone. Only the common garter snake (*Thamnophis sirtalis*) is widely distributed, in riparian areas and damp forest litter in the major valleys. The western terrestrial garter snake (*Thamnophis elegans*) is found only in wetlands and riparian areas in the southern portion of the Columbia Mountains. The western skink (*Plestiodon skiltonianus*), northern alligator lizard (*Elgaria coerulea*) and rubber boa (*Charina botta*e), are found along the valley bottoms in the southernmost portion of the ICH (Ketcheson et al., n.d.).

3.4.2.3 Birds

Bird species potentially occurring in each the BEC zone present in the proposed Zincton CRA area are presented in Table 18 (BC Ministry of Forests and Range, 2006; Coupe et al., n.d.; Ketcheson et al., n.d.).

Table 18: Bird species potentially occurring in the Zincton OEI area.

BEC Zone	Common Name	*Scientific Name*
ESSF	American Dipper	*Cinclus mexicanus*
ESSF	American Robin	*Turdus migratorius*
ESSF	Cassin's Finch	*Haemorhous cassinii*
ESSF	Clark's Nutcracker	*Nucifraga columbiana*
ESSF	Dark-eyed Junco	*Junco hyemalis*
ESSF	Fox Sparrow	*Passerella iliaca*
ESSF	Golden-crowned Sparrow	*Zonotrichia atricapilla*
ESSF	Hammond's Flycatcher	*Empidonax hammondii*
ESSF	Harlequin Duck	*Histrionicus histrionicus*
ESSF	Mountain Chickadee	*Poecile gambeli*
ESSF	Northern Goshawk	*Accipiter gentilis*

BEC Zone	Common Name	*Scientific Name*
ESSF	Northern Pygmy-Owl	*Glaucidium californicum*
ESSF	Orange-crowned Warbler	*Vermivora celata*
ESSF/ICH	Red-breasted Nuthatch	*Sitta canadensis*
ESSF	Rufous Hummingbird	*Selasphorus rufus*
ESSF	Spruce Grouse	*Falcipennis canadensis*
ESSF	Three-toed Woodpecker	*Picoides dorsalis*
ESSF	Western Tanager	*Piranga ludoviciana*
ESSF/ICH	White-winged Crossbill	*Loxia leucoptera*
ESSF	Wilson's Warbler	*Cardellina pusilla*
ESSF/ICH	Black-backed Woodpecker	*Picoides arcticus*
ESSF/ICH	Bohemian Waxwing	*Bombycilla garrulus*
ESSF/ICH	Golden-crowned Kinglet	*Regulus satrapa*
ESSF/ICH	Pine Grosbeak	*Pinicola enucleator*
ESSF/ICH	Pine Siskin	*Spinus pinus*
ESSF/ICH	Red Crossbill	*Loxia curvirostra*
ESSF/ICH	Steller's Jay	*Cyanocitta stelleri*
ESSF/ICH	Varied Thrush	*Ixoreus naevius*
ESSF/ICH	Winter Wren	*Troglodytes hiemalis*
ESSF/ICH	Yellow-rumped Warbler	*Setophaga coronata*
ESSF/IMA	Blue Grouse	*Dendragapus obscurus*
ESSF/IMA	Golden Eagle	*Aquila chrysaetos*
ICH	Blackcapped Chickadee	*Poecile atricapillus*
ICH	Hairy Woodpecker	*Leuconotopicus villosus*
ICH	Downy Woodpecker	*Picoides pubescens*
ICH	Evening Grosbeak	*Coccothraustes vespertinus*
ICH	Gray Jay	*Perisoreus canadensis*
ICH	Great Horned Owl	*Bubo virginianus*
ICH	House Wren	*Troglodytes aedon*

BEC Zone	Common Name	*Scientific Name*
ICH	Lewis' Woodpecker	*Melanerpes lewis*
ICH	Long-eared Owl	*Asio otus*
ICH	Northern Pygmy Owl	*Glaucidium californicum*
ICH	Olive-sided Flycatcher	*Contopus cooperi*
ICH	Pileated Woodpecker	*Dryocopus pileatus*
ICH	Saw-whet Owl	*Aegolius acadicus*
ICH	Townsend's Solitaire	*Myadestes townsendi*
ICH	Townsend's Warbler	*Setophaga townsendi*
ICH	Veery	*Catharus fuscescens*
ICH	Western Bluebird	*Sialia mexicana*
ICH	Western Wood-Pewee	*Contopus sordidulus*
ICH	Yellow-bellied Sapsucker	*Sphyrapicus varius*
IMA	Gyrfalcon	*Falco rusticolus*
IMA	Horned Lark	*Eremophila alpestris*
IMA	Ptarmigan	*Lagopus muta*
IMA	Rosy Finch	*Leucosticte tephrocotis*

3.4.2.4 Rare and Endangered Wildlife Species

A search was conducted for potentially occurring at-risk wildlife species through the BC Conservation Data Centre iMap species and ecosystems explorer (BC Government, 2021f). Details on the classification system for at-risk species can be found in section 3.4.1.4. The CDC iMap did not display any rare and endangered wildlife species occurrences within the proposed Zincton CRA area (BC Government, 2021f). However, "no known recorded occurrences" does not necessarily mean rare and endangered wildlife species are not present. Since no occurrence records were found, a desktop search for potential habitat in the area was conducted. The proposed Zincton CRA shapefile boundary was uploaded to the CDC explorer tool and results produced based on the geographic area. The results of the search are provided in Table 26 within Appendix A, rare and endangered fish species are discussed in section 3.3.1.1 (B.C. Ministry of Environment, 2021). Wildlife species were then given a possible occurrence based on known available habitat and habitat ranges within the proposed Zincton CRA. The search resulted in a total of 167 wildlife species potentially present within the proposed CRA. Of those, 61 species were determined to be possible or confirmed occurrences from known available habitat in the area (Table 19). Detailed descriptions of the known species at risk in the area provided from feedback from provincial staff are provided in detail below. This includes the western toad, wolverine, south mountain caribou, mountain goat and grizzly bear.

Table 19: Possible and confirmed species at risk occurrences analyzed from Table 26 (Appendix A) that could utilize habitat in the proposed Zincton CRA.

English Name/ Scientific Name	Status		Potential Occurrence
	BC List	SARA Status	
Amphibians			
Western Toad *Anaxyrus boreas*	Yellow	Special Concern	**Confirmed**- Breeding site at Bear and Fish Lakes
Birds			
Northern Goshawk, *atricapillus* subspecies *Accipiter gentilis atricapillus*	Blue		Possible
White-throated Swift *Aeronautes saxatalis*	Blue		Possible
Great Blue Heron, *herodias* subspecies *Ardea herodias herodias*	Blue		Possible- fish bearing streams
Short-eared Owl *Asio flammeus*	Blue	Special Concern	Possible
American Bittern *Botaurus lentiginosus*	Blue		Possible-summer vagrant
Common Nighthawk *Chordeiles minor*	Yellow	Threatened	Possible
Evening Grosbeak *Coccothraustes vespertinus*	Yellow	Special Concern	Possible
Olive-sided Flycatcher *Contopus cooperi*	Blue	Threatened	Possible
Horned Lark, *merrilli* subspecies *Eremophila alpestris merrilli*	Blue		Possible
Prairie Falcon *Falco mexicanus*	Red		Possible
Peregrine Falcon *Falco peregrinus*	No Status	Special Concern	Possible
Gyrfalcon *Falco rusticolus*	Blue		Possible
Barn swallow *Hirundo rustica*	Blue	Threatened	Possible
Western Screech-Owl *Megascops kennicottii*	No Status	Threatened	Possible
Western Screech-Owl, *macfarlanei* subspecies *Megascops kennicottii macfarlanei*	Blue	Threatened	
Lewis's Woodpecker *Melanerpes lewis*	Blue	Threatened	Possible
Reptiles			
Northern Rubber Boa *Charina bottae*	Yellow	Special Concern	Possible
Western Skink *Plestiodon skiltonianus*	Blue	Special Concern	Possible

English Name/ Scientific Name	Status		Potential Occurrence
	BC List	SARA Status	
Painted Turtle - Intermountain - Rocky Mountain Population *Chrysemys picta pop. 2*	Blue	Special Concern	Possible
Mammals			
Townsend's Big-eared Bat *Corynorhinus townsendii*	Blue		Possible
Big Brown Bat *Eptesicus fuscus*	Yellow		Possible
Wolverine, *luscus* subspecies *Gulo gulo luscus*	Blue	Special Concern	**Confirmed**- in the proposed Zincton CRA
Silver-haired Bat *Lasionycteris noctivagans*	Yellow		Possible
Hoary Bat *Lasiurus cinereus*	Yellow		Possible
Southern Red-backed Vole, *galei* subspecies *Myodes gapperi galei*	Blue		Possible
Californian Myotis *Myotis californicus*	Yellow		Possible
Long-eared Myotis *Myotis evotis*	Yellow		Possible
Little Brown Myotis *Myotis lucifugus*	Yellow	Endangered	Possible
Northern Myotis *Myotis septentrionalis*	Blue	Endangered	Possible
Long-legged Myotis *Myotis volans*	Yellow		Possible
Yuma Myotis *Myotis yumanensis*	Yellow		Possible
Least Chipmunk, *oreocetes* subspecies *Neotamias minimus oreocetes*	Blue		Possible
Mountain Goat *Oreamnos americanus*	Blue		**Confirmed** - Identified possible mountain goat habitat
Caribou (Southern Mountain Population) *Rangifer tarandus pop. 1*	Red	Threatened	**Possible** - Nakusp herd range and critical habitat nearby
Grizzly Bear *Ursus arctos*	Blue	Special Concern	**Confirmed -** Known connectivity corridor
Insects			
Albert's Fritillary *Boloria alberta*	Blue		Possible
Hoffman's Checkerspot *Chlosyne hoffmanni*	Red		Possible
Mead's Sulphur *Colias meadii*	Blue		Possible
Silver-spotted Skipper *Epargyreus clarus*	Blue		Possible
Western Pondhawk *Erythemis collocata*	Blue		Possible

English Name/ Scientific Name	Status		Potential Occurrence
	BC List	SARA Status	
Gillette's Checkerspot *Euphydryas gillettii*	Blue		Possible
Nevada Skipper *Hesperia nevada*	Blue		Possible
Bronze Copper *Lycaena hyllus*	Blue		Possible
Lilac-bordered Copper *Lycaena nivalis*	Blue		Possible
Sandhill Skipper *Polites sabuleti*	Red		Possible
California Hairstreak *Satyrium californica*	Blue		Possible
Forcipate Emerald *Somatochlora forcipata*	Blue		Possible
Ray-finned Fish			
Cutthroat Trout, lewisi subspecies *Oncorhynchus clarkii lewisi*	Blue	Special Concern	Confirmed
Bull Trout *Salvelinus confluentus*	Blue		Confirmed
Bivalves			
Swamp Fingernailclam *Musculium partumeium*	Blue		Possible
Herrington Fingernailclam *Sphaerium occidentale*	Blue		Possible
Gastropods			
Banded Tigersnail *Anguispira kochi*	Blue		Possible
Coeur d'Alene Oregonian *Cryptomastix mullani*	Blue		Possible
Shortface Lanx *Fisherola nuttalli*	Red		Possible
Ashy Pebblesnai *Fluminicola fuscus*	Red		Possible
Golden Fossaria *Galba obrussa*	Blue		Possible
Attenuate Fossaria *Galba truncatula*	Blue		Possible
Pale Jumping-slug *Hemphillia camelus*	Blue		Possible
Pygmy Slug *Kootenaia burkei*	Blue	Special Concern	Possible
Magnum Mantleslug *Magnipelta mycophaga*	Blue	Special Concern	Possible
Subalpine Mountainsnail *Oreohelix subrudis*	Blue		Possible

English Name/ Scientific Name	Status		Potential Occurrence
	BC List	SARA Status	
Northern Tightcoil *Pristiloma arcticum*	Blue		Possible
Wrinkled Marshsnail *Stagnicola caperata*	Blue		Possible
Glossy Valvata *Valvata humeralis*	Red		Possible
Sheathed Slug *Zacoleus idahoensis*	Blue	Special Concern	Possible

3.4.2.4.1 Western Toad

The western toad (*Anaxyrus boreas*) is the only true toad (*Anura: Bufonidae*) found in BC. Western toads have a biphasic life cycle consisting of aquatic eggs and tadpoles and terrestrial juveniles and adults (Ministry of Environment, 2014). Western toads were recently down graded from blue listed (species of concern) to yellow listed (species at least risk of being lost) on the BC species at risk list and are listed as a special concern on the SARA schedule (B.C. Ministry of Environment, 2021). The CDC changes the status of a species when additional research is conducted. Yellow listed species reflects that the species is now thought to be at least risk of being lost and is the default rating for all species that are not listed as special concern (blue) or threatened (red). Western Toads spend 95% of their life in terrestrial habitats, using aquatic environments to breed. Breeding occurs in shallow water with preferred sites including existing substrate for egg strands to secure onto and are often sheltered from wind and wave action (McCrory, 2019).

Newly metamorphosed toads form large aggregations near the shoreline and then move on mass to terrestrial habitats, where they forage for several years before returning to breed. Terrestrial habitats include a variety of grassland, forest, shrub, marsh, and meadow habitats, which at higher elevations include avalanche slopes and subalpine meadows. The toads may move 1 km or more from breeding sites to foraging and hibernation areas, movements up to about 7 km from breeding sites were recorded on Vancouver Island (Ministry of Environment, 2014).

Fish and Bear Lake is situated on the southern border (Map 16) of the proposed Zincton CRA and within the 3 km study boundary. Both Fish and Bear Lake are known waterbodies in which western toads breed.(McCrory and Mahr, 2015).

There are three main migration events in the Fish Lake area as adults move to and from Fish Lake for breeding in the spring and toadlets leave the lake in late summer for upland habitat. For adults in spring, migration is intermittent, taking place primarily during warm, wet nights. Toadlets migrate only in the daytime, usually following summer rain events(McCrory and Mahr, 2015). Toads hibernate underground in the winter, often in small mammal burrows and coarse woody debris with recent studies finding preference within rotted root wads that provide natural burrows into the earth (Wind, 2020).

The western end of Fish Lake with its confluence of Goat Creek watershed (Map 16) is a known location in which migration of toads and toadlets occur with toads using the riparian area as a migration corridor (Kootenay Conservation Program, 2020). Upland habitat within the proposed Zincton CRA including the slopes of London Ridge and Whitewater likely provides terrestrial habitat to western toad species including forest, riparian habitat, and avalanche chutes.

3.4.2.4.2 Mountain Goat

Mountain Goats are part of the Bovidae family and have no close relative in North America. British Columbia contains more than half of the world's population (BC Ministry of Environment, Lands and

Parks, 2000). Most winter ranges are steep sites that shed snow with a warm south to west exposure. In the interior, goats winter on cliffs at varying elevations, including high windswept ridge crests. Kortello et al. (2019) has characterized winter habitat as south facing slopes (135–185°) between 1330 m and 2320 m of elevation within a 500 m buffer of escape terrain (100% slope). Seasonal migration is mostly a local shift in elevation. Goats survive by eating a wide variety of plants, including lichens, ferns, grasses, herbs, shrubs, and deciduous or coniferous trees (BC Ministry of Environment, Lands and Parks, 2000). Mountain Goats are strongly attracted to mineral licks in summer. They often travel several kilometres downslope through forest to reach them. Licks are often on cliffs or sometimes in clay pits. Goats can stay at the lick for up to three week to recharge in sodium and other mineral lacking in spring vegetation (BC Ministry of Environment, Lands and Parks, 2000).

Based on the model of Kortello *et al* (2019), the proposed Zincton CRA contains a total of 515 ha of suitable winter habitat (Map 21). The proposed Zincton CRA is located withing the management unit subzones 4-17 B and 4-18 A. Goat estimates for these subzones are 40 and 45 respectively (Murphy, 2020).

3.4.2.4.3 Southern Mountain Caribou

All caribou in British Columbia are of the woodland caribou subspecies (*Rangifer tarandus caribou*). However, they are separated into six geographically distinct populations in Canada: Northern Mountain, Southern Mountain, Boreal, Forest-tundra, Atlantic-Gaspésie, and Newfoundland (Environment Canada, 2014).

The mountain population found within the central Selkirk Mountains are part of the southern mountain caribou population unit and classified by COSEWIC as Designatable Unit 9 (DU9). They are one of the world's southernmost caribou populations and globally unique although they are genetically indistinct to other woodland species (BC Government, 2021g).

The southern mountain caribou population has drastically declined over the past 100 years, with a sharp decline from about 2500 animals in 1995 to about 1540 in 15 herds today (BC Government, 2021g). The Southern mountain population is red listed species on the BC species at risk and listed as a threatened species on the SARA schedule 1 list (B.C. Ministry of Environment, 2021). Research conducted by BC recovery planning of mountain caribou has designated 38 individual herds or subpopulations for mountain caribou and these subpopulations were organized into local population units (LPUs). The proposed Zincton CRA crosses the borders of the Southwest Kootenay LPU and the Central Kootenay LPU (Environment Canada, 2014). The LPUs consider that the subpopulations were historically larger in size and were fragmented into the currently recognized subpopulations. Numerous surveys were conducted for all Southern Group subpopulations since the early 1990s and the subpopulation current distribution boundaries were accurately delineated into the named “core” habitat ranges. “Matrix” ranges have also been delineated adjacent to core ranges which include seasonal migration or transient areas and areas of lower use compared to delineated core ranges. Subpopulation core or matrix habitat ranges are not found within the proposed Zincton CRA or 3 km study area. The proposed Zincton CRA is within the area mapped as extirpated of south mountain caribou populations. The closest core habitat range of the Nakusp herd is located beyond the west of Wilson Creek at approximately 10 km from the proposed CRA boundary.

The Federal *Species at Risk Act* (SARA) creates recovery programs for listed species at risk that includes identified habitat to assist in the survival or the recovery of the listed species named “critical habitat”. Southern mountain caribou are listed as threatened under SARA and critical habitat from the recovery program was mapped within the 3 km study area and 1.5 km to the west of the CRA boundary (Map 21).

The population estimates for each LPU and subpopulation from the recovery strategy dated 2014 includes 22 for the southwest Kootenay LPU and 66 for the Central Kootenay LPU, with 64 of that population and within the Nakusp herd. All populations had a declining status (Environment Canada, 2014).

In BC the province recognizes two ecotypes of Caribou based on the adaptive behaviours to migration and feeding and ecological conditions. The Southern Mountain Caribou are part of the "mountain" ecotype as they live primarily in deep snow and feed primarily on arboreal lichen (Environment Canada, 2014).

Southern Mountain Caribou occupy diverse topography and terrain as well as varying environmental conditions. To separate themselves, horizontally and by elevation, from predators, other prey species and human disturbance, they require large areas of relatively undisturbed and connected habitat called habitat matrices. In the winter they need large patches of mature and old forests with abundant lichen. Most Southern Mountain Caribou require high elevation habitat to birth their calves(Environment Canada, 2014).

The southern group (in southeastern BC) spends the winter in high elevation mature and old forests and subalpine areas with deep snowpack. The deep snowpack which when consolidated in mid to late winter provides them with access to forage on arboreal lichens on higher branches. During early winter they will use mid to low elevation mature and old forest and forage on arboreal lichen on downed trees and from windfall. During the spring they use low elevation mature and old forests but return to high elevation to calve and for the duration of the summer(Environment Canada, 2014).

3.4.2.4.4 Grizzly Bear

The grizzly bear is one of eight species of the bear family, Ursidae (BC Government, 2004). Grizzly bears live in a variety of habitats, including coastal rain forests, alpine tundra, mountain slopes, upland boreal forest, taiga, and dry grasslands. A grizzly bear's use of habitat tends to vary between seasons and is often dependent on vegetation growth and prey concentrations. Home range sizes vary based on habitat quality. Neither males nor females are territorial (Office of the Auditor General of British Columbia, 2017). Grizzly bears consume a wide variety of foods, including roots and green vegetation, small and large mammals, fish, and insects. In the interior grizzlies feed mainly on the roots of *Hedysarum spp.*, spring beauty (*Claytonia lacneolata*), and/or avalanche lily (Erythronium grandiflorum) depending on local abundance, and on carrion in the early spring. As the green vegetation emerges the bears begin to graze on grasses, horsetails, rushes, and sedges and prey on ungulates on their calving grounds. During the summer, bears feed on cow-parsnip (*Heracleum* spp.). They also obtain early ripening fruits beginning in mid-July mainly in riparian forests and productive low elevation seral forests, such as pine-soopolallie terraces. In late-summer and fall (August–October) high elevation berries are the dominant food source, mainly soopolallie (*Shepherdia canadensis*), blueberries, and huckleberries. Mountain ash (*Sorbus* spp.) or kinnickinnick (*Arctostaphylos uva-ursi*) Vaccinium, and on the roots of Hedysarum is the dominant food during late fall. Throughout the active season, interior grizzlies will prey on small mammals, especially ground squirrels (*Spermophilus* spp.) fish, roots, pine nuts, or bulbs, and insects are important whenever they are available (BC Government, 2004).

Grizzly bear tends to forage mostly in non-forested sites, or sites with partial forest, or sites with many tree gaps in older forest. Security habitat and day bedding areas (for heat relief, rain interception, or warmth) are more often located in closed forest sites near higher quality foraging sites (BC Government, 2004). In the interior, hibernation will take place from October to May (BC Government, 2004).

The proposed Zincton CRA is within the Central Selkirk Grizzly Bear Population Unit (GBPU) which is considered viable (Ministry of Environment, 2012). The Central Selkirk GBPU is further divided by the Highway 31A into two sub populations: Selkirk Kokanee south of Highway 31A and Selkirk Goat north of Highway 31A. The grizzly bear population was estimated at 30 grizzly bears and 223 grizzly bears in the Selkirk Kokanee and Selkirk Goat subpopulation respectively (Proctor et al., 2012). The proposed Zincton CRA provides high quality grizzly bear habitat, as well as high quality huckleberry patches (Map 20). Based on the habitat quality assessment conducted by Proctor et al (Proctor et al., 2017) the proposed Zincton CRA contains 15% (856.14 ha) of huckleberry patches, 39 % (2186.72 ha) of high quality habitat and 30% (1650.75 ha) of very high quality habitat. Due to presence of high quality habitat, the proposed Zincton CRA occupies part of a connectivity corridor between the two sub populations

separated by Highway 31A (Proctor, 2020). The Selkirk Goat sub population as part of the larger central Purcell-Selkirk area was identified as a source population for the adjacent smaller fragmented population units such as Selkirk Kokanee (Proctor et al., 2012) (Map 20). In addition, the proposed Zincton CRA is located within the grizzly bear connectivity corridor identified in the Kootenay-Boundary Higher Level Plan Order (BC Government, 2020) (Map 20).

3.4.2.4.5 Wolverine

Wolverines are members of the family Mustelidae (subfamily Mustelinae) and are the largest mustelid in North America in order Carnivora. In BC two subspecies are described, the mainland interior variant being the *Gulo gulo luscus* and the *Gulo gulo vancouverensis*, found on Vancouver Island. The *Gulo gulo luscos* subspecies is blue listed on provincial species at risk scale and listed on the Schedule 1 of SARA as Special Concern (B.C. Ministry of Environment, 2021).

Wolverines range from valley bottoms to alpine meadows and consume a variety of food items, but large ungulates (e.g., moose, elk, caribou, deer, and mountain goats), primarily obtained as carrion, form a large component of their diet. Composition of the diet appears to vary seasonally and with the sex of the individual. During summer, wolverine adult females with kits included hoary marmots as a substantial portion of their diet. Wolverine populations tend to occur in areas where a diversity of abundant seasonal food is available within their home ranges, which is often related to elevational diversity (Weir, 2004).

Wolverine as a species do not have easily defined habitat features as they require a range of habitat variables across large home ranges. Female wolverine and their young require an arrangement of habitats that provide suitable shelter and a supply of large ungulate carrion during the late winter close to an area that supplies adequate food during summer (e.g., marmots) (Weir, 2004). Therefore, female habitat is more easily located and identified for habitat protection purposes. Recent studies into wolverine habitat found strongest modelling between wolverine winter distribution and select environmental factors within the female wolverine population.(Kortello et al., 2019).

Female wolverines typically situate dens in snow tunnels leading to masses of fallen trees (accumulations of classes 1–3 coarse woody debris or rocky colluvium) (Weir, 2004). Recent studies in the area have found female wolverines excavate dens in high elevation cirque basins and at toes of avalanche slopes in large boulder fields (Hausleitner, 2021). Preferred den sites are used repeatedly, being passed down to kin. Female wolverines also situate dens on slopes with a northern aspect, which experience colder temperatures throughout the winter season and a persistence of spring snow. Female wolverines would utilize the persistent spring snow on these northern slopes for travel and hunting purposes (Hausleitner, 2021).

Wolverine activity was documented in areas adjacent to the proposed Zincton CRA (Kortello et al., 2019) and the proposed CRA likely forms part of their large home ranges. Wolverine ranges in the northern Columbia Mountains are estimated at 100,500 ha for males and 31,100 ha for females (Weir, 2004). A study into mechanisms influencing the winter distribution of the wolverine in the southern Columbia mountains captured the proposed Zincton CRA (Kortello et al., 2019). The study used bait sites with barbed wire to sample wolverine presence and collect hair samples for genetic identification. Four bait sites were positioned in close proximity to the proposed Zincton CRA. Two bait stations were located outside of the proposed CRA on the ridge west of Kane Creek on the west of the proposed CRA and on Lardeau Creek/Davis Creek east of the proposed CRA. Two bait sites were located within the proposed CRA on the west aspect of London Ridge and to the west of Whitewater Creek. (Map 22). Wolverine were detected at both the Kane Creek and Lardeau bait stations during two sample events. Wolverine were not detected at either the London Ridge or Whitewater Creek site within the proposed CRA (Kortello et al., 2019) (Map 22). A “no detection” at bait station does not necessarily mean an absence of occurrence in the area due to the small sampling size of the study.

Wolverine habitat preferences including avalanche chutes and habitat for prey preferences including marmot were identified and mapped within the proposed Zincton CRA area (Map 22).

Wolverine occurrence modelling mapping provided by provincial staff found a density ratio of wolverine to be relatively low within the boundary of their study area. Wolverine occurrence modelling predicted a density level of 2 wolverines per 1,000 km^2 within the majority of the CRA boundary, with greater density's occurring at the north of the CRA area (Hausleitner, 2021). The study data connected to the mapping was not shared with Cascade. As a precautionary approach, Cascade predicts a density level of 1-4 wolverines per 1,000 km^2 as displayed in the northern border of the proposed Zincton CRA boundary. The area of increased density of wolverine abuts the Provincial Park in the vicinity of Whitewater Mountain and upper valley of Whitewater Creek (Map 22). The Kortello studies showed wolverine density modelling increased in undeveloped drainages including the Goat Range Provincial Park (Kortello et al., 2019) to the north of the CRA. Wolverine density modelling within Goat Range Provincial Park decreased from the centre of the Park from 1-8 wolverines per 1,000 km^2 to 1-4 wolverines per 1000 km^2 which overlaps the CRA boundary (Map 22) (Hausleitner, 2021). This reduction in density around the permitter of the park is due to "edge effect" and disturbance from other land uses.

Approximately 441 ha or 11% of the proposed CRA is within the higher wolverine density area (1-4 wolverine per 1000km^2) and 4710 ha is within the lower wolverine density area (>0-2 wolverine per 1,000 km^2).

3.4.3 Valued Ecosystem Components

Valued Ecosystem Components are natural features identified as valuable for wildlife survival. The valued ecosystem components identified in the proposed Zincton CRA include wildlife trees, coarse woody debris, wildlife connectivity corridor, rocky outcrop and talus slope, avalanche chutes, mineral licks and huckleberry patches.

3.4.3.1 Wildlife Trees

Due to the presence of old growth and mature forest on the proposed Zincton CRA, wildlife trees are likely to be present. Wildlife trees include significant standing snags, veteran trees, and trees with broken tops, holes or cavities. These trees are important for various reasons such as perching, foraging, and nesting sites for birds and mammals.

3.4.3.2 Whitebark Pine

In addition to designation as endangered under SARA, whitebark pine is a keystone species. At the centre of a high-elevation species interaction network of plants and animals, whitebark pine enables increased biodiversity. This tree species provides food and habitat for numerous birds and mammals. It facilitates the establishment and growth of other plants in the harsh, upper subalpine environment and helps regulate snowpack and runoff, providing watershed stability. The seeds are also used as food traditionally by Indigenous peoples (COSEWIC, 2010).

3.4.3.3 Wildlife Connectivity Corridor

Wildlife tend to use routes with specific features when moving across the landscape to forage for food, disperse, find mates, or locate breeding sites. These features can include such things as cover, shade, vegetation, water, or surface characteristics.

Scale is also a significant factor in determining the suitability of a landscape; larger animals with home ranges covering hundreds of kilometres (e.g. grizzly bear, wolverine) have far different connectivity corridor requirements than some amphibians (e.g. western toad), whose corridor requirements are measured in metres. The subject site is likely to be used by various wildlife species as corridors to move across the landscape. More species-specific information regarding wildlife movement is presented in section 3.4.2.5 to 3.4.2.9

3.4.3.4 Rocky Outcrop and Talus Slope

Rocky outcrops and talus slopes were observed on the orthophoto imagery. Rocky outcrops and talus slopes provide specialized habitat for many species. Reptiles are likely to utilize the dry rocky habitat found throughout the study area. Snags within these exposed sites are ideal perch sites for raptors and potential roosting sites for some species of bat.

3.4.3.5 Avalanche Chute

Avalanche chutes create a rich food source for a wide array of animals. Both black and grizzly bears seek out avalanche chutes to forage on berries, cow-parsnip and other vegetation. In addition, the thawed-out carcass of an avalanche-killed ungulate provide food for carnivore species such as wolverine. Trees toppled in snow slides create deadfall shelter for insects, rodents, songbirds, martens and all manner of other small creatures; those knocked into watercourses can diversify stream habitats (Shaw, 2017).

3.4.3.6 Mineral Lick

A mineral lick is an area used on a habitual basis by ungulates to obtain dietary macroelements, including sodium, calcium, and phosphorous, and trace elements such as manganese, copper, or selenium (Ministry of Environment and Climate Change Strategy, Ecosystems Branch, 2018). Mineral licks are frequented by ungulates throughout the year but particularly during periods when bone, antler, horn, and muscle growth peak (i.e., spring and summer). Ungulates require these minerals for nutrition and also to aid in digestion by countering the effects of unpalatable plant compounds. Mineral licks are relatively uncommon across the landscape and some ungulates will travel extensive distances (e.g., over 15 km) to visit them (Ministry of Environment and Climate Change Strategy, Ecosystems Branch, 2018). It is currently unknown whether mineral licks occur in the proposed Zincton CRA. However, the Kootenay-Boundary Region habitat biologist expects mineral licks to be present (Murphy, 2020).

3.4.3.7 Huckleberry Patches

Studies have shown that food resources can heavily influence density of vertebrate populations (Proctor et al., 2017). Black Huckleberries (*Vaccinium membranaceum*) are the main energy-rich grizzly bear food in the majority of the south Selkirk and Purcell Mountain. Huckleberry patches are considered the most important driver in female habitat use, home range selection, density, and fitness (Proctor et al., 2017). Huckleberries are high energy foods and are particularly important for hibernating bears. Females grizzly bear are known to reabsorb their yet to be implanted embryos in the fall if they do not store sufficient fat reserves (>~20-24 % body fat) for hibernation (Proctor et al., 2017). Proctor *et al.* (2017) suggests that certain combinations of soil conditions, ecological and topographic features, climate conditions, and position in this mountainous habitat when combined with lower canopy cover yield huckleberry patches with enough fat building berries to make it worth a grizzly bear's investment. Based on the model created by Proctor (2017), a total of 856 ha of huckleberry patches were identified in the proposed Zincton CRA (Map 20).

Map 20: Grizzly Bear and Corridor Connectivity Habitat Map

Map 21: Ungulate Habitat Map

Map 22: Wolverine Habitat Features

4 Environmental Opportunities and Constraints

4.1 Cultural Environment

4.1.1 Indigenous Communities

Indigenous communities' valued ecosystem components may include special places, culturally modified features and places of traditional use. These valued components may be any of the following:

- burial sites;
- cultural landscapes;
- oral histories;
- cultural values and experiences of being on the land;
- Indigenous governance systems and Indigenous laws tied to the landscape;
- sacred, ceremonial or culturally important places, plants, animals, objects, beings or things; and
- archaeological potential and/or artefact places (Government of Canada, 2020).

A number of high potential archaeological sites are identified with the proposed Zincton CRA. They are identified on Map 5.

The London Ridge area may provide harvesting opportunities and Indigenous communities may desire unencumbered and unobserved access to traditional harvesting areas.

4.1.2 Anthropogenic Values and Features

The historic structures remaining in the Valley of the Ghosts should be considered constraining to project and recreational activities. Any existing structures within the proposed CRA should be considered as candidates for preservation and recreational activities should avoid derelict buildings and mining relics for safety reasons.

4.1.3 Recreational Activities

The CRA is located within an identified wildlife connection corridor identified in the Kootenay-Boundary Land Use Plan (BC Ministry of Agriculture and Lands, 2009). The corridor should be considered a valued component and as such, recreational activity may be constrained by seasonal wildlife use on the land.

4.1.3.1 Trapline Areas

The identified trapline areas gives the right to trap and harvest fur bearing animals in which the proposed Zincton CRA overlaps. As a licensed trapper in the area, impacts to the trapline tenure holder should be considered as it is a licensed use of Crown land.

4.1.4 Other land uses

4.1.4.1 Forestry

BC Timber Sales (BCTS) and Interfor both have active forest operating license areas within the proposed Zincton CRA with certain harvesting rights of Crown land timber. BCTS also has legislative silviculture obligations to maintain forest regeneration. The project will be constrained by these rights and obligations and, as the area is within the larger operating skiing area with minimal forest clearing, planned, agreements may be negotiated to enable complementary joint use of the land.

4.1.4.2 Mining

In B.C., in order to have the right to prospect for minerals, you must first obtain a Free Miner Certificate. A free miner has certain rights set out in the *Mineral Tenure Act* and *Mineral Tenure Act Regulation* including the right to acquire and hold mineral titles, which acquire the subsurface rights that are available at the time of acquisition (BC Government, 2021h). The mineral titles listed that overlap the proposed Zincton CRA have certain subsurface rights to the land within their claim and right to enter said claims and may have certain constraints to the operating area.

4.1.4.3 Local Government and Official Community Plans

Provincial government agencies including Forests Lands Natural Resource Operations and Rural Development have jurisdiction over use of Crown land. Local government and Official Community Plans are relevant to the resort planning process at this initial stage and throughout the resort master planning process. Although local land use designations through OCP's do not apply to unzoned Crown land, both provincial and municipal governments coordinate land use planning to ensure the interests of local government and communities are considered in Crown land use decisions.

Relevant policies and area objectives of both the Area D Comprehensive Land Use Bylaw No. 2435, 2016 and Area H Official Community Plan Bylaw No. 1967, 2009 as provided by RDCK staff related to the proposed Zincton CRA is displayed in Appendix C.

The proposed Zincton CRA is generally consistent with the OCP. However, RDCK staff indicated the scale of Zincton may go beyond the "small scale" related activities originally envisioned of the OCP. The RDCK indicated that a OCP amendment may be required to allow public engagement and assess and determine appropriate long term growth to the area (RDCK, 2020).

As the proposed CRA area is within the RDCK Watercourse Development Permit Area, any planned work within 30 m of highwater mark of a watercourse would be subject to a permit and a Riparian Areas Protection Assessment conducted by a Qualified Environmental Professional (RDCK, 2020).

4.1.4.4 Higher Level Land Use Plans

Land use planning sets high-level direction and helps define 'what' can occur on the land base. Two identified legal objectives from the Kootenay-Boundary Higher Level Plan Order are to be considered during planning for the proposed Zincton CRA to ensure the project is compliant with land use objectives (BC Ministry of Agriculture and Lands, 2009).

The following land use objectives from the Kootenay-Boundary Higher Level Plan Order include:

- Connectivity corridors
- Water Intakes for Human Consumption

Statuary decision makers making decisions for use of Crown land must consider and must be consistent with legislative framework in an approved higher land use plans. The Kootenay-Boundary Higher Level Plan Order is established under the *Forest and Range Practices Act of British Columbia* which provides legislation and regulations which govern forest practices in BC (BC Ministry of Agriculture and Lands, 2009). The legal objectives provided in the Kootenay-Boundary Higher Level Plan Order are geared towards forestry practices and forest development plans. Forest development plans are produced to protect environmental resources during forestry operations and may not directly constrain a Commercial Recreation Area application. However, the land use objectives should be considered in the application process.

Both applicable legal land use objectives are considered and impacts and mitigation measures to meet these objectives are described in the following sections.

4.1.4.4.1 Forest Range and Practices Act Wildlife Orders

The proposed Zincton CRA does not contain UWR's. However, UWR number u-4-014 established for mountain caribou exists to the west of the proposed CRA boundary(Map 21) (BC Government, 2021b). The general wildlife measures set out for the area should not be affected by the proposed CRA (Ministry of Environment, 2009), although impacts and mitigation for the Southern Mountain Caribou Population were considered in the report.

4.2 Physical Environment

4.2.1 Climate

The climate appears to be suitable for the proposed type and intensity of the proposed activities. No climatic impacts are anticipated from the proposed project.

4.2.2 Geology

The geology of the site does not appear to present any significant constraints to proposed project beyond that imposed by steep slopes and exposed bedrock. Several active and inactive mineral claims are present within the project area. Activation of these claims may be constraining to recreation-based activities. Geotechnical issues associated with the project should be addressed in a separate report.

4.2.3 Soils

The project site covers a variety of soils that are discussed in section 3.2.4. Soil survey results that may constrain the project include the glacier polygons within the uppermost elevations due to a lack of soil and extreme climate conditions. Other constraints include the soil associations Curtis, Mount Cond and Ymir. These are typically treeless and sometimes entirely non-vegetated due to their location on unstable terrain on steep slopes, at the base of cliffs, or within avalanche chutes. These areas are prone to avalanches, rockslides, and harsh climates due to high elevations in mountainous terrain. Soil types are variable, and permeable with loose rock and boulders. Due to the unstable nature of these soils, this may pose a constraint to the project.

Another constraint to soils on site is sediment erosion due to surface disturbance. Construction activities resulting in vegetation removal and exposed soils will require mitigation measures to reduce sediment erosion within the proposed Zincton CRA. In British Columbia, the *Environmental Management Act* provides standards for allowable turbidity of waters that impact aquatic life. The BC *Water Sustainability Act* also prohibits the introduction of debris or contaminants in any watercourse or waterbody. Water runoff from site must meet the BC turbidity standards before meeting watercourses, which includes Marten Creek, O.K. Creek, Kane Creek, Seaton Creek and Carpenter Creek.

Contaminated soils within the proposed Zincton CRA are presently unknown. Contamination may exist from prior mining and forestry activities.

4.2.4 Hydrology

Several watercourses are present within the proposed Zincton CRA. The location and abundance of these watercourses present a constraint to the assembly of lift lines and associated access and egress routes.

4.3 Aquatic Environment

All identified waterbodies within proposed Zincton CRA including downstream fish bearing watercourses and their associated riparian zones present a constraint to the project. Any disturbance within the riparian zone of these watercourses must comply with the *Water Sustainability Act* (Province of British Columbia,

2014), the *Fish Protection Act* (Province of British Columbia, 1997), the Riparian Area Protection Regulation and the Federal *Fisheries Act* (Government of Canada, 2016). Retention of riparian vegetation protects stream banks from erosion and subsequent downstream siltation. In addition, the riparian vegetation helps to maintain lower water temperatures in summer, and provides a potential food source for downstream fish (i.e. terrestrial insects falling into the stream).

4.3.1 Fish and Fish Habitat

The main constraint to the project from fish and fish habitat are based on rare and endangered fish species presented the following subsection (4.3.1.1).

4.3.1.1 Rare and Endangered Fish Species

Westslope cutthroat and bull trout are present in watercourses in the proposed CRA as well as in connected downstream waterbodies in both the Slocan River Watershed and the Kootenay Lake Watershed (Table 7 and Table 8). These species require intact riparian areas, cool and clean waters with ground water up-welling specifically for spawning, incubation, and early life stage rearing. As such, riparian habitat is a constraint to the project.

4.3.2 Water/Sediment Quality

Water quality of the streams draining the study area is of particular concern for fish and fish habitat, downstream water users and water licence holders. Geochemical Stream Survey sediment samples collected within the proposed Zincton CRA show exceedances of Lead (Pb), Zinc (Zn), Cadmium (Cd), Nickel (Ni), Arsenic (As), Chromium (Cr) and Manganese (Mn) within the drainage basins of O.K. Creek and McEllis Creek, Kane Creek, Watson Creek, Goat Creek, Whitewater Creek. There is an opportunity for the proponent to conduct site remediation of known past producing mine sites to mitigate the further release of the above-mentioned elements into the surrounding water course through precipitation and snow melt.

4.4 Terrestrial Environment

4.4.1 Vegetation

4.4.1.1 Old Growth Forest

Map 18: Terrestrial Ecosystems Map denotes five polygons as Old Forest (Structural Stage 7). Within the biogeoclimatic subzones on the subject site, Old Forest is defined as forests greater than 250 years old. Old growth forests are ecologically important for many rare and endangered wildlife and vegetation species. Old Forest covers an area of 114.2 ha within the project area. Although Old Forest should be retained where possible, there are currently no legal constraints in BC for the protection of Old Forest per se.

4.4.1.2 Rare and Endangered Plant Species

Rare and Endangered plant species that are confirmed to occur or have the potential to occur within the proposed Zincton CRA include lance-leaved figwort, piper's anemone and whitebark pine.

4.4.1.2.1 Lance-leaved Figwort

The lance-leaved figwort is listed as blue (special concern) in British Columbia and is not listed under SARA. There is one known occurrence of this species on the southern boundary of the proposed CRA along Highway 31A (BC Government, 2021f). Identified individuals should be preserved where possible, although there are no legal constraints pertaining to the protection of the lance-leaved figwort in BC.

4.4.1.2.2 Piper's Anemone

Piper's anemone is red listed and rare in BC (endangered or threatened) and is not listed under SARA. It occurs exclusively in the ESSFwc subzone with a recorded occurrence 17 km from the CRA. Identified individuals should be retained when possible.

4.4.1.2.3 Whitebark Pine

Whitebark pine is listed in British Columbia as blue (special concern). However, it is nationally listed as SARA Schedule 1 endangered, which provides legal protection to all whitebark pine individuals on federal land. Whitebark pine has experienced population declines largely due to its susceptibility to White Pine Blister Rust (*Cronartium ribicola*). BC CDC lists the closest known occurrence on the east side of Kootenay Lake and VRI data lists various polygons on site where it occurs (Map 18).

Whitebark pine are visually distinct from other tree species in their subalpine environment. The trees typically range from 5-20 m in height with a rounded to irregular spreading crown and unswept branches. They may reach over 1 m in diameter at the base (COSEWIC, 2010). The Land Management Handbook for the South-Central Columbia Mountains (MacKillop, D. and A. Ehman, 2016) lists Whitebark pine as typically associated with the following terrestrial ecosystems (TE): ESSFwc4/102, ESSFwcw/102, ESSFwh1/102, and ESSFwcp4/Sk (Map 19). Suitable subalpine and alpine habitat exists on site (Klinkenberg, Brian, 2020; B.C. Ministry of Environment, 2021).

The proposed recovery strategy for the whitebark pine (Environment and Climate Change Canada, 2017) lists the major threats as White Pine Blister Rust, Mountain Pine Beetle, climate change and fire excursions. White Pine Blister Rust alone is projected to cause a 50% decline in the population over a 100-year period. Whitebark pine are dependent on Clark's nutcracker populations for seed dispersal. Recovery strategies include:

- Minimizing negative impacts of wildfire and/or prescribed fire in areas deemed important to whitebark pine recovery;
- Ensure a sufficient amount of suitable habitat persists across current and potential range of whitebark pine;
- Improve mapping and inventory data to meet objectives and address other threats; and
- Minimize localized and contribution to cumulative effects causing or contributing mortality to whitebark pine individuals that are cone-bearing, and/or that are not terminally-infected with a pathogen.

Critical habitat is determined based on available information of the current distribution of whitebark pine, stand densities required to support the Clark's Nutcracker, corresponding dispersal, survival and establishment of seeds/seedlings, and additional habitat required for regeneration and recovery. Critical habitat identification is only partially identified due to incomplete information and insufficient knowledge of the determining criteria. The project site contains potential area containing seed dispersal, regeneration, and recovery critical habitat. Whitebark pine is anticipated to occur sporadically on London Ridge with most occurrences on the northern slope above Kane Creek.

4.4.1.3 Rare and Endangered Ecological Communities

There are two Provincially listed rare and endangered ecological communities of concern that potentially occur within the project site.

Western redcedar – western hemlock / common horsetail (ICHmw2/111) is wet forest associated with old growth forest stands. This ecological community covers 21 ha on site and is provincially blue listed. *Subalpine fir / black huckleberry / bear-grass* (ESSFwc4/00) is provincially blue listed and occurs on warm aspect avalanche chutes. This ecological community may exist within the CRA but cannot be confirmed without field investigations. There are currently no legal constraints for the protection of provincially blue listed (special concern) ecological communities in BC.

4.4.2 Wildlife

4.4.2.1 Rare and Endangered Species

4.4.2.1.1 Western Toad

The western toad is protected under the provincial *Wildlife Act* from killing, wounding, and taking of individual species, the western toad is also listed as a species of special concern under the Species At Risk Act (SARA). A species that is listed as Endangered, Extirpated or Threatened within Schedule 1 of SARA is legally protected under the Act by certain prohibitions. A species that is listed within Schedule 1 of SARA with the classification of special concern will not receive protection under the SARA general prohibitions.

SARA contains prohibitions that make it an offence to:

i. *kill, harm, harass, capture, or take an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated;*
ii. *possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated;*
iii. *damage or destroy the residence (e.g. nest or den) of one or more individuals of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated, if a recovery strategy has recommended the reintroduction of that extirpated species.*

Land use restrictions including WMA's, WHA's or federally listed critical habitat exist for the protection of western toad habitat. The proposed Zincton CRA does not contain any environmental land use restrictions for western toad. However, a Section 17 Crown land Reserve (File # 0224831, Map 8) does exist on the west end of Fish Lake and Kaslo River which was likely enacted to protect the environmental assets of the riparian areas and western toad habitat. The proposed Zincton CRA may be affected by these boundaries although there are no legal constraints within the proposed CRA. As a known SARA occurrence within the study area, impacts, mitigation measures and management consideration are detailed in section 5.4 and section 6.

4.4.2.1.2 Mountain Goat

Mountain goat may be present within the proposed Zincton CRA. Mountain goats are protected under the provincial *Wildlife Act* from killing, wounding, and taking. No Ungulate Winter Range were identified within the proposed Zincton CRA. However due to the species regional interest, mountain goat habitat should be preserved where possible.

4.4.2.1.3 South Mountain Caribou

South mountain caribou are protected under the provincial *Wildlife Act* from killing, wounding, and taking. In addition, the south mountain caribou is also listed as threatened under the SARA.

Critical Habitat is enacted from SARA recovery strategy's programs and includes identified habitat to assist in the survival or the recovery of the listed species. Critical habitat polygons do not exist within the proposed CRA, but critical habitat is delineated within the 3 km area of interest, 1.5 km to the west of the proposed CRA boundary (Map 21). As detailed in section 3.4.2.7 the proposed Zincton CRA is outside of all current or "core" subpopulation distributions habitat ranges and "matrix" range habitat and is mapped within the area listed as extirpated of south mountain caribou populations.

The SARA critical habitat requirements pertain to Federal lands. However, the Province has a responsibility to protect this habitat on non-federal and public lands. In May 2018, the Minister of Environment and Climate Change announced findings that Southern Mountain Caribou were facing imminent threats to its recovery. The Federal government under SARA established a bilateral conservation agreement with the Province in February 2020. The agreement was established to take

immediate action to develop future conservation and recovery measures to support the recovery of Southern Mountain Caribou to a self-sustaining population in BC (Government of Canada, 2021).

As part of the bilateral recovery strategy, management plans for individual herds within the southern population were required. The Nakusp herd was merged with the Duncan herd to form the Central Selkirks sub-population (BC Caribou Recovery Team, 2020). A draft phase 1 of the Central Selkirks herd management plan is publicly available. However, a complete management plan and directives have not been finalized and are currently in development. This management plan lists directives and recommendation actions to protect and restore caribou habitat areas. However, no environmental restrictions are currently suggested for areas adjacent to these critical habitat areas (BC Caribou Recovery Team, 2020). The document identifies potential impacts from recreation activities that occur directly within caribou habitat and recommends revision of current restrictions on snowmobiling, heli-skiing and cat-skiing. However, at the time of writing this report the herd plan does not identify constraints on recreation activities adjacent to the critical habitats.

Recovery planning for mountain caribou began in 2005. The Mountain Caribou Science Team (MCST) was established to identify core mountain caribou habitat and establish management directions for the recovery of the species producing the *Mountain Caribou Recovery Implementation Plan* (BC Government, 2021g). This work led to the refinement of land use planning for caribou habitat area of the KBLUP implementation strategy as stated in section 3.1.4.4.1 and formation of UWR's. As stated previously, a UWR number u-4-014 was established for the protection of southern mountain caribou habitat within the 3 km area of interest. However, wildlife measures as part of the UWR management direction are not constraining to the proposed Zincton CRA area.

The provincial recovery planning also led to the refinement of federal critical habitat in the *Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada* in 2014 and management planning can be unified from the recovery planning documents as three management actions (Environment Canada, 2014).

i. *Protecting and restoring sufficient habitat for caribou to carry out life history processes and reduce predation risk thereby ensuring long-term population persistence. Habitat protection generally has included managing recreational activities (e.g. snowmobiling and heli-sking) within caribou range.*
ii. *Managing the populations of other ungulate species.*
iii. *Managing predator populations*

As a species that is facing imminent threats to recovery, the Nakusp caribou population critical habitat requires identification and consideration during the resort master planning process and proposed impacts and mitigation measures are considered in section 5.4 and section 6.

4.4.2.1.4 Grizzly Bear

Grizzly bears are known to occur in the proposed Zincton CRA (Murphy, 2020). Grizzly bears are protected under the provincial *Wildlife Act* from killing, wounding, and taking. In addition, the grizzly bear is also listed as Special Concern under SARA. A species that is listed as Endangered, Extirpated or Threatened within Schedule 1 of SARA is legally protected under the Act by certain prohibitions. A species that is listed within Schedule 1 of SARA with the classification of Special Concern will not receive protection under the SARA general prohibitions.

Wildlife habitat for endangered species are protected through Wildlife Management Areas (WMA's) under section 4(2) of the *Wildlife Act* ((BC Government, 2021i)). No WMA's are located within the proposed CRA or 3km buffer. The proposed Zincton CRA is located within the Kootenay-Boundary Higher Level Plan Connectivity Corridor (BC Government, 2020). This Kootenay-Boundary Higher Level Plan establishes resource management objectives. The objectives regarding grizzly bear habitat and connectivity corridor are as follows:

i. *To maintain mature and/or old forests adjacent to avalanche tracks important for grizzly bear habitat as jointly determined by the District Manager of the Ministry of Forest and the Designated Environmental Official of the Ministry Of Environment, Lands & Parks.*
ii. *To maintain mature and/or old forests within connectivity corridors, for purposes of regional forest ecosystem connectivity* (Map 20)

The occurrence of the species and the potential presence of dens in the proposed Zincton CRA may be a constraint to seasonal activities. Potential impacts and mitigation measures are considered from the proposed project in sections 5.4 and 6.

4.4.2.1.5 Wolverine

Wolverine occurrences were recorded adjacent to the proposed Zincton CRA. Wolverines are protected under the provincial *Wildlife Act* from killing, wounding, and taking, and legal harvest for their pelts is regulated and now trapping of wolverines is prohibited in Region 4. In addition, the wolverine is also listed as Special Concern under SARA. A species that is listed as Endangered, Extirpated or Threatened within Schedule 1 of SARA is legally protected under the Act by certain prohibitions. A species that is listed within Schedule 1 of SARA with the classification of Special Concern will not receive protection under the SARA general prohibitions.

Federal protection of critical habitat for wolverine has not been established in BC. Wildlife habitat for endangered species including the wolverine are protected through wildlife management areas (WMA's) under section 4(2) of the *Wildlife Act* (BC Government, 2021i). WMA's for wolverine are not located within the proposed Zincton CRA or 3 km buffer. The closest WMA is Hamling Lakes WMA to the north. Wildlife Habitat Areas offer another land use tool to protect habitat of an identified species made under the authority of sections 9 and 12 of the Government Actions Regulation of the FRPA. WHA's for wolverines do not exist in the proposed Zincton CRA area or 3 km study area.

In the absence of known dens, there are no constraints arising from wolverine in the proposed Zincton CRA. However, due to the occurrence of the species in the area potential impacts and mitigation measures for the proposed project are considered in sections 5.4 and 6.

4.4.3 Valued Ecosystem Components

4.4.3.1 Wildlife Trees

No specific legal protection exists for wildlife trees. However, wildlife trees may provide den habitat for SARA listed species (e.g. little brown myotis, grizzly bear, etc.). In that instance the wildlife tree would be protected. In addition, many bird species may use wildlife trees for nesting. Therefore, wildlife trees providing residence to SARA listed species or nesting birds, may be constraining to the proposed project. Residence by SARA listed species would present a long-term constraint as the residence is protected from damage or destruction under SARA. However, protection of a wildlife tree occupied by a non SARA listed bird species would not preclude recreational activities from taking place. The nest of a bird would be a short term constraint as Section 34 of the *Wildlife Act* states that an offence is committed if a person "possesses, takes, injures, molests or destroys (a) a bird or its egg, (b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or (c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg" (BC Government, 1996).

4.4.3.2 Whitebark Pine

Whitebark pine trees are legally protected by the federal *Species At Risk Act* (SARA). In British Columbia, it is estimated that 26% of the whitebark pine range occurs in protected areas. Whitebark pine was logged in some areas, although the extent is unclear. BC government agencies have suggested voluntary conservation measures for consideration in planning and operational forestry activities (COSEWIC, 2010). See section 4.4.1.2 for additional information.

4.4.3.3 Wildlife Connectivity Corridor

The proposed Zincton CRA is located within the Kootenay-Boundary Higher Level Plan Connectivity Corridor (BC Government, 2020). This Kootenay-Boundary Higher Level Plan establishes resource management objectives. The objectives regarding grizzly bear connectivity corridor to maintain mature and/or old forests within connectivity corridors, for purposes of regional forest ecosystem connectivity (Map 20). However, as mentioned in 3.4.3.3, grizzly bears are only expected to use the connectivity corridor outside of hibernation.

In addition, listed species may use the proposed CRA as a connectivity corridor. If listed species are known to be actively occupying the portions of the proposed CRA, their presence may present constraints to activities.

4.4.3.4 Rocky Outcrop and Talus Slope

Rocky outcrop and talus slope may provide denning habitat for reptiles and roosting/ hibernacula habitat for species of bat. Should those be a listed species, the den, roost and hibernacula sites will be protected which may be constraining to proposed project at the site of the occurrence.

4.4.3.5 Avalanche Chute

The Kootenay-Boundary Higher Level Plan Order (BC Government, 2020) has an objective to maintain mature and/or old forests adjacent to avalanche tracks important for grizzly bear habitat as jointly determined by the District Manager of the Ministry of Forest and the Designated Environmental Official of the Ministry Of Environment, Lands & Parks. Mature and old forests should be considered constraining to disturbance or harvesting.

4.4.3.6 Mineral Lick

Mineral licks do not have legal protection unless designated as significant (George Heyman, 2018). However, due to their importance for ungulate survival, they should be considered constraining to disturbance.

4.4.3.7 Huckleberry Patches

Huckleberry patches do not have legal protection in this area, at this time. However, due to their importance for bear survival and high traditional value to First Nations, they should be considered constraining to clearing.

5 Potential Impacts

5.1 Cultural Environment

5.1.1 Indigenous Communities

No information regarding Indigenous peoples' valued components within the proposed Zincton CRA is currently available. However, three sites are identified as potentially occurring within the proposed CRA. Since no disturbance in planned at or near these sites, the potential for impact is minimal. Further, it is understood that the proponent continues to engage the local Indigenous communities.

5.1.2 Anthropogenic Values and Features

Anthropogenic features in the proposed CRA are mainly limited to valued relic features from the mining era and will not be adversely impacted by the proposed use.

In addition to exploration roads left from mining activity, there are a number of forestry roads from past and potentially future harvesting and silviculture activities. The proposed activity will not adversely affect the existing infrastructure of forest roads and harvesting blocks; existing and potential.

Portions of the proposed CRA contain established and historic use trails. The trails or their use will not be affected by the proposed project.

5.1.2.1 Infrastructure

Due to the nature of the proposed project, few alterations to the land in the proposed CRA are anticipated.

The plans call for three ski lifts extending into the CRA. Each will have a 10 m wide right of way that will be cleared of trees. This will result in approximately 4.6 ha of tree removal and conversion to shrub structural stage vegetation within the CRA.

Access/egress routes to the base of the two chairlift load stations sited in the CRA may result in clearing of approximately 4.8 ha of forest within the CRA. These routes will also be the right of way for provision of electric power to the drive stations for the lifts.

Access to the top stations of the lifts for operations is currently planned by snowmobile. The route could be through the forest or conversely, the old exploration road out of the Kane Creek valley could be re-established providing both snowmobile and snowcat access to the top of the chairlifts. As the roadbed is still evident in air photos, tree cutting should not be required.

5.1.2.2 Backcountry Lodge

A backcountry lodge is proposed in the alpine area. No trees will be removed because the ridgetop location is above the treeline, but a ground disturbance of approximately 20 m^2 should be anticipated for the footprint of the structure. It is proposed that all materials and prefabricated building components will be flown to the site by helicopter or accessed by existing resource roads which extend to within 250 m of the proposed site. Wastewater will be delivered by gravity feed pipe to a septic field 90 m south of the lodge near the existing resource road. Non-potable water will be collected from the roof top into a cistern. Drinking water will be brought in as needed by helicopter.

Operationally, management of people (guests and staff) and food waste may be a potential concern.

5.1.3 Recreational Activities

The study area currently experiences low levels of both summer and winter recreation use by the public. Unless restricted by recreational closures, public access is currently allowed on Crown land in British Columbia. Public recreational use on Crown land falls under the purview of Recreation Sites and Trails BC. Adventure Tourism (AT) is managed by FLNRORD and operations must not impede public access to tenured lands as a condition of the Licence of Occupation. Licences of Occupation issued for commercial Adventure Tourism activities are non-exclusive and compatible overlapping tenures are allowed. All tenured AT operations have client day targets that are used to manage the intensity of use by AT operations occurring on the landscape (BC Government, 2013).

Various public groups have expressed concern about loss of access or crowding arising from Zincton visitors. However, loss of public access concerns may be unfounded. According to Zincton, access by the public will not be impeded at all during the summer season due to a proposed operational closure over a significant portion of the eastern part of the CRA (Map 4). In the winter, public access will be allowed from the highway at Goat Pass, except when avalanche control is taking place. This is the same level of restriction that currently occurs when avalanche control measures are conducted by MOTI. The potential use levels allowed by the existing AT operations according to their management plans, would be higher than that anticipated by Zincton. Further, the Zincton operation would be self propelled, without disturbance from overflights or snowcat transport of skiers.

Currently, there are three existing Adventure Tourism companies with licenses to use portions of the land base within the proposed CRA that may be affected. The Province adheres to a policy of integrated resource use, whereby several activities may occur on the same land base, provided they are coordinated and meet the requirements for long-term sustainable management and are consistent with BC Government goals. Although it is legitimate to identify a potential impact to existing tenures (as a loss of tenure or decommissioning of trails) this may not be the final outcome of negotiation. The Province encourages discussions to settle matters in a business-like fashion by applying reasonable judgement and actions/measures proposed to avoid conflict and/or mitigate the impact to a point of incompatibility. There is an expectation that tenure holders will make reasonable efforts to accommodate the interests of other resource users. Reciprocal accommodation is the foundation of successful, integrated resource use.

The heli-skiing operation would be potentially impacted by a loss of a portion of their tenure within the CRA. The cat-skiing tenure within the proposed CRA is not currently utilized in the winter. While the same operator would potentially be impacted by the loss of and decommissioning of the tenured trails for heli-mountain biking within the CRA, these lands were rarely used in the past (Chris McNamara, 2020). The tenured summer hiking operation would be unaffected by the creation of the CRA and could continue to operate as usual, as complement to the Zincton plan.

5.1.3.1 Trapline Areas

The proposed Zincton CRA is located within an active licensed trapping area. The project could potentially impact the fur-bearing resources within the area by reducing utilization of the habitat. Trapping activities could continue in the CRA area. Access and trapping activities could continue to occur and significant impacts should be avoidable with communication and management. Proposed mitigation measures for wildlife and habitat protection are discussed in section 6.1.4.3 to reduce impacts to this resource.

5.1.4 Other Land Uses

5.1.4.1 Forestry

The proposed Zincton CRA overlaps the forest operating areas of Interfor and BC Timber Sales. If these areas were to be removed from the harvesting land base it would reduce the timber available to be harvested from the Kootenay Lake and Arrow timber supplies.

5.1.4.2 Mining

Designation of the Zincton CRA could potentially lead to the loss of some of the listed mineral claim rights.

5.1.4.3 Local Government and Official Community Plans

Potential impacts and issues as identified by the RDCK in review of the initial Expression of Interest for Zincton are summarized below (RDCK, 2020):

Socio-economic Impacts

Zincton could potentially have positive impacts to local communities in terms of job creation and taxes generated through increased visitation and population growth. Zincton could potentially help reverse the negative growth trend in New Denver, as well as supporting the provision, maintenance and viability of social services and facilities.

The RDCK expressed concern that with the village design for in-resort amenities, economic benefits may not extend to local business within New Denver and Silverton, and if employee housing is planned on-site local hiring initiatives could be reduced.

Impacts on local Infrastructure and Services

The creation of Zincton will support infrastructure improvements in the region through an expanded tax base.

Impacts on Active Forest Licenses

As discussed in section 3.1.4.1 two active forest licensees are within the proposed CRA area and the OCP outlines the importance of this resource to the local economy of the communities. Any reduction of harvesting area as a result of the project could impact this resource. Harvesting is expected to continue in the near future.

5.1.4.4 Higher Level Land Use Plans

KBHLP Connection Corridor Legal Order

Connectivity corridors are designated to maintain mature/old forests for the purpose of regional ecosystem connectivity. The proposed Zincton CRA will not require significant forest harvesting. However, there will be glading of trees (falling individual small trees by hand to reduce the stand density) within Pod A ski area (650 ha) and select tree removal for lift alignments and egress routes (Map 3). Within the CRA as per TE analysis, mature forest covers 51.3% and Old Forest covers 2.2% of the total area. No Old Forest is expected be impacted by the assembly of lift structures, egress routes and ski glading within Pod A. The area of mature forest within the CRA expected to be impacted by the project is 0.4% (Table 22) within Pod A. Glading activities within Pod A will likely modify and not diminish mature forest habitat as understory vegetation will remain and small trees removed to stump level to provide skiing areas in the winter with a snow base.

The impacts on mature and old forest within the connectivity corridor area are not expected to be significant. Old forest will not be removed, 0.4% of mature forest will be impacted within the CRA and the

rest of the forested area will remain in a natural state. The connectivity corridor has also been considered in the proposed operations of Zincton with 4,025 ha out of 5,152 ha or 78% of the land base being closed to summer commercial operations. This will preserve wildlife habitat connectivity within the area for important species including grizzly bear (Map 4).

The proposed CRA and current project plans are generally compatible with the KBLUP land use objective. The Zincton CRA would produce a much higher target retention rate of old and mature forest than the set target retention rates for forestry operations in the Kootenay-Boundary land use plan.

UWR's, WHA's or WMA's do not overlap the proposed Zincton CRA.

KBLUP Water Intakes for Human Consumption

The objective within the order is to reduce impacts of forest harvesting on streams licensed for human consumption. The streams identified within the land use plan with water intakes are within Whitewater Zone (Pod D) (Map 3). Pod D will not be disturbed and will be used for backcountry skiing. Therefore, aside from being contaminated from historic mining activities, no water impacts are anticipated. Both intakes are within the summer exclusion commercial operating zone and will not be impacted by activities in the CRA in the summer season. The proposed CRA summer activities are compatible with the land use direction.

5.2 Physical Environment

5.2.1 Climate

No anticipated significant adverse impacts to the local climate are identified in this Overview Assessment.

5.2.2 Geology and Geomorphology

No anticipated significant adverse impacts to the local geology or geomorphology of proposed Zincton CRA are identified in this Overview Assessment.

5.2.3 Soils

Soil Associations

Current project plans of the lifts, backcountry lodge and egress trails do not occur on soils of the associations Curtis, Mount Cond and Ymir that occur on terrain of steep slopes, at the base of cliffs, or within avalanche chutes. As the proposed project will not occur in these unstable terrain types, no impacts from soil associations are anticipated.

Erosion and Sediment Control

Vegetation removal has the potential to expose soils and create surface soil erosion. Erosion and Sediment Control (ESC) Best Practice mitigation measures are required for certain areas of disturbance to reduce potential impacts. The purpose of ESC is to decrease the erosive effects of rain drop impact on soil particles, decrease runoff velocity and volumes, and promote water infiltration into the soil (Ministry of Forest, Lands, Natural Resource Operations, 2018).

The proposed construction of the backcountry lodge takes place on thin soils near exposed bedrock (Map 13 and Map 15) in a sparsely vegetated alpine grass and sedge vegetated area. This will require little to no vegetation clearing and exposed soils should be minimal.

Installation of the lifts will require tree removal while maintaining the shrub, herb and moss vegetation layers. Although some disturbance to vegetation is expected, exposed soils and soil erosion are not anticipated due to the remaining vegetation that provides soil surface stability.

Glading throughout Pod A will remove some trees to thin forested areas by hand cutting methods. Tall shrubs and small regenerative trees will also be removed. Areas to be gladed should maintain the forest tree layer, small shrubs, herb and moss/lichen layers. Soil erosion is not anticipated due to glading due to the remaining vegetation.

Clearing for the egress trails assumed a 10 m buffer along the proposed alignments, resulting in an affected area of 10.67 ha. Egress trails will run along part of the CRA southern boundary and the western boundary. Construction of the egress trails may expose soils and will likely involve vegetation removal, grubbing and potential terrain adjustments (sloping, compaction). The egress trails traverse across the CRA for low elevation access and will exist as level to gently sloping trails. Egress trails pose a soil constraint for rain drop impact on soil and runoff velocities and volumes. Water infiltration in soil should not be affected as the egress trails will not be impervious. Mitigation measures will reduce the ESC impacts. ESC will prevent turbid runoff into watercourses and will minimize the need for maintenance measures by reducing water erosion of the developed trails.

5.2.4 Hydrology

No risk to existing hydrological flow or patterns is identified with the project. However, avalanches will continue to present a risk associated with snowpack on steep slopes. This is an existing condition in the proposed Zincton CRA.

5.3 Aquatic Environment

As mentioned above in section 5.1.2.1, few alterations to the land or water in the proposed Zincton CRA are anticipated.

The current proposed alignments for the Cooper Chair cross a watercourse that drains into Kane Creek. The Rawhide Lift lines crosses watercourses that drain into Seaton Creek. Access/egress routes to the base of the two chairlift lower terminals cross several watercourses which drain to both Kane Creek and Seaton Creek (Map 3). Clearing and construction for these lifts as well as the access/egress routes may impact the watercourses they cross and the downstream fish bearing watercourse they drain into, thereby potentially impacting water quality, fish, fish habitat and other water users.

Any changes to water quality or disturbance within the riparian areas adjacent to the drainages on site could affect the fisheries potential of downstream fish bearing watercourses and downstream human water usage, whether it be for agriculture, domestic, or commercial.

Construction of lift lines, associated access and egress as well as lodge construction works may further disturb elements associated with tailings from adits and mines within the proposed CRA potentially contributing to exceedances of the BC's working water quality guidelines for freshwater aquatic life through subbasin runoff.

5.4 Terrestrial Environment

5.4.1 Vegetation

5.4.1.1 Rare and Endangered Plant Species

Piper's Anemone

Piper's anemone is a rare perennial herb that is red listed (endangered) in British Columbia. Little information is known about its critical habitat. Habitat is moist, shady forest in the montane zone. Potential negative impacts include tree removal for glading and lift installation. Neither activity will include vegetation grubbing of the forest floor beyond the footprint of the tower foundations. Impacts to potential habitat of Piper's anemone can be reduced through mitigation strategies including surveys.

Lance-leaved Figwort

Lance-leaved figwort is a perennial herb that is blue listed (special concern) in BC. Potential habitat includes open areas such as roadsides within the lowest elevations of the CRA (ICHmw subzone). Potential threats include roadside mowing and road/utility line maintenance activities including herbicide use (B.C. Ministry of Environment, 2021). One known location of the lance-leaved figwort exists along the New Denver/Kaslo Road adjacent to the CRA. Zincton does not anticipate activities along the public road and these roadsides are not expected to be impacted.

Tree removal within the CRA may create additional habitat for the lance-leaved figwort. Positive impacts to lance-leaved figwort may occur through the clearing of the egress trails by providing additional open habitat.

Other potential habitat for lance-leaved figwort includes open roadsides along existing mining and forestry dirt roads in the lowest elevations of the CRA. No changes are currently proposed that would disturb these areas.

Whitebark Pine

Current plans anticipate no impact to whitebark pine. The number of individuals is very low and primarily concentrated on the north slope of London Ridge at higher elevations. Occurrence of whitebark pine in both critical habitats was determined by Environment Canada mapping (displayed in Map 19), and provincial VRI data which provides tree species data grouped by polygon areas. VRI data includes both photo interpretation and ground sampling methods. The areas of VRI whitebark pine and Environment Canada critical habitat are the same. Occurrence of whitebark pine covers 101 ha within the CRA while Potential Habitat covers 375 ha of the CRA. Table 20 lists TE polygons as potential whitebark pine habitat where there are no whitebark pine known occurrences. Current plans for the upper lifts will cross through 1.59 ha of the potential habitat.

It is possible to provide minimal positive impacts to whitebark pine through the retention of all species individuals and the selective removal of some competing tree species throughout its habitat. Seed dispersal is not anticipated to be impacted as seed harvesting occurs in autumn prior to the onset of winter ski activities.

Table 20: Whitebark pine occurrence and potential habitat

Whitebark Pine Data	Total Area (ha)	Potentially Impacted Area (ha)
Occurrence	101	0
Potential Habitat	375	1.59
Total	**476**	**1.59**

5.4.1.2 Rare and Endangered Ecological Communities

Two rare and endangered ecological communities exist within the project area. *Western redcedar – western hemlock / common horsetail* (ICHmw2/111) is associated with old growth forest in wet forest conditions. ICHmw2/111 covers an area of 21 ha on the project site (Polygon 188 on Map 18).

Subalpine fir / black huckleberry / bear-grass (ESSFwc4/00) occurs in high elevation, warm aspect avalanche chutes. This ecological community potentially occurs within the CRA but cannot be verified without field investigations.

Current plans for the lifts, lodge, egress trails and ski routes are not anticipated to impact any potential habitat for ESSFwc4/00 or the identified ICHmw2/111 area.

5.4.1.3 Invasive Plant Species

The project area contains various disturbed sites due to mining activities, forestry, roads and fires. As invasive species tend to prosper in open, disturbed sites, the proposed Zincton CRA likely contains invasive species. Invasive species are non-native species that become well established because they have no natural predators or controls. They may spread quickly and can out compete native species, negatively affecting the biodiversity of an area (Central Kootenay Invasive Species Society, n.d.).

Invasive species control in the project area is managed by the Central Kootenay Invasive Species Society (CKISS). Invasive plant species in the project area includes invasive knotweeds (*Polygonum*), blueweed (*Echium vulgare*), giant hogweed (*Heracleum mantegazzianum),* yellow star thistle (*Centaurea solstitialis*), puncturevine (*Tribulus terrestris*) and yellow flag iris (*Iris pseudacorus*). The proposed Zincton CRA is located within the Slocan Valley Invasive Plant Management Area (IPMA) on the western half of the property, and the North Kaslo IPMA on the eastern half of the property. The North Kaslo IMPA was extensively inventoried and mechanical treatments were conducted. In the Slocan Valley IPMA, the Slocan Integral Forestry Cooperative conducted an invasive plant inventory in 2008 and extensive weed control work in 2009. Pesticide use is controversial in both IMPAs (Central Kootenay Invasive Species Society, 2020).

Mitigation measures should be implemented during the construction phase to minimize spread of invasives species. Cleaning of construction equipment and vehicles will prevent and/or reduce the spread of invasive species of the study area. The construction and operations within the CRA provides opportunity for invasive species removal through mechanical controls and increased identification and reporting to CKISS. This is anticipated to benefit the invasive species management of the proposed Zincton CRA.

5.4.1.4 Vegetation Loss

Loss of trees is anticipated for installation of the lifts, and the two egress trails. Plans for the proposed lifts are not yet finalized and vegetation was assessed for the current concept plans. Installation of lift structures and lines will require tree clearing. A buffer of 10 m was applied on either side of the proposed lift alignments and on the egress trails to determine the tree loss area. The vegetated state will be altered from forest to shrub. Table 21 outlines the TE vegetation associations affected by current draft plans. The table displays the areal extent of each TE code across the entire CRA, what is expected to be affected, and the percentage of the TE code that will be affected within the CRA.

Current plans will affect 0.2% or 19.33 ha of the CRA. The lifts are expected to affect 0.2% of the total CRA as 8.64 ha of forest ecosystems. The backcountry lodge is expected to affect 0.0004% of the total project site as 0.02 ha of subalpine talus. The egress trails are expected to affect 0.2% of the total CRA as 10.67 ha of forest ecosystems. An assessment of structural stages is displayed below in Table 22.

Table 21: Terrestrial ecosystems affected by the proposed CRA

TEM Site Series	Structural Stage	Total Area within CRA (ha)	Area affected (ha)	Percent of Affected TE Site Series / Code
Lifts				
ICHmw2/ 101	6	550.02	1.15	0.2%
ICHmw2/ 104	3, 5, 6	856.83	3.68	0.4%
ESSFwc4/ 102	6	341.41	0.60	0.2%
ESSFwc4/ 103	6	461.28	1.04	0.2%
ESSFwcw/ 102	5	62.53	0.99	1.6%
ESSFwcw/ 103	5, 6	108.51	1.18	1.1%
Lifts Total			**8.64**	**0.2% of CRA**
Lodge				
ESSFwcw/ Rt	3	109.50	0.02	0.02%
Lodge Total			**0.02**	**0.0004% of CRA**
Egress trails				
ICHmw2/ 101	6	550.02	3.58	0.7%
ICHmw2/ 103	5	54.84	0.33	0.6%
ICHmw2/ 104	5, 6	856.83	6.46	0.8%
ESSFwc4/ 103	3	461.28	0.30	0.1%
Egress Trails Total			**10.67**	**0.2% of CRA**
Total		**5151.65**	**19.33**	**0.4% of CRA**

Table 22 displays the areas covered by each structural stage of ecosystem units on site and the percentage each will be affected by the proposed plans. The project site is composed mainly of Mature Forest at 51.3% and second most of shrub at 15.0% of the total project site. Current plans will affect Shrub, Young Forest, and Mature Forest within the ICH zone and sparse subalpine forest, with the most land affected in Mature Forest and secondly of Young Forest. Non-vegetated structural stage represents rivers, lakes, glaciers, roads, and disturbed mining areas. Non-vegetated areas are unaffected.

Table 22: Vegetation Structural Stages affected by proposed CRA

Structural Stage	Total Area on Site (ha)	Percent of Project Site	Area Affected (ha)	Percent of Structural Stage Affected
1 – Sparse/Bryoid	728.15	14.1%	0	0%
2 – Herb	333.18	6.5%	0	0%
3 – Shrub	774.50	15.0%	0.91	0.1%
4 – Pole/Sapling	42.14	0.8%	0	0%
5 – Young Forest	419.47	8.1%	7.57	1.8%
6 – Mature Forest	2641.15	51.3%	10.94	0.4%
7 – Old Forest	114.20	2.2%	0	0%
Non-vegetated	98.66	1.9%	0	0%

Structural Stage	Total Area on Site (ha)	Percent of Project Site	Area Affected (ha)	Percent of Structural Stage Affected
Total	5151.65	100%	19.42	0.4% of CRA

5.4.1.5 Old Growth Forest

Old Forest covers 114.2 ha, or 2.2%, of land within the CRA. Current plans do not anticipate impact to Old Forests. Additionally, small old growth forest stands or patches may exist on site unidentified by VRI data. There may also be old growth veteran trees in polygons where the forests are not classified as Old Forest.

5.4.2 Wildlife

5.4.2.1 Western Toad

Road Traffic Mortality

Studies conducted on the western toad population at Bear and Fish Lake have found mortalities occur due to roadway traffic from Highway 31A. Highway 31A intersects western toad upland terrestrial habitat from their aquatic breeding habitat at Bear and Fish lakes (McCrory and Mahr, 2015). As described previously three migration events occur as adults move to and from Fish Lake for breeding in the spring and toadlets leave the lake in late summer for upland habitat (Map 16). All three migration events can lead to road mortality from traffic (McCrory and Mahr, 2015).

Studies have found roads and trails do not present a movement barrier to western toads during these migration effects and species look for the easiest and shortest route, toads as an ectotherm species also find roads attractive to provide thermal radiation in requirements for digestion and other bodily functions (Wind, 2020).

Zincton expects the majority of roadway traffic to come through New Denver and access Zincton on Highway 31A from west to east. This highway access to the proposed CRA from New Denver will not cross the identified western toad migration route as the highway turn off will be west of this point (Map 16). Zincton also plans to run a shuttle bus from the communities of Kaslo and New Denver to further reduce traffic over the pass. Impacts associated with traffic mortalities on the western toad during migration to and from Fish and Bear Lake to surrounding upland habitat is not expected to increase significantly from existing levels as a result of Zincton, since traffic volume is not expected to increase. Without a traffic assessment completed for Zincton true impacts of traffic increases on Highway 31A from visitors are hard to predict. However, with a maximum total build out capacity of 1,550 guests with normal operating days receiving much lower numbers, traffic levels are not anticipated to increase substantially from current levels and increased mortalities to western toad from roadway traffic would be predicted not to be significant.

Impacts to Terrestrial Habitat

Impacts to western toad outside of migration events when utilizing terrestrial habitat are difficult to assess. Terrestrial habitat of the western toad has not been detailed significantly by field surveys. However, studies into hibernation behaviour have found potential hibernacula sites may be as important as breeding sites to the toad (Wind, 2020). Hibernacula are found in terrestrial habitat at distances of at least 1 km from breeding sites and can be communal, which could describe limited and specialised hibernacula sites within the landscape. Hibernacula sites are described as coarse wood debris, rotted tree stumps with root channels that extend into the ground and mammal burrows all of which allow the toads to escape the frost line (Wind, 2020).

Potential impacts from Zincton on western toad hibernacula habitat could include any clearing or disturbance of stumps, coarse woody debris or forest habitat within the upland habitat. The proposed village is approximately 5 km from the west point of Bear Lake (Map 16) and is outside of the proposed

CRA. As per existing plans, the land around Bear and Fish Lake will remain undisturbed by Zincton. Activity will be limited to the upland slopes in Pod C or Pod D (Map 3), leaving the Bear and Fish Lake area in its natural state. Therefore, impacts to western toad upland habitat should be avoided. Installation of the lifts and tree removal within gladed areas in Pod A (Map 3) could affect potential western toad habitat and specific mitigation measures for protecting amphibian habitat were provided in section 6.4.2. Glading activities within Pod A would also retain understorey and stumps as only small trees would be flush cut to provide openings for skiing.

5.4.2.2 Mountain Goat

Impact to habitat

The proposed installation of lifts and clearing of egress routes will impact a total of 7.17 ha of potential mountain goat habitat which represent 1.37% of the potential habitat present in the proposed Zincton CRA. The construction of the lodge will result in the loss of 0.02 ha (0.004 %) while the creation of the egress trails and the installation of ski lifts will modify 5.48 ha (1.06%) and 1.53 ha (0.29%) respectively Table 23.

Table 23: Summary of impact to potential mountain goat habitat

Type	Description	Area ha	Percent
Modified	Lifts	1.53	0.29
Modified	Egress trails	5.48	1.06
Loss	Lodge	0.02	0.004

In addition, habitat values may be affected due to increased human presence within the proposed Zincton CRA. The potential effects of human disturbance on mountain goats is a concern (Mountain Goat Management Team, 2010). Proximity to humans can cause disturbance that varies from short term (e.g., increased vigilance and short flight response) to long term (displacement from preferred habitat). The effects vary depending on the type of disturbance (e.g. walking, horseback, motorized, and aerial). habituation may be possible as some population have shown signs of conditioning while no habituation was observed in other populations (Mountain Goat Management Team, 2010).

Backcountry tourism and recreation can result in disturbance or displacement of mountain goats. Recreation can vary from highly mechanized transportation (e.g., snowmobiles, snowcats, and ATVs), to generally less threatening human powered pursuits (e.g., hiking, ski touring, ice-climbing) (Mountain Goat Management Team, 2010). However, the direct impact of many outdoor recreation pursuits on mountain ungulates is poorly quantified (Mountain Goat Management Team, 2010). Simulated non-mechanized recreational impacts had a negligible effect on mountain goat activities in Colorado and disturbance due to human foot traffic appears to be generally minor, but may be more important at specific times of the year (e.g., calving) (Mountain Goat Management Team, 2010). Recreational activity can result in an increase in energy costs for wintering animals, and may result in displacement of animals to less desirable habitat (Mountain Goat Management Team, 2010). Alteration of habitat within mountain goat areas may cause animals to abandon a feature and use other, possibly less suitable locations. Mineral licks, which are important for mountain goats, may be abandoned when cover is removed, resulting in secondary health effects on the goats (Mountain Goat Management Team, 2010).

The project may also have a positive impact on the mountain goat population since hunting legally and illegally are known to negatively impact mountain goat populations. Once Zincton is operational, hunting should not be allowed within the proposed Zincton CRA.

5.4.2.3 Southern Mountain Caribou

Recreation Impacts on Southern Mountain Caribou

Direct disturbance to southern mountain caribou habitat is more easily quantified than proposed recreation and activity taking place in an adjacent area. Threats and impacts related to recreation in recovery documents include winter snowsports (snowmobiling, heli-skiing, cat-skiing and backcountry skiing) and summer activities (hiking and mountain biking) that take place within defined caribou habitat. These activities can lead to displacement of high value habitat, increased stress and increased predator access through hard packed snow, trails and roads into normally restricted alpine caribou habitat areas (BC Caribou Recovery Team, 2020; Environment Canada, 2014).

The proposed Zincton CRA is spatially separate from the identified population distribution ranges (core habitat) and critical caribou habitat. Therefore, impacts to caribou from backcountry skiing should be avoided. However, motorized recreation in the form of heli-skiing and snowmobiling which can currently take place in the proposed CRA, was found to increase stress hormones in caribou from up to 10 km in distance (Environment Canada, 2014; Freeman, 2008). It should be noted the Central Selkirk (Nakusp) population's current distribution range (core habitat) is located at a greater distance than the identified critical habitat beyond the west of Wilson Creek at approximately 10 km from the proposed CRA boundary (See section 3.4.2.7). The Zincton CRA proposes non-motorized activity in the form of backcountry skiing and hiking.

Impacts from Movement and Highway Traffic

The Central Selkirk herd management plan lists major highways including Highway #6, #23, #31 and #31A as a potential direct source of mortality for caribou due to roadkill and may further alter or impede caribou movement within the herd area (BC Caribou Recovery Team, 2020). It lists roadkill for caribou as rare although it maybe more prevalent for smaller populations. Guests will be utilizing Highway #31A to access Zincton. The herd management plan lists highway #31A as being located 13 km south of the Naksup current distribution range (core habitat) boundary and that caribou interactions with this highway corridor are likely rare (BC Caribou Recovery Team, 2020).

5.4.2.4 Grizzly Bear

Impact to Habitat

The proposed CRA will affect up to 9.02 ha of very high-quality grizzly bear habitat, 5.57 ha of high-quality grizzly bear habitat and 3.71 ha of huckleberry patch habitat. Some of this habitat may be modified through the installation of ski lifts and egress routes. Cleared egress routes may be selected for utilization by grizzly bears in the spring, as wet seeps on and in the vicinity of these routes may provide food attractive to bears (Herrero, 2005). Table 24 summarizes the impact of the proposed use in the potential grizzly bear habitat.

Table 24: Summary of impact to grizzly bear habitat.

Impact Type	Proposed Use	Habitat Type	Area Ha	Percentage
Modified	Lifts	Huckleberry Patch	2.54	0.297
Modified	Egress Trails	Huckleberry Patch	1.17	0.137
Modified	Lifts	Very High	3.1	0.195
Modified	Lifts	High	1.67	0.076
Modified	Egress Trails	Very High	5.9	0.370
Modified	Egress Trails	High	3.9	0.186
Loss	Lodge	Very High	0.02	0.0012

Human presence, outside of grizzly hibernation, may reduce habitat attractiveness as bears move to lower quality habitats and display higher movements rates in response to human activity avoidance. This can reduce the net energy available for growth and reproduction. Bears may become negatively

conditioned to human activity as a result they would minimize their interaction with recreationalists by spatially and temporally avoiding high use areas. Bears might use trails and human facilities at night when unoccupied. While habituated bears appear to successfully use habitat near humans, they also are most likely to die as a result of a human-bear conflict (Herrero, 2005).

Impact from restricted movement

Maintaining connectivity of habitat is a key element for future grizzly bear survival (Office of the Auditor General of British Columbia, 2017) . Scientific research suggests that the northern Central Selkirk grizzly bear populations, around Goat Range Provincial Park and the Purcell Conservancy, are important for the survival of fragmented populations to the south (Proctor et al., 2012). The central Purcell Central/Selkirk population (estimated at 67 individuals) acts as a regional core or source population. The proposed CRA may contribute to fragmentation of that area which could contribute to genetic isolation and could inhibit the long-term sustainability of bears across the region (Proctor et al., 2012).

The proposed Zincton CRA provides an important inter-population north/south migratory corridor between patches of high value habitat. Bears are known to avoid high-volume roads in a major transportation corridor (Herrero, 2005). Therefore, increased traffic, coupled with the avoidance of the proposed CRA as described in the section, above may reduce movement efficiency through the area. Any potential fragmentation could contribute to a “habitat peninsula’s leading to a higher risk of isolation in smaller populations such as the Selkirk Kokanee Subpopulation” (Murphy, 2020). Within the proposed CRA, the Upper Goat Creek was identified as a movement area as there is a low elevation pass at the head of Goat Creek that animals can move through to the Kane Creek watershed (Wildsight, 2020). A lodge may affect wildlife movement in that area. In addition, Whitewater Creek is identified as an important north-south connectivity corridor (Wildsight, 2020).

Human-wildlife interaction

Increased human presence in the proposed Zincton CRA may result in an increase in grizzly bear-human interaction when bears are not hibernating. Some of these interactions may have negative impacts on grizzly bears.

The increased human presence in the proposed Zincton CRA may increase bear habituation to humans. Herrero (2005) suggests that habituation may increase the efficiency of bear habitat use by reducing displacement and minimizing the frequency of energy-demanding response. However, habituated grizzly bear are subject to higher mortality rates in all future years (Herrero, 2005). Additionally, the proposed CRA may increase highway use which could increase direct road mortality (Murphy, 2020).

5.4.2.5 Wolverine

Avoidance of Habitat due to Human Disturbance

Potential impacts could include a negative association and avoidance of habitat use within the proposed Zincton CRA. According to recent studies, wolverines exhibit a negative response to human disturbance, including anthropogenic features and activity within the environment including high elevation forest service roads (Kortello et al., 2019). Wolverines exhibit a negative response to winter recreation including motorized and non-motorized activities with a stronger response to off-road and unpredictable winter recreation over more predictable and linear recreation movement (Heinemeyer et al., 2019). Modelling results based on these studies find female wolverines exhibiting a stronger avoidance to human disturbance than males (Hausleitner, 2021; Kortello et al., 2019). Kortello (2019) found the highest use by wolverines occurred within undeveloped drainages including protected park lands.

The study conducted by Heinemeyer et al. (2019) stated that wolverines avoided all forms of winter recreation, showed increasing avoidance and experienced indirect habitat loss through lower value habitat use. However, as the amount of off-road winter recreation increased, wolverines still maintained multi-year home ranges within landscapes that have winter recreation and some resident animals had >40% of their home range within the footprint of winter recreation. This suggests that at some scale

wolverines tolerate winter recreation within their home ranges (Heinemeyer et al., 2019). Recently, wolverine observations of tracks found in the nearby Whitewater Ski Resort crossing lift accessed runs during the night shows some tolerance of a mountain resort within their home range (Whitewater Ski Resort, 2020). With male home ranges typically three times the size of those of females and with ranges in the northern Columbia Mountains estimated at 100,500 ha for males and 31,100 ha for females, wolverine habitat impacts on such a large landscape scale is difficult to quantify (Weir, 2004). As recommended by studies, impacts to female habitat preferences occurring in smaller ranges and identified features should be the focus for management considerations and this strategy is addressed in section 6.

Impact of Potential Wolverine Habitat Preferences

Mapping provided from provincial staff included potential marmot habitat areas within the proposed CRA boundary. Marmot colonies are a predictor of wolverine occurrence and are to be a major prey item of wolverines, with marmots making up 16-67% of prey items in the scat at female den sites (Kortello et al., 2019). The proposed lift line alignments, egress routes and backcountry lodge will impact 1.3 ha or 0.9 % of 150 ha of potential marmot habitat (Map 22).

Avalanche chutes and deposition areas are also important habitat areas for wolverines who are known to search and dig out avalanche-killed ungulates as an important food source (Weir, 2004). Avalanche terrain may also provide preferred denning habitat. The skiing pods within the CRA will not impact avalanche zones directly (Map 3). However, if skiing activities are being conducted in close proximity, wolverines are unlikely to share these areas or use as denning.

Current Conditions of Habitat Quality of Land for Wolverine

The proposed Zincton CRA is currently Crown land and is used by public recreationalists in the summer and winter for motorized and non-motorized activities. Forest service roads and mining roads exist on the north and south side of London Ridge and on the southwest aspect of Whitewater Ridge within the subject area. Kortello's (2019) models predict wolverine winter distribution displaying a strong negative response to forest service roads, wolverine habitat use within the area is likely already displaced.

Connectivity Corridor and Highway Crossing

Studies of show wolverine avoid transportation corridors within there home ranges. Studies have also shown male wolverines movement within their ranges was not affected by highways and crossed Highway 1, a major transit route in Banff National Park, frequently due to their drive for genetic dispersal, whereas female wolverines almost never did. This may restrict genetic disposition within the species and may effect reproductive output of the wolverine population (Rocky Mountain Outlook, 2019; Sawaya et al., 2019). Therefore, increased traffic is may have an impact either by roadkill while crossing or repeated negative attempts if trying to cross (Austin, 1998). However, both studies by Austin and Clevenger are focused on the large transport corridor of Highway 1 with greater traffic frequencies and greater widths of right of way compared to Highway 31A that parallels the southern border of the proposed CRA. Impacts to wolverine movement across Highway 31A already exist and are probably quite low since wolverines tend to cross the highway during the night to avoid traffic (Austin, 1998).

The study by Austin also suggests that highway right of ways be designed to be 50 m or less as wolverines are more likely to cross at shorter distances (Austin, 1998). Highway 31A is currently a two-lane highway and has a right of way width of 30 m. While an increase in traffic on the Highway 31A may occur, the level of impact, if any, is difficult to predict. However, with a maximum build out capacity of 1,550 guests per day for Zincton and lower capacities occurring on most operating days, traffic volumes are predicted not to increase significantly.

The study by Heinemeyer stated in the transcript below and forms the direction for mitigation measures within this document.

"These back-country landscapes represent critical habitats for wolverines, important and highly valued areas for people to connect with nature and are economic drivers for the small communities that surround them. Solutions to finding a balanced approach to sustaining the diverse values of these wild landscapes require creative approaches and collaboration between land managers, stakeholders, and wildlife professionals" (Heinemeyer et al., 2019).

5.4.3 Valued Ecosystem Components

5.4.3.1 Wildlife Trees

Wildlife trees may be impacted, but the extent of the impact is unknown as the location and number of wildlife trees providing habitat for SARA listed species and cavity nesting birds is unknown. Removal of wildlife trees is not anticipated, except where posing a safety hazard to lifts and people.

5.4.3.2 Whitebark Pine

The backcountry lodge is located within the 2 km buffer of the whitebark pine known range (Map 19: Rare and Endangered Plant Species). However, the proposed backcountry lodge is in an area that ranges from sparsely vegetated to non-vegetated and is described as subalpine talus. It is likely that minimal vegetation will be affected by the 0.02 ha lodge footprint and any whitebark pine encountered in this area can be protected.

Installation of lifts is anticipated to affect 1.59 ha of potential whitebark pine habitat (based on TE vegetation associations). However, no whitebark pines will be cut within the CRA. Whitebark pines occur on the top of London Ridge and on the north slopes of the Kane Creek drainage where clearing will be limited.

Creation of egress trails affect an area of 10.67 ha within the lower elevations of the CRA. These are not anticipated to affect critical or potential habitat of whitebark pine.

Pod A has an area of 650 ha and any glading is not anticipated to affect whitebark pine or its habitat. Glading will take place via strategic hand cutting of trees in densely forested areas.

5.4.3.3 Wildlife Connectivity Corridor

Wildlife connectivity corridor functionality has the potential to be affected. A discussion of potential species-specific impacts was presented previously in section 5.4.2.1 to 5.4.2.5

5.4.3.4 Rocky Outcrop and Talus Slope

No impact to rocky outcrop or talus slope is expected

5.4.3.5 Avalanche Chute

No impact to avalanche chutes is expected.

5.4.3.6 Mineral Lick

Mineral licks may be impacted if disturbed. However, the potential or extent of any impact is unknown as the location or number of mineral licks in the proposed CRA is unknown.

5.4.3.7 Huckleberry Patches

A total of 3.71 ha of identified huckleberry patch may be impacted as a result of the installation of the ski lifts (2.54 ha) and the creation of the egress trails (1.17 ha). This represents a potential impact of 0.43 %

of the total huckleberry patch. However, glading may encourage huckleberry growth along edge habitat and since little ground disturbance is anticipated, the impacts may be positive.

6 Opportunities/Mitigation Strategies

6.1 Cultural Environment

6.1.1 Indigenous Communities

Three sites are identified as having potential cultural interest to Indigenous peoples. In order to avoid impact to Indigenous interests, Zincton should continue to develop relationships with, and seek input from communities.

- Continue to engage local Indigenous communities to identify issues or concerns with the proposed use of the lands.
- Identify and buffer from activity and disturbance, any culturally sensitive sites.
- Accommodate seasonal use of lands for cultural and spiritual activities.
- Discuss potential accommodation of Indigenous peoples by promoting capacity building within the communities.

6.1.2 Anthropogenic Features

Analysis of anthropogenic features and values identified a number of existing relic structures and trails in the proposed CRA that may have historic value. In order to avoid impacts from and to any anthropogenic features within the proposed CRA, the following measures should be considered.

- Assess risk to human health from any existing contaminated sites and manage access.
- Where feasible, manage drainage around abandoned mine sites to mitigate ongoing contamination of surface water from acid draining rock.
- Identify any relic structures that may pose a risk to public safety and mitigate or install hazard warning signage.
- Ensure historic trails are not altered and access is preserved, where feasible.

6.1.2.1 Infrastructure

The level and type of impact associated with infrastructure is expected to be minimal, limited to some forest clearing for lift lines (4.6 ha) and access egress roads (4.8 ha). The following measures would significantly mitigate the effects.

- Clearing for lift lines could be limited to only those trees necessary to ensure safety for the lift and its passengers. The ground cover and shrub layer could be left intact, significantly reducing impacts from vegetation loss.
- The access and egress routes to the base of the lifts will be necessary for safety, maintenance access and a corridor to deliver electric power to the drive stations. The width of the corridor should be reduced to the width required for a grooming machine. The bed of the route can be revegetated with grass to reduce the amount of exposed soil.
- Access routes to the top stations will be needed for safety checks prior to daily startup. Reactivating existing resource roads would avoid any additional disturbance arising from road/trail building.

6.1.2.2 Backcountry Lodge

The backcountry Lodge is proposed to be located above tree line and on a rocky/talus surface. As a result, tree clearing is not required. The identified potential impacts are limited to that associated with the provision of services, access and operations.

- Wastewater will be piped away from the site for treatment at a suitable area for a septic field.

- Power should be provided by a combination of solar/wind with battery storage.
- As an alternative to helicopter access, the old exploration road could be re-established (it is currently in active use by ATV's and dirt bikes), providing 4X4 and snowcat access to the Backcountry Lodge.
- Management of guests, food and food waste should be carefully planned.
- Using a conventional backcountry hut model, like the Kokanee Glacier Cabin may mitigate operational impacts associated with guest and waste management.
- Drinking water should be brought in or collected from rooftop precipitation into a cistern.

6.1.3 Recreation Activities

Section 5.1.3 identified potential impacts to commercial recreation within the proposed CRA. While Zincton should continue to meet with other tenure holders and discuss issues arising from overlapping and potentially conflicting land use, it is understood that mitigation would ultimately respond to a land use decision by FLNRORD. As such, identification of mitigation measures associated with an agency decision falls outside the scope of this assessment. Therefore, this section focuses on measures to avoid or minimize impacts to existing public recreation.

- Protect existing type and levels of public recreation activity within the CRA.
- Preserve existing public trails within the CRA where appropriate and work with local user groups and commercial operators to decommission mountain bike trails in the alpine areas.
- Accommodate designated parking outside of the proposed CRA on the north side of the highway at the summit of Goat Pass.
- Proponent proposes a summer closure area for Zincton activity for 4,025 ha of the 5,152 ha CRA to protect wildlife from adverse effects by guests.
- Enter into an avalanche management agreement with MOTI for the CRA and manage for recreational ski touring.
- The establishment of the CRA will allow for an opportunity for controlled recreation in the area removing other multiple overlapping adventure tourism operators in the area. Request adjudication from the Crown regarding highest best use of land for any overlapping and non-compatible AT tenures
- Manage search and rescue services within the CRA for both guests and public recreationists.

6.1.3.1 Trapline Areas

One registered trapline holder exists within the proposed CRA providing a license to trap furbearing animals. Identified potential impacts include reduced use by fur bearing wildlife in the area due to human activity and/or impediment of access by the trapline licensee. The following opportunities are identified to mitigate these potential impacts.

- The proposed summer commercial closure of 78% of the land base provides an opportunity to retain much of the wildlife habitat in the CRA area for continued fur-bearing wildlife use and potential trapping activities.
- Identified trapline holders should be consulted during the Zincton master planning process for input and continued access for trapping activities during operation of the CRA.
- Wildlife interactions with anthropogenic sources will be mitigated through wildlife strategies described in section 6.4.2.3.

6.1.4 Other Land Uses

6.1.4.1 Forestry

Two forest tenure holders (Interfor and BC Timber Sales) are identified in the proposed CRA and could be affected by creation of the CRA. The operators' areas within the proposed Zincton CRA could potentially be removed from the harvesting land base which would reduce the timber available to be harvested from the Kootenay Lake and Arrow timber supply areas. There are two options for the future of forest operations within the proposed CRA and the decision falls outside of the control of the proponent. The proponent should consider the mitigation options for both outcomes.

- The removal of forestry and harvesting within the proposed Zincton CRA area would provide an opportunity for an offsetting positive ecological effect by retaining mature and old growth forest stands and benefiting wildlife and ecosystem diversity within the known connection corridor.
- A joint use agreement could be developed to enable both stakeholders to determine and minimize the impacts of a potential reduction in timber volume that would be impacted from the proposed CRA. There could also be negative impacts to BCTS and Interfor impacting the available volumes.

6.1.4.2 Mining

There are 58 registered mineral claim grants and tenures within the proposed CRA and mineral claims rights may be affected by the establishment of the CRA. The key potential impact would arise from a decision to halt mining in the CRA. However, a number of options are identified to reduce or avoid this outcome.

- The establishment of the CRA could, subject to a decision by the BC Government, provide an opportunity to restrict further mining in an area which has already seen a historical mining producing potential areas of environmental concern.
- Alternatively, Zincton could support mining rights within the future operation of Zincton for mineral extraction and form land use agreements with the mineral tenure holders.
- The proponents should continue to consult with all mineral claim holders on the Zincton planning process for input and agreements for establishment of the CRA.

6.1.4.3 Local Government and Official Community Plans

The RDCK provided comment to the Zincton Expression of Interest (EOI) and outlined comments regarding local communities surrounding the proposed Zincton CRA. The comments are summarized in section 5.1.4.4. The goal of Zincton is to ensure a sustainable future for New Denver and Kaslo and provides an opportunity to incorporate local community input in the plan. The recommendations below are intended to address some of the initial concerns received from the RDCK.

- Engage residents in nearby local communities with Zincton plans as it proceeds through the resort master planning process.
- The resort master plan should consider community services including grocery stores, emergency service and health services capacities.
- Develop hiring guidelines to prioritize hiring local employees.
- Develop guidelines to encourage sales of local community goods and promote tourism and businesses in local communities.

6.1.4.4 Higher Level Land Use Plans

The KBLUP contains legal land directives within the proposed Zincton CRA to guide sustainable planning on Crown Land. These polices include an identified large scale connection corridor in the Kootenay-Boundary area that provides links between protected park areas and to maintain old and mature forest for

ecosystem diversity and continuity. Protection of water sources for human diversion are also identified for protection during planning within the proposed Zincton CRA.

Current plans for the proposed Zincton CRA were analyzed and no old forest is expected be impacted by lift structures, egress routes and ski glading within Pod A. The establishment of a CRA provides an opportunity to preserve old and mature forest which could be otherwise harvested. The area of mature forest within the CRA expected to be impacted is 0.4%. Mature and old forest within the connection corridor will be retained at higher retention levels than targets set within the Kootenay-Boundary Higher Level Land Use Plan (KBHLP) for forestry activity. Key measures to meet the objectives of the KBHLP are:

- A commercial summer closure of 78% of the CRA operating area mitigates impacts to wildlife movement within the boundaries of the connection corridor (Map 4).

Water quality of watercourses within the proposed Zincton CRA will be protected by principles outlined below in section 6.3 (Map 16).

6.2 Physical Environment

6.2.1 Climate

No significant adverse impacts are identified with respect to the effect of climate on the project or of the project on climate. Therefore, no mitigation measures are recommended.

6.2.2 Geology and Geomorphology

No significant adverse impacts are identified with respect to the effect of geology or geomorphology on the project or of the project on the geology or geomorphology of the area. Therefore, no mitigation measures are recommended.

6.2.3 Soils

Identified areas of concern with respect to soils on the site relate to erodible soils and sediment control. Mitigation measures for erosion and sediment control during construction and trail building should be applied wherever vegetation is cleared and soil is exposed. Soil erosion is one of the most frequent types of environmental impact in montane and alpine areas. Soil erosion can increase maintenance costs and decrease plant and wildlife habitat quality. Any re-activated roads should be managed with erosion control measures. Egress trails occur in lower site elevations that mainly contain fine-textured soils. Fine-textured soils dry out slowly after rain, become muddy after wet trampling, are susceptible to compaction and surface water ponding in level areas.

Erosion and sediment control mitigation measures should be applied for construction and maintenance of the egress trails. Trail plans propose level to gentle slopes for the trails and no major watercourses cross the proposed trail alignments (Map 15). Mitigation measures such as bridges and culverts should be used where trails cross drainage areas to ensure sediment erosion runoff does not impact downslope fish habitat. Trail sloping and ditches should be used to prevent pooling at level areas and to prevent erosion from steep slopes and adjacent drainages and watercourses. Revegetation is recommended in spring or fall immediately following completion of trails to reduce soil erosion.

Mitigation measures for trails are provided from the BC Ministry of Forests Recreation Manual (British Columbia Ministry of Forests, 2000):

- Avoid steep sections susceptible to water runoff;
- Orient trails across slopes on the diagonal, or use switchbacks to climb steep slopes;
- Incorporate natural grade dips into the trail surface so drainage is diverted at frequent intervals;

- Use steps or ladders on steep slopes, making sure drainage water is diverted from the top of steps;
- Sloping the cross-section of the trail tread approximately 2%, or 4 cm per 1 m of tread width to redirect water;
- To direct surface runoff, the tread cross-section should be crowned, with a ditch on the uphill side to lead water to grade dips, culverts or waterbars;
- Revegetate trails with grass or herbs to prevent tree regeneration on trails and reduce sediment erosion; and
- Construct bridges or install culverts where the trail alignment will cross a watercourse or drainage.

6.2.4 Hydrology

Minimal risk is anticipated to watercourses within the proposed CRA provided riparian buffers are respected and best management practices for work in and around watercourses are adhered to.

The current level of avalanche risk and magnitude of occurrence may be mitigated through management intervention, but the overall effect on hydrology of the area should not be altered significantly by the proposed project. As such, no additional mitigation measures are recommended.

6.3 Aquatic Environment

Analysis of the concept plans in the EOI indicate few alterations are planned near water. The proponent has identified an opportunity to remediate known historic mine sites which may be contributing elevated concentrations of minerals into the surface watershed through runoff. The following best practices should ensure compliance and mitigation impact.

- Avoid disturbing tailings or areas of previous disturbance and ensure storm runoff is directed away from possible sources of exposed mineral concentrations.
- Disturbances should remain outside of the 30 m setback from any watercourse where possible to minimize impact to water quality and the aquatic environment. Detailed design, the application of industry best practices during construction and the post construction remediation will mitigate this concern.
- All wetlands should be retained and left undisturbed. All wetlands with the exception of bogs are protected below the top of bank under the *Water Sustainability Act.*
- Should clearing be required within the 30 m riparian assessment area, a Riparian Area Protection Assessment should be conducted at sites of disturbance near watercourses to determine appropriate clearing setbacks for the protection of fish habitat values and water quality.
- If the appropriate riparian setback cannot be maintained a site-specific sediment erosion control plan should be prepared and implemented.
- Water required for construction and operation of Zincton should consider existing water rights, ensuring those water rights are not impacted by the project. Water licences will be required for any water used by Zincton.
- Any works caried out in a stream, including diversion, will require an application for changes in and about a stream (Section 11 of the *Water Sustainability Act*).
- Where practicable, improve water quality for fisheries and existing water licence holders.

6.4 Terrestrial Environment

6.4.1 Vegetation

6.4.1.1 Rare and Endangered Plant Species

The risk to rare or endangered plants is mitigated by separating potential occurrence locations from disturbance locations. The only identified plant known to occur in proximity of disturbance or activity is the whitebark pine. However, the following precautionary approach should offer additional protection.

To mitigate damage or loss of rare and endangered plant species and ecological communities, efforts should be made for identification and protection. Mitigation measures should include the following:

- Rare and endangered plant species surveys should be conducted by a Qualified Environmental Professional (QEP). Any identified plants or ecological communities of concern should be protected.
- Identify and protect individual plants or ecological communities in areas outlined by Map 18: Terrestrial Ecosystems Map (Polygon 188) and Map 19: Rare and Endangered Plant Species and TE/VRI data that are close to disturbance areas.
- Final plans should consider Map 18 (Polygon 188) and Map 19 to avoid disturbance or destruction of rare and endangered plant species and ecological communities. According to the current plans, lifts, lodge, and egress trails are not anticipated to impact these species or communities.
- Pesticide use should be avoided on the property, particularly at low elevation, open roadsides where the lance-leaved figwort may be present.

Whitebark Pine

In addition to a commitment to protect and preserve all individuals in the proposed CRA, the following measures from the proposed recovery strategy for the whitebark pine (Environment and Climate Change Canada, 2017) should be implemented to manage potential risk:

- Minimizing negative impacts of wildfire and/or prescribed fire in areas deemed important to whitebark pine recovery;
- Ensure a sufficient amount of suitable habitat persists across current and potential range of whitebark pine;
- Improve mapping and inventory data to meet objectives and address other threats; and
- Minimize localized and contribution to cumulative effects causing or contributing mortality to whitebark pine individuals that are cone-bearing, and/or that are not terminally-infected with a pathogen.

Based on the recovery strategy, the following mitigation measures are suggested:

- Any identified individuals will be protected from disturbance and should be reported to the BC CDC (https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre).
- No planting of other competing tree species in potential whitebark pine habitat;
- Ensure construction equipment is clean.

6.4.1.2 Rare and Endangered Ecological Communities

The two rare plant communities identified as potentially occurring within the CRA are not anticipated to be affected by the Zincton project. As such, no specific mitigation measures are suggested.

6.4.1.3 Invasive Plant Species

A number of invasive plants are identified and of concern in the proposed CRA. The proponent should be vigilant, identifying and destroying invasive plants as they are discovered. Based on the recovery strategy, the following mitigation measures are suggested:

- Identify suspected invasive plant species within project area.
- Report invasive species to the Central Kootenay Invasive Species Society at 1-844-352-1160, or a report can be submitted through www.ckiss.ca.
- Ensure construction equipment is clean before arriving to site.

6.4.1.4 Vegetation Loss

Some loss of trees and ground cover vegetation may occur during installation of lift towers, and the lodge. The Ministry of Environment, Wildlife Guidelines for Backcountry Tourism / Commercial Recreation for non-motorized winter sports, applicable for grasslands, forests and alpine/tundra may be most appropriate and should be followed.

- Minimize vegetation removal where possible.
- Protect habitat of endangered species and ecosystems within the operating area.
- Avoid damage to or removal of wildlife trees.
- Old growth stands or significant veteran trees should be protected where possible.

6.4.1.5 Old Growth Forest

Old growth forest will not be harvested. Therefore, no mitigation measures are proposed.

6.4.2 Wildlife

6.4.2.1 Western Toad

Risks to western toad are linked to road traffic mortality and loss of terrestrial habitat, neither of which would be contributed to by the proposal. The following mitigation measures are presented to further contribute to risk reduction.

- Approach the Valhalla Wilderness Society and Kootenay Conservation Project for potential collaboration opportunities to aid in the existing Highway 31A western toad mortalities mitigation measures. Current mitigation measures include toadlet migration fencing and toadlet bridge beneath Goat Creek Highway Bridge(Kootenay Conservation Program, 2020).
- Encourage public transport initiatives, such as the proposed EV or Hydrogen Shuttle buses, between Kaslo, Zincton, and New Denver to reduce traffic volumes on Highway #31A.
- Any clearing within Pod A for lift alignments, egress routes and gladed areas should retain trees, shrubs logs and stumps as much as possible, which could provide cover or hibernacula for toads and other amphibians (Wind, 2020).
- If stumps and coarse woody debris are required to be removed in Pod A, removal should occur outside of the hibernating time for western toads of November to February (Wind, 2020).
- Ensure water quality at Bear and Fish Lake is maintained by protecting upland drainages during operations within the CRA including construction and operation of the backcountry lodge.
- When developing the resort master plan, designs should follow the *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia (2014).*

6.4.2.2 Mountain Goat

British Columbia adopted guidelines to restrict nonmotorized ground-based activities in open areas in relation to large mammals within 100 m line-of-sight (Mountain Goat Management Team, 2010). These

specific mitigation recommendations apply consistently to all forms of recreational activity within the province:

- In order to minimize impact to mountain goats, a survey should be conducted to determine the extent of active habitat used within the proposed Zincton CRA. In addition, the potential location of minerals licks should be identified, and their use verified. Ground disturbance should then avoid damaging any mineral licks and a minimum 100 m buffer of intact forest around significant licks should be maintained (Ministry of Environment and Climate Change Strategy, Ecosystems Branch, 2018);
- During the designated winter (1 Nov. – 30 Apr.) and kidding/early rearing periods (1 May – 15 July), ground access should be restricted within 500 m of mountain goat habitat by motorized activities (snowcats, snowmobiles, ATVs, etc.), and by 100 m by nonmotorized activities (ski touring, ice climbing, etc.);
- Develop facilities, trails, and/or roads away from mountain goat winter range, kidding/early rearing ranges, and mineral lick areas;
- Establish and only use designated travel routes to make human use of areas as predictable as possible; and
- Identify potential conflicts and develop mitigative strategies.

6.4.2.3 Southern Mountain Caribou

The proposed CRA is spatially separated from identified core and critical habitat. A draft Phase 1 of the Central Selkirks Herd Management Plan for southern mountain caribou recovery lists directives and recommends actions to protect and restore caribou habitat areas. The plan lists impacts from recreation activities that occur directly within caribou habitat and recommends restrictions on snowmobiling, heli-skiing and cat-skiing within these critical habitat areas. The establishment of the proposed CRA would provide an area for controlled recreation with non-motorized lift accessed activities outside of all critical habitat for the south mountain caribou and may be considered a highest and best use of the land compared to surrounding motorized recreational tourism tenures use (including heli-skiing, snowmobiling and cat-skiing). The herd management plan also lists highway #31A as being located 13 km south of the Nakusp current distribution range (core habitat) boundary and recognizes that caribou interactions with this highway corridor are likely rare (BC Caribou Recovery Team, 2020).

The proposal should consider caribou stewardship if the Central Selkirk Herd expands its range in the future or if individuals enter the area.

- During the resort master planning stage, the BC Caribou Recovery Team should be contacted for updates concerning the adjacent critical habitat from the in-progress Central Selkirks Herd Management Plan from the bilateral conservation agreement between Canada and British Columbia.
- Establishment of the CRA provides an opportunity to manage and potentially remove motorized recreation within the proposed area which could reduce potential stress impacts to the adjacent critical habitat area.
- Ensure the *Wildlife Guidelines for Backcountry Tourism/Commercial Recreation in British Columbia* (British Columbia Ministry of Environment, Lands and Parks, 2001) regarding mountain caribou are implemented in the resort master plan. If mountain caribou are observed in the operating area management results for mountain caribou during non-motorized recreation include maintaining distances of up to 100 m from the animal to prevent changes in behaviour which may result in operating area closures (British Columbia Ministry of Environment, Lands and Parks, 2001).

6.4.2.4 Grizzly bear

Grizzly bears are known to use the area and it has a long tradition of uncontrolled recreational use. Public and agency response to the EOI identified potential effects ranging from loss of habitat due to development, the presence of humans reducing habitat attractiveness and impaired connectivity between populations. The level and veracity of these identified potential impacts is not known and merits further study. The following approach is suggested to avoid impacts through design and best management practices or to mitigate potential effects:

- Identify the location of potential bear dens and ensure the proposed infrastructure and activity doesn't impact the identified dens.
- The impact on habitat quality will be minimized by implementing a Protection Zone during the summer months. Part of the CRA is currently tenured to Retallack for mountain biking. Mountain biking is a risk for negative bear-human interaction. Due to the fast speed and quiet nature of bikers, it can result in sudden and unexpected encounters. Herrerro and Herrerro suggest that grizzly bears are more likely to attack if a human is closer than 50 m before being detected (Herrero and Herrero, 2000) (from (Wildsight, 2020)). The proposed Zincton CRA will have no mountain biking in the Protection Zone, which should eliminate mountain bike-bear interactions mitigate impact potential.
- To minimize negative human bear encounters, a grizzly bear education and signage program should be implemented with a goal of ensuring that all visitors and public are aware of the risks and impacts associated with human-bear interactions. The program should include best practices to reduce negative human-bear interactions. Signage should include, but is not limited to, designated trails locations, and on leash- dog areas, sensitive times of the year as it relates to wildlife use, trail etiquette, etc. in addition visitors should be discouraged from picking wild berries which are an important food source for bears.
- Given the impact of off-leash dogs on wildlife, dogs should be kept on-leash at all times on any trails within the proposed Zincton CRA. No pets, or a leashed pets policy, should be considered to prevent negative interactions with wildlife.
- To avoid bear habituation, grizzly bear attractants should be avoided in restorative planting in the proposed CRA.
- To minimize impact to grizzly bears, a Wildlife Management Plan should be prepared prior to commencement of the construction phase. This plan should include a wildlife human interaction prevention plan that will address workers behavior around wildlife. Workers should be taught adequate behavior around wildlife to prevent wildlife harassment or attraction.

6.4.2.5 Wolverine

As described in section 5.4.2.5, wolverines utilize large ranges which due to their size are hard to protect and manage. In the absence of confirmed sightings, utilization should be assumed. Female wolverines have a greater negative association to anthropogenic features than males and have more easily described habitat requirements. Therefore, impact mitigation focuses on female habitat preferences.

- Collaborate with South Columbia Mountains Wolverine Project staff to help identify potential female denning habitat and any known den sites within the proposed Zincton CRA. Develop a management plan for wolverine during operations based on the management guidelines for recreation and industry currently being developed by the team (Hausleitner, 2021).
- Confirm active use of marmot habitat and protect as a potential food source for wolverine.
- If preferred habitat for wolverine is found within the Zincton area e.g. marmot colonies, avalanche terrain producing late spring snow, then investigate restricting ski access or summer recreation closures.

- Control motorized recreation on existing FSR's within the proposed Zincton CRA to prevent disturbance in the Kane Creek watershed and within the alpine bowls.
- Enact the commercial summer closure area to facilitate wolverine movement in the connection corridor (Map 4).
- Consult *Wildlife Guidelines for Backcountry Tourism/Commercial Recreation in British Columbia* (British Columbia Ministry of Environment, Lands and Parks, 2001) in formation of a wolverine management plan. Ensure desired behaviours with results to minimize physiological and behavioural disruption and changes of habitat for direct disturbance of wildlife are implemented and indicators and limits actively monitored during operation to mitigate effect on the wolverine population. Special management results for wolverine during non-motorized recreation include protecting known den sites with a desired behaviour of 100 m default buffer from known wolverine dens in the area and with seasonal closures if necessary (British Columbia Ministry of Environment, Lands and Parks, 2001).

6.4.3 Valued Ecosystem Components

6.4.3.1 Wildlife trees

Wildlife trees may need to be removed for safety reasons. However, their ecosystem value is recognized and prior to removal the following measure will mitigate the impact of their loss.

- Surveys should be conducted to determine location of wildlife trees near any proposed works that may be providing residence habitat for SARA listed species and avoid impact to those trees.
- Pre-construction bird nest surveys should be conducted if timber is to be removed between April 1 and August 31, in order to comply with the *Migratory Bird Convention Act*.

6.4.3.2 Whitebark Pine

Whitebark pine is not plentiful on London Ridge and observed individuals tend to be located in the Kane Creek side of the ridge. To achieve the goal of protecting whitebark pine, the following approach is suggested.

- A survey should be conducted by a QEP in proposed disturbance sites that require tree clearing and are within the identified whitebark pine range (see Map 19: Rare and Endangered Plant Species).
- Identified trees should be identified, located by GPS, and protected.
- Construction equipment used on site should be cleaned to prevent spread of White Pine Blister Rust (See section 4.4.1.2.3).

6.4.3.3 Wildlife Connectivity Corridor

As per the Kootenay-Boundary Higher Level Plan Order (BC Government, 2020), connected patches of the mature/old growth forest should be preserved to maintain the connectivity corridor. Species specific mitigation regarding wildlife movement can be found in section 6.4.2 to 6.4.2.5.

- All proposed plans should strive to protect the function of the wildlife connectivity corridor through design and management of activities.

6.4.3.4 Rocky Outcrop and Talus Slope

A very small portion of the proposed CRA is composed of rocky outcrops or talus slopes and no disturbance is proposed in these areas. However, in recognition as a valued ecosystem component, the following mitigation measure is suggested.

- The location of listed species dens or residence within rocky outcrops or talus slopes should be determined prior to any disturbance. Avoid any damage to listed species dens or residences.

6.4.3.5 Avalanche Chute

The existing vegetated condition of avalanche chutes should be left undisturbed for their habitat value to wildlife.

6.4.3.6 Mineral Lick

The value of mineral licks is recognized and the following efforts should be considered:

- Location of any mineral licks should be identified using game cameras and located with GPS.
- Due to their importance for ungulate survival, identified mineral licks should be preserved.

6.4.3.7 Huckleberry Patches

Huckleberry patches should not be impacted by the proposed plans. However, recognizing their importance to grizzly bears, efforts should focus on protection and monitoring utilization by bears.

- In order to reduce impacts on grizzly bear, brush cutting of huckleberry patches should be minimized.
- Prevent or reduce access to huckleberry patches during berry season (late July – late September) in order to minimize human disturbance to female grizzly bears. (Proctor et al., 2017).

7 Recommendations and Conclusions

In addition to the mitigation opportunities and measures presented in section 6 Opportunities/Mitigation Strategies, a number of additional recommendations are presented herein in an effort to further avoid or reduce potential adverse impacts that may be associated with the project.

7.1 Cultural Environment

7.1.1 Indigenous Communities

Follow the recommended mitigation measures presented in section 6.1.1. Most importantly, continue to engage local Indigenous communities to investigate opportunities for collaboration and capacity building.

Conclusion

Subject to the outcome of formal consultation by the province and ongoing engagement by the proponent, no significant adverse effects are identified in this Overview Assessment.

7.1.2 Anthropogenic Features

In addition to the measures presented in section 6.1.2. pursue the Zincton Institute initiative and it's vision of reducing the legacy impacts from the abandoned mines on site using the 1% model (1% for the Planet, n.d.). Focus on improving water quality by diverting surface water away from mine tailings.

Conclusion

All existing identified anthropogenic features will be protected and as a result, no significant adverse impacts to existing features are identified in this Overview Assessment.

7.1.2.1 Infrastructure

Identified infrastructure improvements associated with this project should be limited to that required to support the lifts including access and egress routes. Minimal impact on the ground should remain a priority and the amount of soils disturbance and vegetation removal should be avoided with an aim to leave as much of the proposed Zinction CRA as possible in its existing state.

Conclusions

The spatial extent of the effects is estimated to be approximately 9.4 ha or 0.002% of the proposed CRA. Further, the impacts are limited to the Pod A Lift Serviced Zone which is adjacent to the privately held base area lands. As a result, installation of lifts and infrastructure should not affect environmentally sensitive areas, rare or endangered plant communities or critical wildlife habitat. Therefore, the impacts associated with infrastructure should not be significant.

7.1.2.2 Backcountry Lodge

Situate the Backcountry Lodge in a location that minimizes ground disturbance while taking advantage of solar exposure and proximity to the septic field. Use environmental best practices in design and materials selection for the structure.

Conclusions

Construction and operation of the proposed Backcountry Lodge has potential for impact arising from access, servicing, and operations as related to ground disturbance. If it is based on the BC backcountry hut model, with "leave no trace" and "pack it in, pack it out" ethics, the potential for adverse effects should be minimized.

7.1.3 Recreational Activities

Section 6.1.3 discusses mitigation measures for reducing impact on public recreation. The additional recommendations in this section focus on overall management of the land base within the proposed CRA with an objective to minimize the overall impact of recreation.

Designate the CRA as non-mechanized with only self-propelled activities like skiing and hiking. Work with local recreation groups and interests to develop a Backcountry Access Plan and facilitate safe and responsible access to the CRA.

Manage recreational activities to protect wildlife and wildlife habitat.

Develop a comprehensive signage program for wayfinding, safety and environmental education.

Conclusions

Depending on the intensity, type, and level of recreational use within the proposed CRA, the effects of recreation should be compatible with existing use. The level of use proposed by the EOI should not result in significant adverse effects.

7.1.4 Other Land Uses

7.1.4.1 Forestry

In anticipation of a decision regarding forestry within the proposed CRA, relationships should be established with active licensee holders Interfor and BCTS which overlap the proposed CRA area and discussions should take place during the resort master planning process.

Conclusions

The removal of forestry and harvesting within the proposed Zincton CRA area would provide an opportunity to retain mature and old growth forest stands benefiting wildlife and ecosystem diversity within the connection corridor. The establishment of the proposed Zincton CRA would likely improve environmental values if forestry was removed from the working forest. Agreements would likely be formed as with other ski areas in the province between the involved parties.

7.1.4.2 Mining

Zincton should anticipate that existing mineral claims will continue even if the proposed CRA is established. Discussion and agreements with active mineral title holders should continue within the proposed CRA area throughout the resort master planning process.

The establishment of the CRA could also provide an opportunity to remediate past mining areas of environmental concern with Zincton committing to assist remediation actions by diverting 1 % of its ski revenue. All mineral claim tenures should be consulted throughout the application and establishment of the CRA for the formation of agreements.

Conclusions

Mining rights have an historical standing in BC and with 58 registered mineral claim tenures within the proposed CRA mineral claims rights may be affected by the establishment of the CRA. The establishment of the CRA could potentially restrict further mining in an area which has seen historical mining producing potential areas of environmental concern in the form of waste rock dumps, tailing dumps, ore storage handling and transportation areas, ore processing areas and diesel and hydroelectric generation in the Retallack mining district (Bear Environmental Limited, 2020).

7.1.4.3 Trapline Areas

The trapline area licensee holder (TR0417T006) and adjacent trapline area licensees should be consulted throughout the resort master planning process for input on access points and operational wildlife measures used to mitigate effects on fur bearing resource within the area.

Conclusion

The proposed commercial operation closure of 78% of the CRA during the summer months should accommodate continued trapping activities.

7.1.4.4 Local Government and Official Community Plan

Local communities surrounding Zincton should be kept informed of the resort master planning process through public engagement. Initiatives should be explored to promote local business, local hiring and resident housing initiatives.

Conclusions

The RDKB found the proposed Zincton CRA to be generally consistent with the OCP. Local community involvement will continue in the resort master planning process, including open house formats to gather community input.

7.1.4.5 Higher Level Land Use Plans

Retain as much old and mature forest to ensure the mature/old forest connectivity corridor KBLUP land use objective is met. Water quality objectives are to be protected to ensure the land use objective for protection of water intake points for human consumption is achieved.

Conclusions

The proposed CRA and current plans are generally compatible with the KBLUP land use objectives and would produce a much higher target retention rate of old and mature forest rate than set targets for forestry operations. Analysis of current development plans found 0.4 % of mature forest and no old forest would be impacted in the proposed CRA.

Listed water diversion points for human consumption would not be impacted from development or operation of the backcountry resort.

7.2 Physical Environment

7.2.1 Climate

There are no significant impacts identified and no additional recommendations at this time.

Conclusion

Climate and climate change is not expected to have a significant impact on the proposed project. Nor is the project expected to result in any measurable effect on the climate or climate change.

7.2.2 Geology and Geomorphology

Geotechnical studies may be required for lifts and building sites within the proposed CRA.

Conclusion

The geology and geomorphology of the proposed CRA should not be altered significantly by the proposed project.

7.2.3 Soils

Recommendations for mitigating impacts associated with soil erosion are addressed in section 6.2.3.

Conclusion

Soil erosion from the limited disturbance associated with the project can be mitigated through best practices.

7.2.4 Hydrology

Risks to hydrology and water quality can by mitigated through maintaining riparian buffers and adhering to best management practices for the protection of water quality. This includes minimizing stream crossings, maintaining natural drainage patterns and protecting riparian buffers.

Conclusions

The overall effect on hydrology and of the project area should not be altered significantly by the proposed Zincton CRA, provided appropriate management planning is implemented.

Water quality for all watercourses within the project boundary as well as downstream fish bearing waters should be similarly unaffected.

Avalanche risk will likely be reduced with the ability to actively assess conditions, manage avalanches and close areas when the risk is high.

7.3 Aquatic Environment

The potential impacts to water quality arising from ground disturbance can be avoided by protecting riparian and by using sound, environmentally prudent construction techniques. Any riparian vegetation that is disturbed as a result of a stream crossing should be replanted using native riparian shrubs and trees.

Stream crossings should be minimized. If stream crossings are required, the proponent should consider installing clear span bridges rather than culverts or fords.

All watercourses should be protected. Redirection of runoff should only occur to improve water quality by diverting surface water away from mine tailings.

Implement stormwater management plans that use BMPs to protect the ecological values of receiving waters. In addition to the operational storm-water management, a drainage plan should also be developed to deal with concerns related to construction activities. This plan should adhere to the Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC Ministry of Environment, 2012).

Conclusions

The proposed project is not anticipated to adversely impact the aquatic environment. There is an opportunity for the proponent to mitigate past producing mine sites which may have contributed to high concentrations of elements in sediment basin within the proposed CRA.

7.4 Terrestrial Environment

7.4.1 Vegetation

7.4.1.1 Rare and Endangered Plant Species

In addition to the measures for protecting whitebark pine suggested in section 6.4.1.1 and 6.4.3.2, additional efforts to enhance habitat should be considered. Selective removal of competing conifer species and/or other encroaching vegetation may help promote whitebark pine health. Avoiding construction of roads, trails and corridors near whitebark pine may protect biophysical attributes of habitat. Appropriately sighting to avoid destruction of soil substrates required for regeneration will contribute to stand health.

Field surveys for rare and endangered species should be undertaken prior to clearing for those specific species identified as 'possible' from the Potential Occurrence column in Table 16 and Table 17.

Conclusion

Protection of rare and endangered plant species should be achievable during construction and operation of the project.

7.4.1.2 Rare and Endangered Plant Communities

Rare and Endangered Plant Communities should be protected during construction and operation of Zincton.

Conclusion

Current plans of the lifts, lodge, egress trails and ski routes are not anticipated to affect potential habitat for the two rare and endangered ecological communities identified as potentially occurring within the proposed CRA: *Subalpine fir / black huckleberry / bear-grass* ESSFwc4/00 or the identified *Western redcedar – western hemlock / common horsetail* ICHmw2/111.

7.4.1.3 Invasive Plant Species

Zincton should actively manage the proposed CRA for eradication of invasive plant species.

Conclusions

The construction and operations within the proposed CRA provide an opportunity to remove invasive species through mechanical controls, increased identification and reporting to CKISS. This is anticipated to benefit the invasive species management in the region.

7.4.1.4 Vegetation Loss

Zincton should strive to minimize all losses of vegetation with emphasis on Old Forest protection.

Conclusion

Coordination with forest tenure holders should help protect identified Old Forest areas by articulating the value of old forests to Zincton.

7.4.2 Wildlife

Wildlife values for species at risk are probably being impacted by existing unmanaged land use activities. Unless managed for protection of wildlife, human disturbance from public recreation and forestry is likely to continue to occur with or without Zincton.

Identified species at risk are considered below.

7.4.2.1 Western Toad

Include a section on potential upland habitat and hibernacula for western toads in construction environmental management plans.

Conclusions

Western toad migration from Fish and Bear Lake is currently managed by erecting barriers that prevent crossing of Highway 31A and which also directs toads to a safe culvert crossing under the highway. The migration fencing limits access to the upland habitat of the proposed CRA. These two migration barriers on Fish and Bear lake reduce the level of utilization of western toad in the proposed CRA.

Winter and summer recreation and operation of Zincton is not expected to impact the terrestrial habitat as recreation activities are unlikely to disturb terrestrial habitat features of the western toad. If mitigation measures are implemented, impact on western toad population should be minimal.

7.4.2.2 Mountain Goat

Hunting could be banned within the proposed CRA to extend protection beyond the park.

Conclusion

Mountain goat may be present within the CRA. However, if mitigation measures presented in this report are implemented, the impact to mountain goat should be minimal.

7.4.2.3 Southern Mountain Caribou

Develop a support relationship with the BC Caribou Recovery Team to promote protection of critical habitat for southern mountain caribou.

Conclusions

No current subpopulation distribution ranges (core habitat) or matrix habitat ranges for southern mountain caribou are within the proposed CRA or the study area. The proposed CRA area is classified as extirpated of southern mountain caribou populations. As such, activity from Zincton will likely be low risk to caribou if they continue utilizing the identified critical habitat.

Traffic volumes from Zincton on Highway #31A are expected to have minimal impact on south mountain caribou.

7.4.2.4 Grizzly Bear

Zincton should support research into the local grizzly bear population and adopt a stewardship role in their protection. Stewardship efforts should focus on monitoring grizzly bear dens, supporting summer closure areas and ensuring the connectivity corridor is maintained across the proposed CRA. Stewardship should also include developing and delivering education programs about proper practices in grizzly bear country.

Conclusions

The proposed Zincton CRA is located within identified grizzly bear habitat and the connectivity corridor. The proposed use of the CRA may impact the grizzly bear population, but with the implementation of the mitigation measures presented in this report, the impact should be minimized.

7.4.2.5 Wolverine

Engage with South Columbia Mountains Wolverine Project staff and adopt a stewardship role. Develop BMP's for wolverine during operation as per the *Wildlife Guidelines for Backcountry Tourism/Commercial Recreation in British Columbia*.

Conclusions

The proposed Zincton CRA is within the home ranges of wolverine and would provide an opportunity for controlled use in the area which currently sees unmanaged public recreation. The establishment of the CRA could allow collaboration with the South Columbia Mountains Wolverine Project staff in production of a wolverine operational management plan and allow study of the area for identification of potential wolverine denning sites.

7.4.3 Valued Ecosystem Components

7.4.3.1 Wildlife trees

Record the location of observed wildlife trees as they are encountered and build a GIS inventory that can be used to monitor residence by wildlife and SARA listed species.

Conclusion

Protection of wildlife trees that do not pose a safety risk should be achievable with this proposal.

7.4.3.2 Whitebark Pine

A survey by a QEP should identify all whitebark pine in disturbance areas in and around the identified whitebark pine range (Map 19).

Conclusion

Protection of whitebark pine and enhancement of its habitat to promote heath of individuals should be achievable with this proposal.

7.4.3.3 Wildlife Connectivity Corridor

The corridor should be managed to maintain connectivity as per the Kootenay-Boundary Higher Level Plan Order (BC Government, 2020). Corridor management should be addressed in the environmental management plan.

Conclusion

With a commitment of stewardship by the proponent and support by the Province, protection of the connectivity corridor should be achievable under the operation of Zincton.

7.4.3.4 Rocky outcrop and Talus Slope

Location rocky outcrop or talus slopes should be located and included in the GIS inventory.

Conclusion

Zincton will avoid disturbance of identified and valued rocky outcrops and talus slopes.

7.4.3.5 Avalanche Chute

Except for avalanche control efforts to ensure safety in the winter, avalanche chutes should be left undisturbed by Zincton.

Conclusion

Avalanche chutes will be protected.

7.4.3.6 Mineral Lick

Location of any mineral licks should be identified and compiled in the GIS. Plans should avoid disturbance in proximity to mineral licks.

Conclusion

Protection of identified mineral licks should be achievable.

7.4.3.7 Huckleberry Patches

Avoid clearing in huckleberry patches and minimize human activity around patches between late July and late September.

Conclusion

Protection of huckleberry patches should be achievable.

7.5 General Conclusions

Based on the information reviewed, the proposed project area appears to be suitable for use as a backcountry resort including associated facilities provided that potential adverse impacts arising from construction and operation are mitigated following the strategies and general recommendations described in sections 6 and 7, respectively. In addition, the Environmental Overview Assessment has identified a number of environmental opportunities and constraints. The opportunities and constraints discussed in this report should be considered by the proponent if the backcountry resort proceeds.

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Appendices

Appendix A: Mineral Inventories

Table 25: Mineral Inventories within the Proposed Zincton CRA

MINFILE Number	Name	Status	Commodity	Deposit types
082KSW100	KAT	Showing	AG, PB, ZN	I05
082KSW027	MINER BOY (L.4915), MINER BOY GROUP, MINER BOY MINE, SEATTLE (L.4178), REDRUTHITE, TIP TOP FR.	Past Producer	AG, PB, CU	I05
082KSW021	PEORIA (L.3318), PEORIA GROUP, SNOWFLAKE (L.3320), HARRIET (L.3319), CODY FR.	Prospect	AG, PB	I05
082KSW022	GRINGO (L.6813)	Prospect	PB	I05
082KSW023	LUCKY JIM, ZINCTON, LUCKY JIM (L.844), ST. GEORGE (L.846), SHIELDS (L.847), DRAGON (L.848), SHILOH (L.850), JOHN PLUMMER FR. (L.851), ROADLEY (L.858), BLACKBIRD (L.4180), BESSIE (L.4183), NONPARIEL FR. (L.4554), CENTURY FR. (L.4557), ISIS (L.4873), HIGHLAND.	Past Producer	ZN, AG, PB, CD, AU, SN	I05, J01
082KSW024	NIL DESPERANDUM (L.2806)	Prospect	AG, PB, ZN, CU	I05
082KSW025	MCALLISTER, MCALLISTER GROUP, MCALLISTER MINE, RIDGEWAY (L.11898), SILVER QUEEN (L.11899), SILVER KING (L.11900), ROUSE FR. (L.11901), PROVINCE	Past Producer	AG, AU, PB, ZN, CU	I05
082KSW026	JO-JO (L.1839), JO JO, JO JO GROUP, JO JO MINE, HALTON CHIEF (L.2158), JOE JOE, JO-JO, MINER BOY GROUP	Past Producer	AG, PB, ZN, AU, CU	I05
082KSW028	SILVER GLANCE (L.3829), SILVER GLANCE MINE, SUMMIT QUEEN (L.3830), SILVER GLANCE FR. (L.12633)	Past Producer	AG, PB, AU, CU	I05
082KSW029	HILLSIDE	Past Producer	AG, CU	I05
082KSW030	WELLINGTON (L.553), WELLINGTON MINE, WELLINGTON GROUP, BLEUCHER, BLUTCHER (L.3633), IC (L.2283), IVANHOE (L.1195), OTTAWA (L.1196), METIS (L.3636), TIGER NO. 2 (L.2273), AY (L.2272), HAZEL (L.2639), HOMESTAKE (L.12414), PORCUPINE, LEO #1, HS FR.	Past Producer	AG, PB, ZN, AU, CU	I05
082KSW031	CHARLESTON (L.2091), CHARLESTONE, KEYSTONE (L.2179), COLORADO (L.1476), COREAN (L.6288), KINGSTON (L.3104)	Past Producer	ZN, AG, PB, AU, CD, CU, SB	I05
082KSW032	GOLD QUARTZ, GOLD QUARTZ NO. 1-9, COTTON TAIL, COTTON TAIL FR. NO. 1-2, WHITEWATER, WHITEWATER 1-3	Prospect	AG, AU, PB, ZN, CU	I05
082KSW033	WHITEWATER (L.1170), DAVYS, WHITEWATER DEEP FR. (L.2268), IRENE (L.1171), MYRTLE R. (L.1418), TENNIE C. (L.1419), ELKHORN (L.2428), LITTLE RALPH (L.2429), BRESLAU (L.2430), HUSTLER (L.2431), ALPHA NO. 1, PAUPERS DREAM, NANCY HANKS (L.1421), MAUDE S. (L.14Past Producer	Past Producer	AG, ZN, PB, AU, CD, CU	I05, J01
082KSW034	METLAKAHTLA (L.3334), WHITEWATER DEEP FR., PETE	Prospect	ZN, PB, CU, AG, AU	I05, J01
082KSW035	DOHERTY (L.12402), IRON HAND, IRON DUKE (L.3190)	Past Producer	ZN, PB, AU, AG, CD	J01, I05

MINFILE Number	Name	Status	Commodity	Deposit types
082KSW036	OHIO	Past Producer	CU, AG, AU, PB	I05
082KSW037	HIGHLAND SURPRISE, PHOENIX (L.3336), FLETCHER (L.5608), CUBA (L.5609), PAISLEY (L.5612), WHISTLER (L.5614), CONNIE FR. NO. 2 (L.5818), COLUMBIA FR., HAVANA (L.5610)	Past Producer	AU, AG, PB, ZN, CU	I05
082KSW038	EUREKA (L.5552), ALHAMBRA FR., TORONTO (L.4646), IRON CROWN (L.2152), KENNETH (L.2153), MOUNT ROYAL (L.2154), BLUE RIDGE, CONDOR, GAP, FAITH, HOPE, CHARITY, LITTLE WINNIE, AGNES, LILLIAN, G. HYDE	Past Producer	AG, PB, AU, ZN, CU	I05
082KSW039	VERA, (L.2835), KOOTENAY STAR (L.2836), DEMOCRAT (L.2837), KOOTENAY STAR FR. (L.2838), TREADWELL (L.2830)	Prospect	PB, AU, AG, ZN	J01
082KSW041	CALEDONIA, CALADONIA (L.15415)	Past Producer	AG, PB, ZN, AU, CD	J01, I05
082KSW069	TOM, TOM 3, TIM, TIP, TAM, CHRIS, OLYMPUS	Showing	CU	I05
082KSW055	PANAMA (L.3152), PANAMA MINE, PANAMA GROUP, BOOSTER, BOURBON FR.	Past Producer	AG, CU, PB, ZN, AU	I05
082KSW058	REVENUE (L.2826)	Showing	ZN, AG, PB, CU	I05
082KSW064	SB 78, SB, BETTY JO, BJ, ELAINE, LOIS, PAM, DDS, RITA	Showing	NI, CU	M02
082KSW066	EK 78910, EK, TOM, CHRIS, TAM, TIM, TIP, OLYMPUS	Showing	AG, PB, CU	I05
082KSW068	SB 9, SB, PAM, BJ, BETTY JO, ELAINE, LOIS, DDS	Showing	CU, PB, AG	I05, G04
082KSW076	GARNET-CUBA, GARNETT (L.2842), CUBA (L.5609), CONNIE FR. NO. 2 (L.5818), WHISTLER (L.5614), PAISLEY (L.5612), EMERALD FR. (L.5821), RUBY FR. (L.5820), ROBIN (L.2509), WILD SWAN (L.2510), MAYFLOWER (L.4458), VIRGINIA (L.3337)	Showing	AU, CU	I05, G04
082KSW077	WILD SWAN (L.2510), ROBIN (L.2509), GARNETT (L.2842), CONNIE FR. NO. 2 (L.5818), WHISTLER (L.5614), PAISLEY (L.5612), EMERALD FR. (L.5821), RUBY FR. (L.5820), MAYFLOWER (L.4458), VIRGINIA (L.3337), CUBA (L.5609)	Showing	AU, CU	I05, G04
082KSW078	MAYFLOWER (L.4458), GARNETT (L.2842), CUBA (L.5609), CONNIE FR. NO. 2 (L.5818), WHISTLER (L.5614), PAISLEY (L.5612), EMERALD FR. (L.5821), RUBY FR. (L.5820), ROBIN (L.2509), WILD SWAN (L.2510), VIRGINIA (L.3337)	Showing	ZN, PB, AG, CU	G04
082KSW082	BLACK GROUSE, KANE, KANE 1-3	Past Producer	AG, PB, ZN, AU, CU	I05
082KSW085	SURE THING (L.4891)	Prospect	PB, AG	I05
082KSW115	LONDON HILL, LONDON HILL GROUP, LONDON (L.1416), THIRD OF JULY (L.1417), POMPEII, ROUND-UP FR.	Past Producer	AG, CU	I05
082KSW116	EMPRESS, EMPRESS MINE, KING (L.12626), QUEEN (L.12627), KING AND QUEEN	Past Producer	AG, AU, PB, CU, ZN	I05
082KSW135	MILTON (L.2159), MILTON GROUP, MILTON FR. (L.3825)	Prospect	AG, PB, ZN, CU	I05
082KSW136	MAGGIE BROWN, CHICKADEE (L.15018)	Prospect	PB	I05
082KSW137	HORSESHOE (L.3634), HORSESHOE MINE, HORSE SHOE	Past Producer	AG, PB	I05

MINFILE Number	Name	Status	Commodity	Deposit types
082KSW139	TOM 3, EK, CHRIS, TAM, TIM, TIP, OLYMPUS	Showing	AB, CH	M06
082KSW140	SUNSET (L.970)	Past Producer	AG, PB, ZN, CU	I05
082KSW142	IRON DUKE (L.3190), DOHERTY (L.12402), IRON HAND	Prospect	PB, AG	I05
082KSW144	VIRGINIA (L.3337), ROBIN (L.2509), WILD SWAN (L.2510), GARNETT (L.2842), MAYFLOWER (L.4458), CUBA (L.5609), PAISLEY (L.5612), WHISTLER (L.5614), CONNIE FR. NO. 2 (L.5818), RUBY FR. (L.5820), EMERALD FR. (L.5821)	Showing	TC, AB	M07
082KSW145	MOTHER LODE (L.15421), MOTHERLODE	Past Producer	AG, PB, ZN	I05
082KSW146	IBEX (L.1428), FLETCHER GROUP, PHOENIX GROUP, HIGHLAND SURPRISE, WHITEWATER 1-3, PAISLEY (L.5612), WHISTLER (L.5614), CUBA (L.5609), GARNETT (L.2842), RUBY FR. (L.5820), EMERALD FR. (L.5821)	Past Producer	AG, PB, CU, AU	I05
082KSW147	MONTE CHRISTO (L.4468)	Past Producer	AG, PB, ZN	I05
082KSW148	BOLLINGER, WHITEWATER 1-3, PAISLEY (L.5612), WHISTLER (L.5614), CUBA (L.5609), GARNETT (L.2842), RUBY FR. (L.5820), EMERALD FR. (L.5821)	Showing	AU, CU, PB	I05
082KSW150	CUBA, CUBA (L.5609)	Prospect	AU, AG	I01
082KSW160	MEGAN, MERIT, MERIT CENTRE, KATE, RICH, FAMOUS FR.	Showing	AG, PB, CU, ZN	I05
082KSW162	GOLD QUARTZ RIDGE	Prospect	AU, AG, CU	I01
082KSW163	GOLD QUARTZ B ZONE	Prospect	AU, AG, CU, PB	I01
082KSW174	OLYMPUS EAST, EK, TOM, CHRIS, TAM, TIM	Showing	PB, ZN, AG	I05
082KSW175	OLYMPUS WEST, EK, TOM, CHRIS, TAM, TIM	Showing	AG, PB, ZN, CU	I05
082KSW176	LEMAC, PAUPERS DREAM (L.1163), SLOPER FR. (L.5990), VANCOUVER (L.2024), KASLO (L.822)	Showing	AG, PB, ZN	I05
082KSW193	KANE CREEK	Showing	AU, AG, PB, ZN, CU	I05
082KSW199	KANE 4, KANE, KANE 1-3	Showing	AG, PB, ZN, AU, CU	I05

Appendix B: Wildlife Species at Risk

Table 26: Wildlife Species at Risk Potentially Occurring on the Proposed Zincton CRA

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Amphibians				
Blotched Tiger Salamander *Ambystoma mavortium*	Red	Endangered	Tiger salamanders inhabit almost any terrestrial habitat as long as it includes the required aquatic breeding habitat, such as a lake, reservoir, permanent and ephemeral pond, or stream pool. They range from warm lowlands to high mountains and spend much of their lives in rodent burrows.	Unlikely-outside of Okanagan distribution range
Western Toad *Anaxyrus boreas*	Yellow	Special Concern	Western Toads were observed in a variety of aquatic and terrestrial habitats. They breed in shallow, littoral zones of lakes, temporary and permanent pools and wetlands, bogs and fens, and roadside ditches (i.e., toads may be found in all lacustrine and palustrine habitats); Western Toads one of few amphibians found at high elevations (> 3,000 m).	Confirmed-Bear and Fish Lakes
Rocky Mountain Tailed Frog *Ascaphus montanus*	Blue	Threatened	Clear, cold swift-moving mountain streams with coarse substrate	Unlikely- endemic to foothills of Rocky Mountains
Northern Leopard Frog *Lithobates pipiens*	Red	Endangered	Northern leopard frogs live in the vicinity of springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes; usually they are in or near permanent water with rooted aquatic vegetation. In summer, they commonly inhabit wet meadows and fields. The frogs take cover underwater, in damp niches, or in caves when inactive. Wintering sites are usually underwater, though some frogs possibly overwinter underground.	Unlikely-prefers wetted wet meadows and fields
Coeur d'Alene Salamander *Plethodon idahoensis*	Yellow	Special Concern	Occupies steep gradient creeks, waterfall splash zones, rock walls or caves with seepages, deep, wet talus, and avalanche paths where there is fissured bedrock associated with moisture	Unlikely- distriction on the east side of Kootenay Lake in the Creston Valley
Arachnids				
Eremobates scaber	Red		No habitat info available	Unknown
Eremobates sp. 1	Red			
Eremobates sp. 2	Red			
Hemerotrecha sp. 1	Red			

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Birds				
Northern Goshawk, *atricapillus* subspecies *Accipiter gentilis atricapillus*	Blue		The Northern Goshawk prefers to breed in mature and old forests, particularly coniferous stands, but will also readily use Trembling Aspen	Possible
Clark's Grebe *Aechmophorus clarkii*	Red		Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers. Nests among tall plants growing in water on edge of large areas of open water	Unlikely- no large areas of open water nearby
Western Grebe White-throated Swift *Aechmophorus occidentalis*	Red	Special Concern	Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers. Nests usually in or very close to water deep enough to allow bird to swim submerged.	Unlikley- no adjacent large waterbodies
White-throated Swift *Aeronautes saxatalis*	Blue		Primarily mountainous country, especially near cliffs and canyons where breeding occurs; forages over forest and open situations in a variety of habitats. Nests in rock crevices in cliffs and canyons. Sometimes nests in buildings, and on seacliffs.	Possible
Great Blue Heron, *herodias* subspecies *Ardea herodias herodias*	Blue		Aquatic areas <0.5 m deep, fish bearing streams and rivers, undisturbed nesting in tall trees. Closest known occurrence is Lost Lake.	Possible- fish bearing streams
Short-eared Owl *Asio flammeus*	Blue	Special Concern	This species can be found in open spaces of many kinds, such as estuaries, grasslands, marshes, fields, tundra, alpine meadows and forest clearings. Nests are built on the ground by the female in long grasses and vegetation usually be water	Possible
Upland Sandpiper *Bartramia longicauda*	Red		This species is closely tied to tallgrass, and occasionally midgrass, prairie habitats when for nesting, but tends to prefer shortgrass habitats for foraging. Migrants observed in southern and central B.C. are generally found in open habitats such as golf courses, agricultural fields, airports, pastures, wet meadows, lakeshores, mudflats, coastal dunes, and beaches, and this species tends to show a preference for upland habitats over coastal environments.	Unlikely
American Bittern *Botaurus lentiginosus*	Blue		Nests primarily in inland freshwater wetlands tied closely with extensive tall emergent vegetation (e.g., cattails, tules)	Possible-summer vagrant

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Rough-legged Hawk *Buteo lagopus*	Blue		grasslands, field, marshes, sagebrush flats, and open cultivated areas. Nests on cliffs (typically) or in trees in arctic and subarctic, in tundra, mountain sides, forests with plenty of open ground.	Unlikely
Broad-winged Hawk *Buteo platypterus*	Blue		In British Columbia, Broad-winged Hawks were recorded in trembling aspen woodland during migration and in mixed deciduous woodland during the summer. Broad-winged Hawks typically select breeding territories within large patches of undisturbed deciduous or mixed forests (Goodrich et al. 1996), often near wet areas and forest openings and on a slope.	Unlikely- not in confirmed population range
Swainson's Hawk *Buteo swainsoni*	Red		Savanna, open pine-oak woodland and cultivated lands with scattered trees.	Unlikely
Green Heron *Butorides virescens*	Blue		Green Herons occur largely at low elevations, below 250 m.	Unlikely
Canyon Wren *Catherpes mexicanus*	Blue		The Canyon Wren inhabits cliffs, rockslides, talus slopes, and steep boulder fields in open Ponderosa Pine (Pinus ponderosa) forest and dry grasslands.	Unlikely
Lark Sparrow *Chondestes grammacus*	Blue		The Lark Sparrow is largely restricted to shrub-steppe grassland with perennial grasses, open ground, Antelope Brush Purshia tridentata and sparse Big Sagebrush Artemisia tridentata (Campbell et al. 2001). It is a bird of low elevations in the interior, usually found along the valley bottoms, but also occurs on suitable higher slopes	Unlikely
Common Nighthawk *Chordeiles minor*	Yellow	Threatened	Habitats include mountains and plains in open and semi-open areas: open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area.	Possible
Evening Grosbeak *Coccothraustes vespertinus*	Yellow	Special Concern	Coniferous (primarily spruce and fir) and mixed coniferous- decidouous woodland, second growth, and occasionally parks; in migration and winter in a variety of forest and woodland habitats, and around human habitation.	Possible

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Yellow-billed Cuckoo *Coccyzus americanus*	Red		During the breeding season, the Yellow-billed Cuckoo is primarily associated with open, brushy deciduous woodlands, riparian groves, overgrown orchards, woodlots, parks, and abandoned farmlands.	Unlikely
Olive-sided Flycatcher *Contopus cooperi*	Blue	Threatened	Olive-sided flycatchers breed in various forest and woodland habitats: taiga, subalpine coniferous forest, mixed coniferous-deciduous forest, burned-over forest, spruce or tamarack bogs and other forested wetlands, and along the forested edges of lakes, ponds, and streams Most nesting sites contain dead standing trees, which are used as singing and feeding perches	Possible
Tundra Swan *Cygnus columbianus*	Blue		Lakes, sloughs, rivers, sometimes fields, in migration. Open tundra marshy lakes and ponds and sluggish streams in summer.	Unlikely
Black Swift *Cypseloides niger*	Blue	Endangered	Nests behind or next to waterfalls and wet cliffs	Unlikely
Bobolink *Dolichonyx oryzivorus*	Blue	Threatened	n British Columbia, the Bobolink breeds in large open areas of grass and broad-leaved forbs, such as Timothy-grass (Phleum pretense) and Alfalfa (Medicago sativa) fields, pastures, weedy fields, and moist meadows	Unlikely
White-headed Woodpecker *Dryobates albolarvatus*	Red	Endangered	Important habitat components are an abundance of mature ponderosa pines with abundant large seeds, relatively open canopy of 50-70 percent closure, and numerous snags and stumps for nest cavities	Unlikely
Horned Lark, *merrilli* subspecies *Eremophila alpestris merrilli*	Blue		Horned Larks are distributed through alpine regions of most of British Columbia's higher mountain ranges (the "Pallid" Horned Lark E. a. arcticola), and in open grassy landscapes and wider valley systems of the central and southern interior plateaus (the "Dusky" Horned Lark E. a. merrillii).	Possible
Rusty Blackbird *Euphagus carolinus*	Blue	Special Concern	The Rusty Blackbird breeds in northern swamps, wooded bogs, and along lake and stream borders. The bulk of the records in northern and central British Columbia	Unlikely

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Prairie Falcon *Falco mexicanus*	Red		The Prairie Falcon nests on cliffs, either within cavities or on ledges, in open, arid grassland habitats in the southern and central interior of British Columbia. Nests are located near water, usually adjacent to rivers.	Possible
Peregrine Falcon *Falco peregrinus*	No Status	Special Concern	Peregrines usually nest on rock ledges high on steep cliffs, mostly in undisturbed areas. “Nest” is hardly the word, though; the eggs are laid in a “scrape” on a part of the ledge that is sheltered by a rock overhang	Possible
Gyrfalcon *Falco rusticolus*	Blue		In British Columbia, the Gyrfalcon nests on cliff ledges on mountains in alpine areas, usually adjacent to rivers or lakes. Occasionally, it nests on cliffs of river banks and in abandoned Golden Eagle nests.	Possible
Barn swallow *Hirundo rustica*	Blue	Threatened	The Barn Swallow breeds in lowlands, valleys and on lower-elevation plateaus throughout British Columbia. is much more common below 250 m than above that elevation. However, can be seen in alpine meadows	Possible
Caspian Tern *Hydroprogne caspia*	Blue		Seacoasts, bays, estuaries, lakes, marshes, and rivers. Nests on sandy or gravelly beaches and shell banks along coasts or large inland lakes	Unlikely
Yellow-breasted Chat *Icteria virens*	Red	Endangered	The species is typically associated with shrubby and riparian habitats with open canopies and dense subcanopy layers	Unlikely-outside of known populations
California Gull *Larus californicus*	Blue		Seacoasts, bays, estuaries, mudflats, marshes, irrigated fields, lakes, ponds, dumps, cities, and agricultural lands	Unlikely
Short-billed Dowitcher *Limnodromus griseus*	Blue		mudflats, estuaries, shallow marshes, pools, ponds, flooded fields and sandy beaches	Unlikely
Western Screech-Owl *Megascops kennicottii*	No Status	Threatened	On the British Columbia coast, territories are often centred on stream courses lined with Bigleaf Maple (Acer macrophyllum), while in the interior, screech-owls are strongly tied to riparian woodlands dominated by Black Cottonwood (Populus trichocarpa), Water Birch (Betula occidentalis) and Trembling Aspen (Populus tremuloides).	Possible
Western Screech-Owl, *macfarlanei* subspecies *Megascops kennicottii macfarlanei*	Blue	Threatened		

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Lewis's Woodpecker *Melanerpes lewis*	Blue	Threatened	Three distinct habitats are used in British Columbia: open areas with scattered trees, riparian forests adjacent to open areas; and burns	Possible
Surf Scoter *Melanitta perspicillata*	Blue		primarily marine littoral areas, less frequently in bays or on freshwater lakes and rivers	Unlikely
Long-billed Curlew *Numenius americanus*	Blue	Special Concern	The Long-billed Curlew nests in shorter vegetation, preferring open grassland with few trees and lower densities of tall grasses and shrubs, e.g., sagebrush (Artemisia species)	Unlikely
Black-crowned Night-heron *Nycticorax nycticorax*	Red		Preferred nesting habitat in this part of the range is wetlands or brackish sloughs surrounded by tall willow (Salix), alder (Alnus) and birch (Betula) tree species	Unlikely- outside of known ranges
Sage Thrasher *Oreoscoptes montanus*	Red	Endangered	This species is associated with shrub-steppe habitats, and requires large (greater that 1m tall) sagebrush for nesting.	Unlikely- outside of known ranges
Band-tailed Pigeon *Patagioenas fasciata*	Blue	Special Concern	The species uses a variety of conifer and mixed deciduous forests with an understorey of fruiting shrubs, and has adapted to suburban and agricultural environments with sufficient tree cover	Unlikely
American White Pelican *Pelecanus erythrorhynchos*	Red		Nests are built on islands in lakes with little natural or human disturbance	Unlikely-outside of know population range
Double-crested Cormorant *Phalacrocorax auritus*	Blue		Lakes, ponds, rivers, lagoons, swamps, coastal bays, marine islands, and seacoasts; usually within sight of land. Nests on the ground or in trees in freshwater situations, and on coastal cliffs (	Unlikely
Red-necked Phalarope *Phalaropus lobatus*	Blue	Special Concern	Red-necked Phalaropes nest in wet subalpine sedge (Carex) and willow (Salix) clumps near small water bodies.	Unlikely- range in northern bc and alpine tunda
American Golden-Plover *Pluvialis dominica*	Blue		reeding birds are found on sparsely-vegetated, well-drained, rocky slopes (Johnson and Connors 2010); in British Columbia these habitats are primarily found in high alpine tundra (typically >1,500 m)	Unlikely
Eared Grebe *Podiceps nigricollis*	Blue		Marshes, ponds and lakes; in migration and winter also salt lakes, bays, estuaries and seacoasts	Unlikely

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Purple Martin *Progne subis*	Blue		Preferred habitats include shallow, freshwater marshes, ponds and lakes with emergent vegetation and an abundance of macroinvertebrates	Unlikely
American Avocet *Recurvirostra americana*	Blue		In British Columbia, the American Avocet is found in low-elevation areas with warm to hot summers. It forages in shallow (<25 cm deep), usually alkaline, freshwater ponds with high seasonal productivity of freshwater zooplankton and aquatic insects.	Unlikely
Bay-breasted Warbler *Setophaga castanea*	Red		In British Columbia, the Bay-breasted Warbler is most likely to be found breeding in boreal forests composed of White Spruce (Picea glauca) and associated Trembling Aspen (Populus tremuloides), Paper Birch (Betula papyrifera), Balsam Poplar (Populus balsamifera), willow (Salix), and alder (Alnus) species	Unlikely
Black-throated Green Warbler *Setophaga virens*	Blue		The Black-throated Green Warbler is found primarily in the Peace River watershed of the Boreal Plains	Unlikely
Williamson's Sapsucker *Sphyrapicus thyroideus*	Blue	Endangered	n British Columbia, the Williamson's Sapsucker breeds in montane coniferous forests that typically have components of live, mature Western Larch (Larix occidentalis) that are important for nesting, sap well creation, and as a source of carpenter ants (Camponotus species), a preferred prey.	Unlikely
Williamson's Sapsucker, *thyroideus* subspecies *Sphyrapicus thyroideus thyroideus*	No Status	Endangered		
Forster's Tern *Sterna forsteri*	Red		Forster's Terns in British Columbia nest on mats of vegetation in marshy, vegetated areas on lake edges, and feed out in open water.	Unlikely-outside of known populations
Barn Owl *Tyto alba*	Red	Threatened	Barn Owls forage over old fields, pastures, hayfields, grassy marshes, grasslands, and roadsides, concentrating on sites where prey species are abundant.	Unlikely
Bivalves				
Swamp Fingernailclam *Musculium partumeium*	Blue		In large and small lakes, ponds, swamps, vernal ponds and slow-moving streams; the usual substrate is mud	Possible
Long Fingernailclam *Musculium transversum*	Blue		Unknown	Unknown

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Herrington Fingernailclam *Sphaerium occidentale*	Blue		Found in stillwaters of swamps, ditches and ponds; prefers habitats that dry up for part of the year, sometimes found among damp leaves on land and only known from regions containing calcareous deposits	Possible
Striated Fingernailclam *Sphaerium striatinum*	Blue		Unknown	Unknown
Gastropods				
Banded Tigersnail *Anguispira kochi*	Blue		In moist, well-vegetated forests, often near shores of lakes and streams	Possible
Coeur d'Alene Oregonian *Cryptomastix mullani*	Blue		Near streams, under rocks, vegetation, leaf litter and logs in forests	Possible
Shortface Lanx *Fisherola nuttalli*	Red		In unpolluted, swift-flowing, highly oxygenated cold water on stable, boulder-gravel substrates, often near rapids in small to large rivers	Possible
Ashy Pebblesnai *Fluminicola fuscus*	Red		Historically, this species thrived in free-flowing, oligotrophic waters	Possible
Prairie Fossaria *Galba bulimoides*	Blue		Unknown	Unknown
Dusky Fossaria *Galba dalli*	Blue		Unknown	Unknown
Golden Fossaria *Galba obrussa*	Blue		This species is found in both perennial lakes and vernal ponds with a mud substrate and macrophytes	Possible
Attenuate Fossaria *Galba truncatula*	Blue		Among vegetation in permanent lakes, ponds, streams and marshes; usual substrate is mud	Possible
Star Gyro *Gyraulus crista*	Blue		Unknown	Unknown
Pale Jumping-slug *Hemphillia camelus*	Blue		In dry to moist coniferous forests, on and around mossy stumps, rocks and logs; also in leaf litter	Possible
Pygmy Slug *Kootenaia burkei*	Blue	Special Concern	Moist, mixed-wood riparian forest	Possible

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Magnum Mantleslug *Magnipelta mycophaga*	Blue	Special Concern	Under moist logs, pieces of bark, in depressions in moist earth and within talus in cool, moist coniferous forests	Possible
Subalpine Mountainsnail *Oreohelix subrudis*	Blue		Under logs, rocks and vegetation in forests and subalpine meadows	Possible
Rotund Physa *Physella columbiana*	Red		A large-river species probably restricted to relatively pure, deep, well-oxygenated water in areas normally covered by several feet or more of wate	Unlikely
Northern Tightcoil *Pristiloma arcticum*	Blue		Montane; lives under rocks and vegetation in wet subalpine forests; meadows, seeps and bogs	Possible
Wrinkled Marshsnail *Stagnicola caperata*	Blue		This species is found in ditches, shallow pools, vernal ponds, or in the spring-flooded margins of permanent-water habitats, and occasionally in large permanent lakes, rivers and swamps	Possible
Widelip Pondsnail *Stagnicola traski*	Blue		Unknown	Unknown
Glossy Valvata *Valvata humeralis*	Red		In lakes, ponds, marshes and slow perennial streams on muddy bottoms, commonly in dense vegetation	Possible
Threeridge Valvata *Valvata tricarinata*	Red		Found among vegetation only in perennial-water habitats including lakes, kettle lakes, rivers, streams and muskeg pools; rare in ponds; in soft substrate in areas with macrophytes	Unlikely
Tapered Vertigo *Vertigo elatior*	Red		a variety of open and wooded wetland habitats, such as fens and wet meadows	Unlikley
Sheathed Slug *Zacoleus idahoensis*	Blue	Special Concern	Most records are from older shady coniferous forest stands ranging from approximately 50 to >200 years. The species often inhabits riparian areas and other very moist microsites	Possible
Insects				
Lance-tipped Darner *Aeshna constricta*	Blue		Rare at small ponds and open, warm, nutrient-rich marshes dominated by cattails and bulrushes; sometimes develops in waters that dry up in summer	Unlikely

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Mormon Metalmark *Apodemia mormo*	Red	Endangered	Mormon Metalmark habitat includes hillsides, slopes and embankments with sandy or gravelly soils and moderate to high densities of rabbitbrush (Erigoneum nauseosus) and snow buckwheat (Erigonium niveum)	Unlikely- known populations in the Similkameen river valley are known
Vivid Dancer *Argia vivida*	Blue	Special Concern	Associated with cool or hot springs	Unlikely
Albert's Fritillary *Boloria alberta*	Blue		Albert's Fritillary was reported from alpine areas, steep rock and scree slopes, windswept ridges and habitat that is in high and inaccessible areas.	Possible
Immaculate Green Hairstreak *Callophrys affinis*	Blue		Callophrys affinis is known to occur in dry gullies within sagebrush and meadow habitats, brushland, woods and scrub.	Unlikely
Hoffman's Checkerspot *Chlosyne hoffmanni*	Red		Openings and meadows in valleys in Canadian Zone forest	Possible
Hairy-necked Tiger Beetle *Cicindela hirticollis*	Blue		Beach and sandy dunes	Unlikely
Mead's Sulphur *Colias meadii*	Blue		observed the species at 1655 m. Habitatincludes steep, dry southfacing alpine slopes, subalpine and alpine meadows	Possible
Columbia Dune Moth *Copablepharon absidum*	Red		habitat specialist associated with arid, sandy habitats including sagebrush steppe, sandy grasslands, and dunes	Unlikely
Eastern Tailed Blue *Cupido comyntas*	Blue		A great variety of open, brushy to lightly wooded, generally dry, habitats with any of the many native and exotic legumes used by the larvae.	Unlikely
Monarch *Danaus plexippus*	Red	Special Concern	Habitat is a complex issue for this species. In general, breeding areas are virtually all patches of milkweed in North America	Unlikely
Alkali Bluet *Enallagma clausum*	Blue		Unknown	Unknown
Silver-spotted Skipper *Epargyreus clarus*	Blue		Wide habitat values	Possible

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Silver-spotted Skipper, *clarus* subspecies *Epargyreus clarus clarus*	Blue		Unknown	Unknown
Western Pondhawk *Erythemis collocata*	Blue		Around ponds and marshy lakes, especially where floating plants occur	Possible
Gillette's Checkerspot *Euphydryas gillettii*	Blue		Valleys, glades, open wooded areas in mountains, often near streams	Possible
Variegated Fritillary *Euptoieta claudia*	Blue		Virtually any open to sparsely treed habitat.	Unlikely
Nevada Skipper *Hesperia nevada*	Blue		Open grassland; grassy meadows, prairies, alpine meadows, openings and roadsides where meadowlike qualities are present.	Possible
Viceroy *Limenitis archippus*	Red		Eastward almost any habitat with willows or small aspens which are the main larval foodplants. Habitats include prairies and dry barrens with small willows as well as wetlands.	Unlikely
Dione Copper *Lycaena dione*	Red		Lycaena dione is known to inhabit wet areas including old fields, meadows, prairies, the edges of openings, roadsides and right-of way edges, streamside edges, grasslands, and open areas with periodic human disturbance	Unlikely
Bronze Copper *Lycaena hyllus*	Blue		Marshes, sedge meadows, moist to wet grassy meadows, ditches, fens, streamside or pondshore wetlands, or roads and right of ways through marshlands.	Possible
Lilac-bordered Copper *Lycaena nivalis*	Blue		Habitat includes dry flowering meadows and forest clearings in the mountains	Possible
Jutta Arctic, *chermocki* subspecies *Oeneis jutta chermocki*	Blue		Unknown	Unknown
Sinuous Snaketail *Ophiogomphus occidentis*	Blue		Unknown	Unknown
Old World Swallowtail, *dodi* subspecies *Papilio machaon dodi*	Red		Unknown	Unknown

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Common Sootywing *Pholisora catullus*	Blue		Very seldom in any kind of natural setting in most of its range, most typically weedy backyards, vacant lots, landfills	Unlikely
Sandhill Skipper *Polites sabuleti*	Red		A complex variety of habitats from coastal dunes and salt marshes, alkalai grasslands to moist mountain meadows and lawns.	Possible
Sonora Skipper *Polites sonora*	Blue	Special Concern	Mostly Canadian Zone moist meadows	Unlikely
Tawny-edged Skipper, *themistocles* subspecies *Polites themistocles themistocles*	Blue		Unknown	Unknown
Checkered Skipper *Pyrgus communis*	Blue		A generally transient species in a great variety of dry disturbed situations and some more natural ones such as short grass prairies.	Unlikely
Behr's Hairstreak *Satyrium behrii*	Red	Endangered	Dry slopes, canyons: sagebrush, pinyon-juniper	Unlikely
California Hairstreak *Satyrium californica*	Blue		Open woodland and edges, brushland, chaparral.	Possible
Half-moon Hairstreak *Satyrium semiluna*	Red	Endangered	Unknown	Unknown
Forcipate Emerald *Somatochlora forcipata*	Blue		Shallow, spring-fed streamlets trickling through subalpine hillside fens,	Possible
Aphrodite Fritillary, *manitoba* subspecies *Speyeria aphrodite manitoba*	Blue		Unknown	Unknown
Mormon Fritillary, *erinna* subspecies *Speyeria mormonia erinna*	Red		Unknown	Unknown
Mormon Fritillary, *eurynome* subspecies *Speyeria mormonia eurynome*	Red		Unknown	Unknown
Mammals				

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Mountain Beaver *Aplodontia rufa*	Yellow	Special Concern	This subspecies is associated with coniferous, mixed and Red Alder forests on moist slopes or hillsides near small streams or seeps. Humid sites with a dense understory are ideal. An important requirement is deep soils suitable for excavating burrow systems and tunnels.	Unlikely- outside of population occurrence
Townsend's Big-eared Bat *Corynorhinus townsendii*	Blue		commonly associated with built structures rather naturally forming or excavated cave features. However, karst caves, talus slopes, old mine excavations or other similar features may be used.	Possible
Big Brown Bat *Eptesicus fuscus*	Yellow		Habitats range from high mountains to low deserts, including cities. Summer roosts generally are in buildings, bridges, hollow trees, spaces behind exfoliating bark, rock crevices, tunnels, or cliff swallow nests, in sites that do not get too hot.	Possible
Wolverine, *luscus* subspecies *Gulo gulo luscus*	Blue	Special Concern	Large ranges from alpine to valley bottoms	Confirmed- in the proposed Zincton CRA area
Silver-haired Bat *Lasionycteris noctivagans*	Yellow		associated with forest and grassland habitats. The elevational range extends from sea level to 1220 metres.	Possible
Hoary Bat *Lasiurus cinereus*	Yellow		Habitat includes primarily deciduous and coniferous forests and woodlands, including areas altered by humans.	Possible
White-tailed Jackrabbit *Lepus townsendii*	Red		Open grasslands and sagebrush plains	Unlikely
Southern Red-backed Vole, *galei* subspecies *Myodes gapperi galei*	Blue		Southern Red-backed Vole inhabits cool, mossy and rocky forested areas.	Possible
Californian Myotis *Myotis californicus*	Yellow		This species inhabits arid grasslands, humid coastal forests, montane forests and mountain meadows. Its elevational range is from sea level on the coast to 1280 metres	Possible
Long-eared Myotis *Myotis evotis*	Yellow		These bats occupy a diverse array of habitats, including lowland, montane, and subalpine woodlands, forests, shrublands, and meadows, wooded stream courses, and areas over water bodies	Possible

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Little Brown Myotis *Myotis lucifugus*	Yellow	Endangered	These bats use a wide range of habitats and often use human-made structures for resting and maternity sites; they also use caves and hollow trees.	Possible
Northern Myotis *Myotis septentrionalis*	Blue	Endangered	This bat generally is associated with old-growth forests composed of trees 100 years old or older.	Possible
Long-legged Myotis *Myotis volans*	Yellow		These bats occur primarily in mountainous areas wooded with coniferous trees, but also may be found in riparian and desert (Baja California) habitats. They may change habitats seasonally. Hibernacula are in caves and mines,	Possible
Yuma Myotis *Myotis yumanensis*	Yellow		This species is more closely associated with water than most other North American bats. It is found in a wide variety of upland and lowland habitats, including riparian, desert scrub, moist woodlands, and forests, usually near open water.	Possible
Least Chipmunk, *oreocetes* subspecies *Neotamias minimus oreocetes*	Blue		Lives in alpine (talus and krumholtz) habitats > 2100m elevation. Restricted to alpine habitats in the Purcell Mountains and the Rocky Mountains.	Possible
Least Chipmunk, *selkirki* subspecies *Neotamias minimus selkirki*	Red		Lives in alpine (talus and krumholtz) habitats > 2100m elevation. Presumed to be restricted to the location close to Invermere, total range estimate of 100 km squared.	Unlikely- outside of population range
Red-tailed Chipmunk, *ruficaudus* subspecies *Neotamias ruficaudus ruficaudus*	Red		In B.C. both sub-species are restricted to south selkik mountain range south of Nelson between the Columbia River and Kootenay lake	Unlikely -outside ok known range
Red-tailed Chipmunk *Neotamias ruficaudus simulans*	Blue			
Mountain Goat *Oreamnos americanus*	Blue		In the interior, goats winter on cliffs at varying elevations, including high windswept ridge crests	Possible- Identified possible mountain goat habitat

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Bighorn Sheep *Ovis canadensis*	Blue		California Bighorns occupythe dry valleys and mountains of the Okanagan, South Cariboo, and South Chilcotinregions. The unfavourably wet, heavily forested Selkirk and Purcell ranges separate the California Bighorns territory from the natural range of Rocky Mountain Bighorns	Unlikely- outside known range
Fisher *Pekania pennanti*	No Status		Fishers utilize habitat features both on the ground and in trees and can be active day and night. A mix of young and mature forests as well as late seral (old growth) forests with >30%canopy is preferred.	Unlikely- outside of known range
Caribou (Southern Mountain Population) *Rangifer tarandus pop. 1*	Red	Threatened	High alpine mature old forests with arboreal lichen	Possible- Nakusp range and critical habitat nearby
Northern Bog Lemming, *artemisiae* subspecies *Synaptomys borealis artemisiae*	Blue		Sagebrush habitat	Unlikely
American Badger *Taxidea taxus*	Red	Endangered	Grasslands and dry open forests associated with suitable soils for digging burrows. Badgers will use mid-elevation and alpine areas where open habitats that contain prey and suitable burrowing soils exist.	Unlikely – outside typical distribution ranges
Northern Pocket Gopher, *segregatus* subspecies *Thomomys talpoides segregatus*	Red		The Northern Pocket Gopher is a small burrowing rodent T. t. segregatus, is restricted to the Wynndel area on the east side of Creston Valley	Unlikely-outside of known range
Grizzly Bear *Ursus arctos*	Blue	Special Concern	variety of habitats, including: coastal rain forests, alpine tundra, mountain slopes, upland boreal forest, taiga and dry grasslands	Possible
Ray-finned fish				
White Sturgeon (Upper Kootenay River Population) *Acipenser transmontanus pop. 1*	Red	Endangered	This sturgeon occurs in a deep lake and a large river. Kootenay River locations are generally more than 6 m deep with flows	
White Sturgeon (Upper Columbia River Population) *Acipenser transmontanus pop. 2*	Red	Endangered	Arrow Lakes Reservoir (ALR): Most sonic tagged individuals used Beaton Flats area to overwinter; this area likely has stable depths (>80m) during the year and bottom substrates range from silt to sand	Unlikely

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Shorthead Sculpin *Cottus confusus*	Blue	Special Concern	Habitat includes fast riffles of cold headwaters, creeks, and small to large rivers	Unlikely
Columbia Sculpin *Cottus hubbsi*	Blue	Special Concern	Habitat includes rocky riffles or creeks and small rivers	Unlikely
Rocky Mountain Sculpin *Cottus sp. 9*	Red	Special Concern	unkown	Unlikely
Burbot (Lower Kootenay Population) *Lota lota pop. 1*	Red		Spends a portion of the life history in Kootenay Lake; prefers cold water, uses hypolimnion or deep river pools in summer; migrates to spawning areas in the Kootenai River or tributary streams	Unlikely
Cutthroat Trout, *clarkii* subspecies *Oncorhynchus clarkii clarkii*	Blue		Requires small, low gradient coastal streams and estuarine habitats; well-shaded streams with water temperatures below 18 C are optimal	Unlikely
Cutthroat Trout, *lewisi* subspecies *Oncorhynchus clarkii lewisi*	Blue	Special Concern	Small mountain streams, main rivers, and large natural lakes; requires cool, clean, well-oxygenated water; in rivers, adults prefer large pools and slow velocity areas	Confirmed
Umatilla Dace *Rhinichthys umatilla*	Red		A riverine species that seems to prefer the cover provided by cobbles and larger stones where the current is fast enough to prevent siltation	Unlikely
Bull Trout *Salvelinus confluentus*	Blue		Habitat includes the bottom of deep pools in cold rivers and large tributary streams	Confirmed in area
Reptiles				
Northern Rubber Boa *Charina bottae*	Yellow	Special Concern	woodlands, grasslands, coniferous forests, dry pine forests, Juniper woods, and riparian areas. Within these regions, however, Rubber Boas tend to avoid dry, hot areas enjoyed by many other snake species, preferring instead humid mountainous areas.	Possible
North American Racer *Coluber constrictor*	Blue	Special Concern	Bunchgrass, Ponderosa pine, Interior Douglas-fir, and dry Interior Cedar–Hemlock biogeoclimatic zones below 900 m elevation. Within these ecosystems, Racers were found in a wide variety of habitat types that include wet valley bottoms and riparian areas, rocky slopes, and sandy terraces at or below 900 m elevation	Unlikely-outside of range

English Name/ *Scientific Name*	Status		Habitat Requirements	Potential Occurrence
	BC List	SARA Status		
Western Skink *Plestiodon skiltonianus*	Blue	Special Concern	Western Skinks need abundant plant cover, as well as rocks, logs, stumps, and bark for foraging and cover, sunny openings for basking, and south facing slopes and rocks for nesting and hibernacula.	Possible
Turtles				
Painted Turtle - Intermountain - Rocky Mountain Population *Chrysemys picta pop. 2*	Blue	Special Concern	Painted turtles live in slow-moving, shallow waters with soft bottoms, basking sites, and aquatic vegetation: streams, marshes, swamps, ponds, lakes, and reservoirs	Possible

Appendix C: Relevant Local Government Land Use Policies and Objectives to the proposed Zincton CRA from Area D Comprehensive Land Use Bylaw No. 2435, 2016 and Area H Official Community Plan Bylaw No. 1967, 2009.

Area D Comprehensive Land Use Bylaw No. 2435, 2016

Typical uses for land designated as Resource Area include forest land, grazing or range land, public recreation areas, tourism, watersheds, and resource extraction areas. Although it is recognized that local land use designations do not apply to the Crown, the designation is intended to provide regulations upon alienation, and to address Crown leases.

1) Relevant Resource Area Objectives include:

3) Retain and diversify resource-based land uses which contribute to the local economy and nature of communities in the Plan area.

4) Ensure, in cooperation with the Province and private land owners, that resource based activities do not result in increased occurrence or magnitude of natural hazards in areas where there is risk to persons or property in the Plan area.

Recognizes the jurisdiction of the Province over public Crown Lands.

6) Promotes low impact recreational activity, opportunity, and use of Crown Lands as a significant contributor to the local economy and nature of the area.

9) Will work with the Province to ensure unique scenic vistas and public recreation areas are recognized and managed for within the Plan area.

10) Will work with the Province to ensure community watersheds and sources of domestic water supply are recognized and protected within the Plan area.

11) Will work with the Province to ensure community watersheds and sources of domestic water supply are recognized and protected within the Plan area.

It is recognized that the most significant public use of Crown Land is recreation, and the most significant and visible commercial uses are forest harvesting, energy production, mining, and tourism. Crown Land objectives include:

1) Encourage the Province to respect the interests and concerns of residents of Kootenay Lake and the Lardeau Valley in decisions concerning activities and development of Crown Lands and Water.

2) Maintain Crown Lands adjacent to lake fronts, riparian area, and areas of environmental sensitivity within the public domain.

Relevant Crown Land Policies include:

3) Strongly encourage the Province to inform and consult with a community before any change n land use on Crown Land, including licenses or permits for any development or activity, and land use amendments that may effect the community.

4) Encourage the management or disposition of Crown land or water in a manner that is consistent with the broader policies of the Plan regarding settlement patterns, the conservation of environmentally sensitive areas, and the recreational and conservation values associated with these lands.

Area H Official Community Plan Bylaw No. 1967, 2009 Resource Area objectives include:

1) To promote sustainable economic development on forestry, mining, recreation and other resource dependent activity based on the principles of sustainability.

2) To retain mining, mineral exploration, energy production, forestry, logging and wood processing as traditional resource-based land uses that contribute to the local economy and nature of communities in the Plan area.

3) To protect the local forest land base and large areas of un-fragmented forest habitat for its aesthetic and recreational value and importance to natural ecological functioning.

5) To protect riparian zones, sensitive ecosystems, watersheds, and biodiversity.

6) To recognize the importance of Crown Lands for recreational values and opportunity.

7) To reduce the environmental, aesthetic and neighbourhood impacts of forestry, mining, recreation and other resource based activities in the Plan area.

8) To ensure that resource based activities do not result in increased occurrence or magnitude of natural hazards in the Plan area in cooperation with private landowners and the Province.

Relevant Resource Area policies include:

1) Recognizes that a Resource Area designation includes those uses compatible with larger parcels and/or restrictions to land use such as accessibility or hazards.

2) Supports a 15ha minimum parcel size for ‘Resource Area’ designations in recognition that these areas will remain rural with limited community services and infrastructure.

3) Recognizes the jurisdiction of the Province over public Crown Land.

4) Encourages the maintenance of contiguous blocks of un-fragmented forest land.

5) Encourages appropriate small-scale forest related activities such as sustainable gathering of non-timber forest products, food crops, outdoor recreation, education and value added industry.

6) Will work with the Province to ensure scenic vistas and community watersheds are protected within the Plan area.