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4 ASSESSMENT METHODOLOGY

This section presents the methodology used to identify and assess the potential effects of the proposed Blackwater Gold Project (the Project) pursuant to the British Columbia *Environmental Assessment Act (*BC *EAA*) and *Canadian Environmental Assessment Act, 2012* (*CEAA, 2012*). The methodology used to assess potential effects is based on federal and provincial requirements, which are identified in **Section 4.1.1**.

The Application has been prepared to include the information requested on British Columbia Environmental Assessment Office (BC EAO) Application Information Requirements (AIR) issued in May 2014 (**Appendix 2.3D**) and the Canadian Environmental Assessment Agency (Agency) Environmental Impact Statement Guidelines (EIS Guidelines) issued in February 2013 (**Appendix 2.4B**), to prepare one assessment that meets both provincial and federal requirements.

The Canadian Environmental Assessment Agency (Agency) and the BC EAO have agreed to coordinate the federal and provincial EAs to the extent possible pursuant to the Canada-British Columbia Agreement for Environmental Assessment Cooperation (2004). Under the coordinated federal and provincial environmental assessment EA) process, the Proponent prepares a single Application containing the information required to fulfill both provincial and federal requirements.

On 9 July 2013, the BC EAO issued an order under section 11 of the BC *EAA* describing the scope, procedures, and methods for undertaking the provincial environmental assessment. **Section 2.3** (Provincial Scope of the Proposed Project) and **Section 2.4** (Federal Scope of Assessment of the Proposed Project) describe the scope of the provincial and federal EA processes respectively.

Pursuant to *CEAA, 2012*, the following environmental effects are required to be assessed:

5. (1) For the purposes of this Act, the environmental effects that are to be taken into account in relation to an act, or thing, a physical activity, a designated project or a project are

- *(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:*
  - *(i) fish as defined in section 2 of the Fisheries Act and fish habitat as defined in subsection 34(1) of that Act,*
  - *(ii) aquatic species as defined in subsection 2(1) of the Species at Risk Act,*
  - *(iii) migratory birds as defined in subsection 2(1) of the Migratory Birds Convention Act, 1994, and*
  - *(iv) any other component of the environment that is set out in Schedule 2;*
- *(b) a change that may be caused to the environment that would occur*
  - *(i) on federal lands,*

(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or

(iii) outside Canada; and

(c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on

(i) health and socio-economic conditions,

(ii) physical and cultural heritage,

(iii) the current use of lands and resources for traditional purposes, or

(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

(2) However, if the carrying out of the physical activity, the designated project or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than this Act, the following environmental effects are also to be taken into account:

(a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and

(b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on

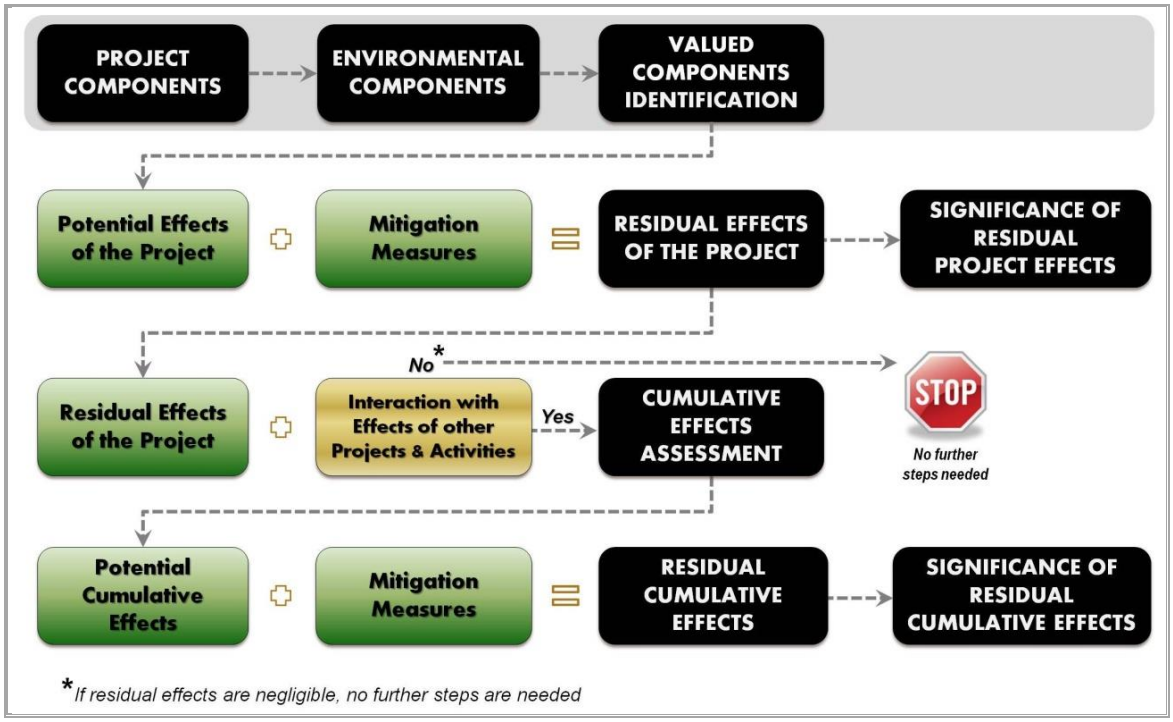
(i) health and socio-economic conditions,

(ii) physical and cultural heritage, or

(iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

4.1 General Approach

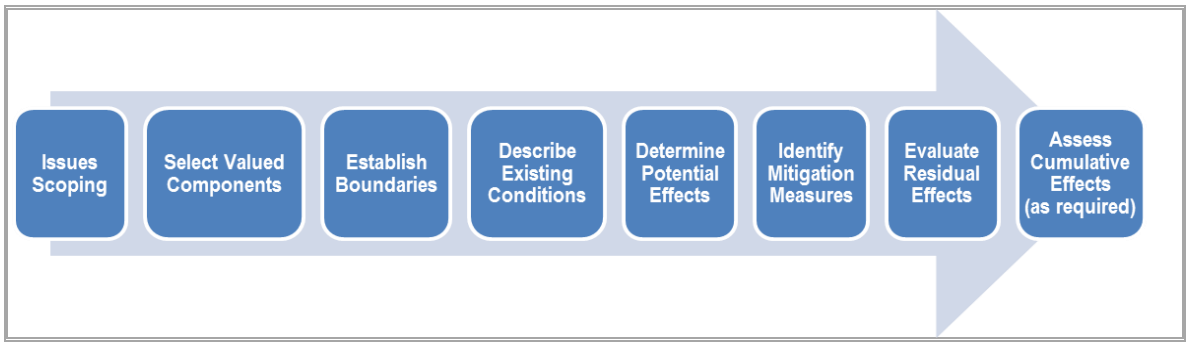
The general approach used to determine potential direct and indirect project effects, appropriate mitigation measures, anticipated residual effects, and their significance is illustrated on **Figure 4.1-1**.



Note: Modified from BC EAO (2013b)

Figure 4.1-1: Effects Assessment General Approach Flow Chart

This approach is consistent with the Guideline for Selection of Valued Components and Assessment of Potential Effects (BC EAO, 2013b). **Figure 4.1-2** presents a simplified version of the steps in the assessment process.



Source: BC EAO, 2013b

Figure 4.1-2: Effects Assessment Process Flow Chart

This section describes the methodology used to assess the potential Project and cumulative effects of the interaction of the Project activities on the five pillars - environmental, economic, social, heritage, and health components. Baseline characterization and the results of consultation and engagement activities provided the information to allow for the identification of the Valued

Components (VCs) representative of the five pillars. VCs are defined as any part of the environment (natural or human) that is considered important by New Gold Inc. (Proponent), Aboriginal groups, public, scientists, and governments involved in the assessment process. Importance may be determined on the basis of values as identified by Aboriginal groups' interests, scientific literature, and regulatory standards or requirements, biodiversity, and sensitivity to project effects. Indicators are metrics used to measure and report on the condition and trend of a VC and will be identified to further focus and facilitate the analysis of interactions between the project and the selected VC (BC EAO, 2013b).

The baseline characterization provided information on the important features of each of the five pillars and associated processes, their interrelationships and interactions, as well as the variability within and among resources, processes, and interactions over the temporal scale as identified in the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application). This information is presented in sufficient detail to allow characterization of each component before any disturbance to the environment due to the Project. In describing the environmental components, both scientific and available traditional knowledge (TK) has been included, as well as the indicators and measures of component health and integrity used for the analysis. The baseline characterization addresses the resilience of the subject area, and relevant historical information. Where little or no information exists, specific studies have been designed to gather further information. The background characterization covers all relevant seasonal and temporal variations. Detailed information is provided in the appendices of this Application and is summarized in **Section 5.1** of the Application. The summary will be focused on representative factors and/or indicators of all of the five pillar components and selected VCs that may be affected by the Project.

Baseline characterization and the results of consultation and engagement activities provided the information to allow for the identification of the VC representative of the five pillars. Once the identification of VCs was completed (**Sections 5.2.1; 5.3.1; 5.4.1; 6.2.1; 7.2.1; 8.2.1;** and **9.2.1**), the methodology continued with the identification of potential effects and mitigation measures. Mitigation measures were proposed for each VC as required, taking into consideration the magnitude and duration of the potential effects of the Project. The mitigation measures are discussed in relation to their expected effectiveness and the risk associated. Following this approach, residual effects were determined subsequent to the application of mitigation measures. The residual effects are the basis for the determination of significance.

Following the assessment of the residual effects of the Project, a Cumulative Effects Assessment (CEA) was conducted for each VC for which there is a residual effect, taking into consideration the past, present, certain (the physical activity will proceed or there is a high likelihood that the physical activity will proceed, e.g., the Proponent has received the necessary authorizations or is in the process of obtaining those authorizations) and reasonably foreseeable (the physical activity is expected to proceed, e.g., the Proponent has publicly disclosed its intention to seek the necessary Environmental Assessment (EA) or other authorizations to proceed) (Agency, 2013a) future projects and activities. The rationale for the selection of projects and activities (both included and excluded) is presented in the Application. Uncertainties and assumptions used in the significance

assessment of residual effects and cumulative effects are presented under each VC in the Application.

This section provides a clear description of the assessment methodology, specifically:

- The scope of the EA **(Section 2.3 and 2.4)**
- A list of the agencies, Aboriginal groups, and stakeholders that reviewed and commented on the draft AIR (**Appendix 4A**); comments provided on the draft AIR are presented in **Appendix 3.1.3A**.
- A list of the guidance documents provided by agencies used to develop the assessment methodology (**Table 4.1-1**);
- Description of applicable standards used for baseline characterization and effects assessment (**Table 4.3-6**);
- A list of applicable provincially/regionally developed Best Management Practices (BMPs) and guidance documents that will be implemented (**Table 4.1-1**);
- A list of all VCs considered in the EA; including the rationale and justification for Candidate VCs, and Selected VCs;
- Methods used for assessing the potential and residual effects of the Project and cumulative effects (considering past, present, certain, and reasonably foreseeable future projects). The assessment will include the construction, operations, closure, and post-closure phases of the Project (**Section 4.3.3 and 4.3.6**);
- How the significance of the residual effects of the Project will be determined, considering the following categories (**Section 4.3.5.1**):
    - Context;
    - Magnitude;
    - Geographic extent;
    - Duration;
    - Reversibility;
    - Frequency;
- The criteria and rationale for each of the above listed factors as it applies to each VC;
- How likelihood will be applied to describe the certainty of occurrence of the residual effect for each VC;
- How the significance of the residual effects was determined for each VC; and
- How confidence was applied to characterize the level of uncertainty associated with both the significance and likelihood determinations.

4.1.1 Guidance Documents, Standards and Best Management Practices

Guidance documents and BMPs from the BC EAO, the Agency and other members of the Working Group were used in the development of the assessment methodology for the Application, including:

- Considering Aboriginal Traditional Knowledge in Environmental Assessments conducted under the Canadian Environmental Assessment Act – Interim Principles (Agency, 2013d);
- Cumulative Effects Assessment Practitioners' Guide (Cumulative Effects Assessment Working Group, 1999).
- Guideline for Selection of Valued Components and Assessment of Potential Effects (BC EAO, 2013b);
- Operational Policy Statement for Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012 (Agency, 2013c);
- Operational Policy Statement for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012 (Agency, 2013b);
- Useful Information for Environmental Assessments (Health Canada, 2010); and
- Agency's Reference Guide Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects.

Table 4.1-1: Provincial and Federal Guidance Documents and BMPs

Discipline	Guidelines and BMPs
Noise and vibration	Environmental Code of Practice for Metal Mines. Environment Canada, Mining and Processing Division, Mining Section, Document No. 1/MM/17, 2009.
Climate change	The equipment information for mine fleet is calculated according to BC GHG methodology (BC MOE, 2013) and based on the fuel consumption information provided by the engineering project team. The GHG from on-road vehicles are based on the emission factors from the US EPA motor vehicle emission simulator model (US EPA, 2010). GHG emission from aviation is based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2010) according to the Landing and Take Off emission factors. GHG emissions from the three waste incinerators were based on the US EPA AP-42 Section 2.1 Refuse Combustion (US EPA, 2000). BC MOE. 2013. 2013 B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions. US EPA. 2010. Motor Vehicle Emission Simulator (MOVES2010b). IPCC. 2010. 2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol. 2. Energy. Chapter 3: Mobile Combustion.
Air quality	US EPA. 2000. AP42, Fifth Edition. Compilation of Air Pollutant Emission Factors, Volume 1: Solid Waste Disposal. Chapter 2.1: Refuse Combustion. BC MOE, Health Canada, and EC have a number of ambient air quality guidelines that list various substances of concern.
Surface water flow	BC MOE. 2009. Manual of British Columbia Hydrometric Standards. Version 1.0. EC. 2009. Environmental Code of Practice for Metal Mines.
Surface water quality	BC MOE water quality guidelines (approved and working) for the protection of freshwater aquatic life: • The Maximum Acceptable limits (Max); • The 30-day Average limits (30-day average); CCME guideline for the protection of aquatic life (freshwater): • Long term (equivalent to MOE 30-day average); • Short term (equivalent to MOE Max); • Health Canada drinking water guidelines; • BC MOE wildlife guidelines.
Sediment Quality	BC MOE. 2006. A Compendium of Working Water Quality Guidelines for British Columbia. BC MOE. 2012. Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. CCME. 2007. Environmental Quality Guidelines.

Discipline	Guidelines and BMPs
Hydrogeology	*CEAA, 2012* (Government of Canada, 2012). The Project is a reviewable project, as defined by the *CEAA, 2012*, and groundwater issues, including groundwater flow, must be assessed under the *CEAA, 2012*. *CEPA, 1999* (Government of Canada, 1999). The *CEPA* regulates surface water chemical or physical quality, flow conditions, or water depth near the Project, which may be affected by Project-related activities pertaining to groundwater flow. *Fisheries Act* (Government of Canada, 1985). Surface water chemical or physical quality, flow conditions, water depth, or benthic or riparian area conditions near the Project may be impacted by Project-related effects on groundwater flow. *SARA* (Government of Canada, 2002). Surface water chemical or physical quality, flow conditions, water depth, or benthic or riparian area conditions near the Project may be impacted by Project-related effects on groundwater flow. BC *EAA* (Government of BC, 2002). The Project is a reviewable project, as defined by this legislation, which requires groundwater issues (including groundwater flow) to be assessed according to BC *EAA* criteria. *Mines Act* (Government of BC, 1996c). This legislation pertains to all mines that operate in BC. *Environment and Land Use Act* (Government of BC, 1996b). This legislation empowers Land Use Committees to ensure the preservation and maintenance of the natural environment, including groundwater, in administrating BC land use and resource development. *Environmental Management Act* (Government of BC, 2003), including the *Contaminated Sites Regulation* (Government of BC, 1996a), *Hazardous Waste Regulation* (Government of BC, 1988), and *Waste Discharge Regulation* (Government of BC, 2004b). This legislation regulates the chemical quality and management of substances, including substances that are released or discharged to the environment. *Water Act* (Government of BC, 1996d), including its *Ground Water Protection Regulation* (Government of BC, 2004a). This legislation regulates the diversion, extraction, use, and storage of surface water and the installation, use, and decommissioning of groundwater wells. *Fish Protection Act* (Government of BC, 1997). This legislation regulates surface water chemical or physical quality, flow conditions, or water depth, as well as habitat conditions within or near surface waterbodies near the Project that may be affected by Project-related effects on groundwater flow.
Wetlands	Guidance document *Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia* (Cox and Cullington, 2009). BC MOE. 2006. British Columbia Approved Water Quality Guidelines. BC MOE. 2008. Ambient Aquatic Life Guidelines for Iron. Victoria, BC. BC MELP (British Columbia Ministry of Environment, Land and Parks (1991). British Columbia Specifications and Guidelines for Geomatics. TRIM. Content Series Vol. 4. Release 2.0. Province of British Columbia. Cox, R. and J. Cullington. 2009. *Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia*. Wetland Stewardship Partnership.

Discipline	Guidelines and BMPs
Fish and Fish habitat	DFO. 1995. Freshwater intake end-of-pipe fish screen guideline. Fisheries and Oceans Canada, Ottawa, ON. DFO. 1998a. Habitat conservation and protection guidelines, 2nd edition. Fisheries and Oceans Canada, Ottawa, Ontario, 19 pp. DFO. 1998b. Guidelines for the use of explosives in or near Canadian fisheries waters. Fisheries and Oceans Canada, Ottawa, Ontario. DFO. 2010a. Pathways of Effects – Fish passage issues. Fisheries and Oceans Canada, Ottawa, ON. DFO. 2010b. Pathways of Effects – Placement of materials or structures in water. Ottawa, ON. DFO. 2010c. Pathways of Effects – Change in timing, duration and frequency of flows. Ottawa, ON. DFO. 2010d. Pathways of Effects – Use of explosives. Ottawa, ON. DFO. 2010e. Pathways of Effects – Vegetation Clearing. Ottawa, ON. DFO. 2010f. Pathways of Effects – Grading. Ottawa, ON. DFO. 2010g. Pathways of Effects- Excavation. Ottawa, ON. DFO. 2010h. Pathways of Effects – Use of industrial equipment. Ottawa, ON. DFO. 2010i. Pathways of Effects – Cleaning or maintenance of bridges or other structures. Ottawa, ON. DFO. 2013a. Measures to avoid causing harm to fish and fish habitat. DFO. 2013b. Fisheries protection policy statement. Fisheries and Oceans Canada, 29 October 2013. EC. 2011. 2011 Metal Mining Environmental Effects Monitoring (EEM) Technical Guidance Document. Environment Canada, National Environmental Effects Monitoring Office. Ottawa, ON.
Soils and Terrain	RIC. 1996. Guidelines and Standards for Terrain Mapping in British Columbia. Government of British Columbia, Victoria, BC. SCWG. 1998. The Canadian System of Soil Classification (CSSC), 3rd Edition. Publication 1646. Research Branch. Agriculture and Agri-Food Canada. Ottawa, ON. ASAC. 1987. Soil Quality Criteria Relative to Disturbance and Reclamation. Prep. by Soil Quality Working Group. Alberta Agriculture. Edmonton, AB.
Vegetation	RIC. 1998. Standards for Terrestrial Ecosystem Mapping in British Columbia. Prepared by Ecosystems Working Group, Terrestrial Ecosystems Task Force, and Resource Inventory Committee. May 1998. BC Hydro. 2003. Approved Work Practices for Managing Riparian Vegetation. A Guide to Incorporating Riparian Environmental Concerns into the Management of Vegetation in BC Hydro's Transmission and Distribution Corridors. BC MOFR 2010. Invasive Alien Plant Program Reference Guide. Part 1. Prepared by Range Branch Ministry of Forests and Range. June 2010.

Discipline	Guidelines and BMPs
Wildlife	Hatler, D.F., D. Blood, & A. Beal. 2003. Furbearer management guidelines–muskrat. FNLRO–Fish and Wildlife Division. Milko, R. (1998). Wetlands environmental assessment guideline. Canadian Wildlife Service, Ottawa, ON. RISC standards for ratings and suitability classes were followed (RISC, 1999). Ministry of Environment, Lands and Parks. 1998. Inventory Methods for Terrestrial Arthropods. Standards for Components of British Columbia's Biodiversity No. 40. Victoria, BC. *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014). *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014); British Columbia Ministry of Forests, Lands, and Natural Resources Operations (BC MFLNRO). 2014. Guidelines and Best Management Practices (BMPs). Water management plan, BMPs (BC MFLNRO, 2014).
Visual Resources	BC MOF. 2001. *Visual Impact Assessment Guidebook*. Second edition. Forest Practices Branch. BC MOF Forest Practices Branch. 1997. Visual Landscape Inventory. Procedures and Standards Manual. May 1997. BC MOF. 1998. Recreation Features Inventory Procedures and Standards Manual. October 1998.
Heritage	Archaeological Impact Assessment Guidelines (Archaeology Branch, 1998). Archaeology Branch. 1998. Archaeological Impact Assessment Guidelines [revised edition], BC Ministry of Small Business, Tourism and Culture, Archaeology Branch, Victoria, BC.
Environmental exposures	Guidelines or site specific water quality objectives. Health Canada. 2005. National Guidelines for Environmental Assessment: Health Impacts of Noise. Draft Version. Prepared by the Acoustic Unit, Consumer and Clinical Radiation Protection Division Product Safety Programme, Healthy Environments and Consumer Safety Branch. Ottawa, ON, May 2005.
Workers health and safety	In terms of camp indoor noise levels, Health Canada (Health Canada, 2005) advises adherence to the WHO guidelines, when considering sleep disturbances and community noise. WHO has established a guideline of 30 dBA inside a dwelling to avoid sleep disturbance (WHO, 1999).

Note: ASAC = Alberta Soils Advisory Committee; BC = British Columbia; BC *EAA* = British Columbia *Environmental Assessment Act;* BC MFLNRO = British Columbia Ministry of Forests, Lands and Natural Resource Operations; BC MOE – British Columbia Ministry of Environment; BC MOF = British Columbia Ministry of Forests; BC MOFR = British Columbia Ministry of Forest and Range; CCME = Canadian Council of Ministers of the Environment; *CEAA, 2012* = *Canadian Environmental Assessment Act, 2012*; *CEPA, 1999* = *Canadian Environmental Protection Act, 1999*; DFO = Fisheries and Oceans Canada; EC = Environment Canada; GHG = greenhouse gas; IPCC = Intergovernmental Panel on Climate Change; RIC = Resource Inventory Committee; RISC = Resource Inventory Standards Committee; *SARA* = *Species at Risk Act*; SCWG = Soil Classification Working Group; US EPA = United States Environmental Protection Agency; WHO = World Health Organization

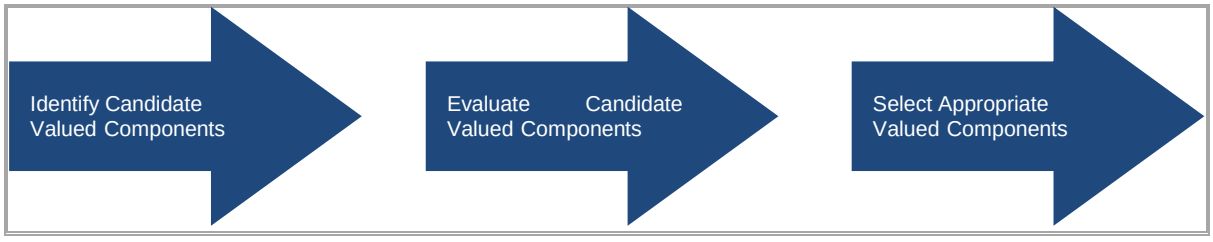
4.2 Identification and Selection of Valued Components

This subsection provides the following information for each of the five pillars (environmental, economic, social, heritage and health):

- Identification of the VCs to be considered in the EA; and
- Description of the general methodology used to identify VCs.

4.2.1 VC Identification, Evaluation and Selection

The selection of VCs for the environmental assessment begins with an issues scoping process through which available information is compiled and analyzed in consultation with government, Aboriginal groups, and stakeholders to identify an initial list of issues. These Project-specific issues are generally indicative of local and regional values held by the public, Aboriginal groups, and other stakeholders. An initial list of key issues and concerns was presented in the Blackwater Project Description, filed with BC EAO and the Agency November 2012 (AMEC, 2012). Building on this list, candidate VCs were identified through EIS Guidelines, the AIR process, incorporating additional guidance from BC EAO and the Agency, issues raised by government, Aboriginal groups, and stakeholders, and professional knowledge of the area. Complete rationale is summarized in the Identification and Selection of Valued Complement sections of the Application (**Sections 5.2.1, 5.3.1, 5.4.1, 6.2.1, 7.2.1, 8.2.1 and 9.2.1**). A list of candidate and selected VCs considered in the EA is provided in **Appendix 4B**. A list of selected VCs is also presented in **Table 4.3-1**). **Figure 4.2-1** illustrates the steps taken to identify Selected VCs.



Source: BC EAO, 2013b

Figure 4.2-1: Steps in the Selection of Valued Components Flow Chart

The candidate VCs were examined to confirm if they would interact with Project components and activities, and if those interactions would result in an environmental effect. Additional evaluation of the candidate VCs to selected VCs applied a confirmation of the VC attributes and key questions. If all attributes and questions were confirmed and answered with “Yes”, the candidate VC became a selected VC. If “No” was answered to one or more of the attributes or evaluation questions; the candidate VC was not considered as a selected VC, unless it was a confirmed to be a component of concern. The outcome of the interactive process was a shorter list of VCs that appropriately reflects the concerns raised and the aspects of the broader ‘environment’ that are of most value to society. This list allowed the assessment to focus on key issues for decision-makers and to address key concerns. The final list of selected VCs was included by BC EAO in the final AIR.

Selected VCs have the following attributes:

- Relevant to the Project setting for each assessment pillar and to the issues raised during consultation and engagement (which generally indicate local and regional values held by the general public, Aboriginal groups, and other stakeholders in the Project area);
- Comprehensive, so that taken together, the VCs selected for an assessment should enable a full understanding of the important potential effects of the Project;
- Responsive to the potential effects of the Project;
- Concise, so that the nature of the Project VC interaction and the resulting effect pathway is clearly articulated and understood, and redundant analysis is avoided;
- Representative of important features of the setting likely to be affected by the Project activities; and
- Reflective of traditional, ecological, or community knowledge values, which are described for each VC where information is available.

The following key questions were used to evaluate the candidate VCs:

- Measurable – Can the potential effects of the Project on the VC be measured and monitored? Is the candidate VC better represented by another VC?
- Grouping – Can the potential effects on the candidate VC be effectively considered within the assessment of another VC?
- Ultimate Receptor – Is the VC an ultimate receptor, meaning that the effects on this VC will not influence effects on another VC?
- Component of Concern – Is the VC a component of concern identified by the public, Aboriginal Groups, Provincial or Federal agencies during the consultation process?

Where useful and practical, indicators and/or factors of selected VCs were identified; these may consist of a species group, guild, or subpopulation, or some other functional aspect, such as habitat, that is important to the integrity of the VC; indicators were not utilized or required for every VC. Those indicators and/or factors selected (BC EAO, 2013b) include:

- Are relevant to the Project setting, conditions, and issues raised during consultation and engagement;
- Provide measurable information on potential effects of the Project on the selected VC;
- Are responsive to potential effects of the Project;
- Are representative, together or singularly, of the VC; and
- Capture the range of potential changes to the VC.

Selected VCs and their indicators and/or factors are presented in **Table 4.2-1**. Detailed discussions on the candidate VCs that were considered and assessed, resulting in selected VCs and indicators are presented in **Section 5** through **Section 9** of the Application.

Table 4.2-1: Selected Valued Components and Indicators, by Assessment Pillar and Subject Area

Pillar	Valued Components	Indicators and/or Factors for Assessment
Environmental	Noise and vibration	• Overall sound levels
	Climate change	• Greenhouse gas emissions
	Air quality	• Measured parameters (e.g., particulate matter and combustion gases)
	Surface water flow	• Water flow • Lake level
	Surface water and sediment quality	• Measured parameters (e.g., pH and heavy metals) • Acid Rock Drainage/Metal Leaching (ARD/ML) • Geochemistry
	Groundwater quantity	• Groundwater level • Groundwater flow
	Groundwater quality	• Measured parameters (e.g., pH and heavy metals) • ARD/ML • Geochemistry
	Wetlands	• Hydrological function • Biochemical function • Ecological function • Habitat function
	Fish habitat	• Surface water flow • Surface water and sediment quality • Ecological health • Riparian habitat
	Fish	• Rainbow trout • Kokanee
	Physiography and topography	• Terrain stability
	Surficial geology and soil cover	• Soil availability and depth
	Soil quality	• Reclamation suitability
	Ecosystem composition	• Ecosystem distribution • Riparian • Old growth • Sparsely vegetated ecosystems • Traditional use plants
	Plant species and ecosystems at risk	• *SARA* listed whitebark pine • Potential plant species-at-risk habitat • Ecosystems at risk
	Amphibians	• Western toad • Western toad habitat
	Water birds	• Ring-necked duck • Ring-necked duck habitat • Yellow rail • Yellow rail habitat
	Forest and grassland birds	• Olive-sided flycatcher (songbird) • Olive-sided flycatcher habitat • Clark's nutcracker (songbird) • Clark's nutcracker habitat • Red-tailed hawk (raptor)

Pillar	Valued Components	Indicators and/or Factors for Assessment
		• Red-tailed hawk habitat
	Moose	• Moose • Moose habitat
	Caribou	• Caribou • Caribou habitat
	Grizzly bear	• Grizzly bear • Grizzly bear habitat
	Furbearers	• Marten • Marten habitat • Beaver • Beaver habitat
	Bats	• Little brown myotis • Little brown myotis habitat
	Invertebrates	• Jutta arctic (butterfly) • Jutta arctic habitat • American emerald (dragonfly) • American emerald habitat
Economic	Provincial economy	• Provincial economy activity (gross domestic product) • Provincial employment and labour income • Provincial government revenues
	Regional and local employment and businesses	• Direct employment of local and regional residents • Contract and business opportunities (Project purchasing from local contractors and businesses) • Changes in regional unemployment • Local and regional labour income and costs • Training and education
	Regional and local government finance	• Municipal tax revenues • Costs to regional and local governments
Social	Demographics	• Population
	Regional and community infrastructure	• Regional and municipal infrastructure (water supply, water/sewage treatment, landfills, communications, electricity, and recreational facilities) • Community housing and temporary accommodation • Regional transportation (road, rail, air)
	Regional and local services	• Regional and local services and conditions (educational, health, social, and protective services)
	Family and community well-being	• Economic hardship • Crime (including drug and alcohol abuse) • Family relationships
	Non-traditional land and resource use	• Protected areas and parks • Recreation/tourism use (e.g., all-terrain vehicle use) • Mining, exploration, and mineral tenures • Forestry and timber resource use • Hunting/trapping/guide outfitting • Fishing and aquaculture • Agriculture and grazing • Range use • Land ownership and tenures • Recreational and commercial use of waterways • Groundwater resource use

Pillar	Valued Components	Indicators and/or Factors for Assessment
		• Surface water resource use
	Current Land and Resource Use for Traditional Purposes	• Hunting and trapping • Fishing • Plant gathering • Other cultural and traditional uses of the land (e.g., cultural and spiritual places, trails, navigation)
	Visual resources	• Visual record • Demonstrated aesthetic value
Heritage	Archaeological sites	• Landmarks • Buildings • Religious features • Human remains • Culturally modified trees • Subsistence features
	Historic heritage sites	• Landmarks • Buildings • Religious features • Human remains • Culturally modified trees • Subsistence features
	Paleontological resources	• Fossil sites
Health	Environmental exposures	• Noise and vibration • Air quality • Surface water and sediment quality • Groundwater quality • Fish • Soil quality • Contamination of country foods
	Workers health and safety	• Occupational exposures • Safety in the workplace • Noise when workers are at rest (construction and operations)

Note: ARD/ML = Acid Rock Drainage/Metal Leaching; GDP = Gross Domestic Product

4.3 Assessment of Potential Effects on Selected Valued Components

This subsection presents a description of the assessment methodology used to determine whether the Project would have significant adverse environmental, social, economic, heritage and health effects, taking into account the mitigation measures proposed in the Application. Specific assessment methods for each VC identified are presented in **Section 5** through **Section 9** of the Application for each VC.

4.3.1 Assessment Boundaries

Assessment boundaries define the scope or limits of the assessment. They encompass the areas and time periods during which the Project is expected to interact with the VCs (spatial and temporal boundaries), any constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and any limitations in predicting or measuring changes (technical boundaries). Each of these boundaries are described in further detail in the subsections below.

4.3.1.1 Spatial Boundaries

This subsection identifies and presents the local and regional spatial boundaries for each VC and the rationale for selecting these boundaries. The maps presenting the spatial boundaries for each VC are provided in the Baseline Summaries under each VC (**Sections 5.1, 6.1, 7.1, 8.1,** and **9.1**).

The Project site, Local Study Area (LSA), and Regional Study Area (RSA) boundaries were selected to cover the geographic extent in which the potential environmental, economic, social, heritage, and health effects of the Project are expected to be measurable. These boundaries define the areas in which the Project is expected to interact with each VC. The following criteria were considered during the identification of spatial boundaries:

- Physical extent (terrestrial, freshwater aquatic, and airshed) of the Project site, including mine site and offsite Project components, as described in **Section 2.2**;
- Extent of biophysical resources potentially affected by the Project;
- Extent of social, economic, heritage, and health effects, including those of First Nations and Métis groups, potentially occurring from the Project; and
- Results of consultations with Aboriginal groups, the general public, and government agencies on the scoping of issues to be addressed in the Application.

The Project site refers to the land where any proposed facilities or infrastructure will be developed (i.e., the footprint) and the land located in between these facilities or in very close proximity[1]. The Project site includes the mine site, the mine access road, the airstrip, the transmission line, the

[1] Buffers were applied around proposed on-site and off-site infrastructure to determine the Project site. Areas located in between project infrastructure or immediately adjacent are considered to be part of the Project site although no development is proposed in those areas.

freshwater supply system, and the Kluskus Forest Service Road (FSR) (between Engen and the mine access road).

The LSA is defined as an area within which all (or most) potential Project effects are expected to occur (BC EAO, 2013b). The LSA for the Project was defined as the Project site and surrounding area, which varies with each VC, where there is a reasonable potential for effects to occur to a VC due to an interaction with the Project components or activities identified in **Table 4.3-1**. The RSA is defined as a larger area (relative to the LSA) and used to provide context for the assessment of potential Project effects (BC EAO, 2013b).

The RSA for the Project was defined as the area within which cumulative effects would be assessed, therefore an area where potential interactions with other projects or activities is possible. RSA selection rationale will be specific to each VC and may vary between VCs.

Figure 4.3-1 is a general illustration of the boundaries for the linear components of the project. The mine site footprint is not represented in this figure. The figure depicts the following:

- Right-of-Way (ROW) and or area of disturbance;
- "Corridor" which is specific to the linear components of the Project;
- LSA that includes the ROW, Corridor and buffers specific to each VC; and
- RSA that includes the LSA and buffers specific to each VC.

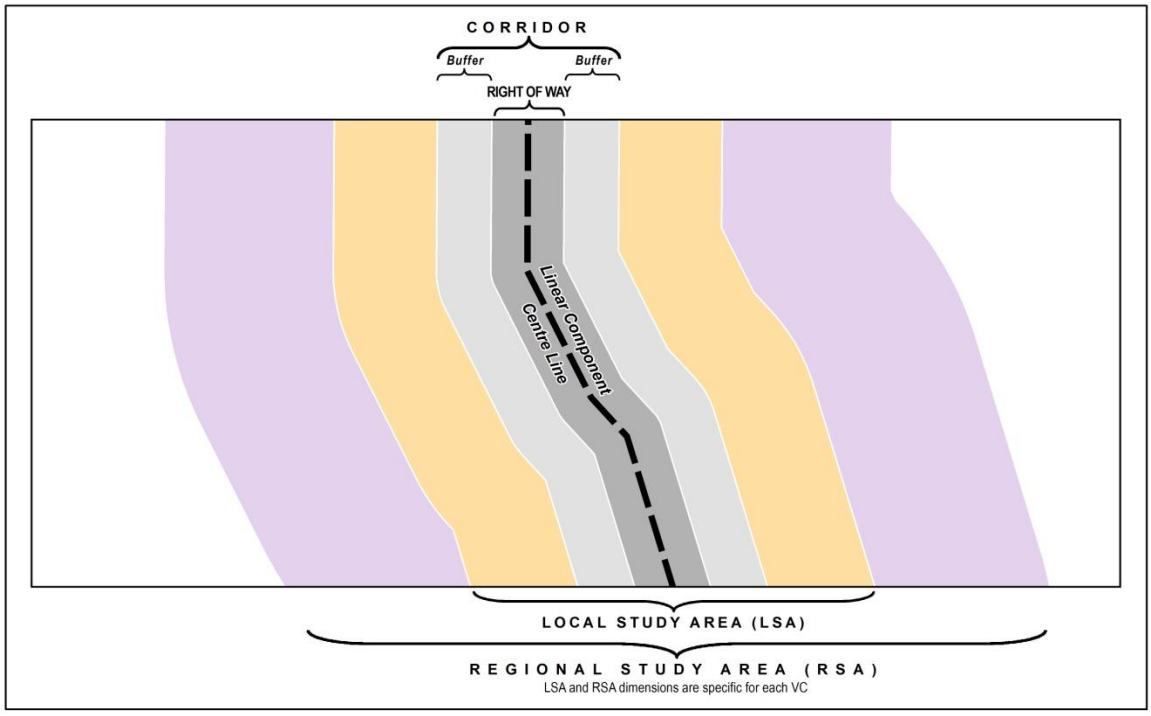


Figure 4.3-1: Boundaries for the Linear Components of the Project

Table 4.3-1 presents the proposed spatial boundaries associated with each VC grouped by subject area as well as the rationale for selecting and modifying the spatial boundaries presented in the approved AIR. When Project components are in close proximity, there is a possibility that study areas overlap, and in these instances, the study areas were merged to avoid duplication.

It was assumed that the whole width of the transmission line ROW will be disturbed to accommodate the transmission line poles and access road that goes along the entire length of the ROW. This is a conservative assumption, because not all vegetation will be removed and the Proponent will make efforts to avoid the removal of sensitive ecosystem such as the ones including plants for traditional use. The final location of the branch roads will be determined during the detailed engineering stage. Its design will follow the same principles of using existing roads avoiding sensitive habitat to the extent possible. The conservative assumptions to overestimate the disturbance along the ROW will cover the disturbance related to the branch roads.

During the development of the AIR, the study area boundaries were further refined to address comments from the Working Group members. One example is Caribou; the ranges for the Tweedsmuir-Entiako and the Itcha-Ilgachuz Populations were considered due to concerns expressed by Aboriginal Groups in relation to the potential for cumulative effects. This change was than agreed to by the sub-working group on Caribou. Further details are documented in the comment tracking tables for the AIR in **Appendix 3.1.3A** and in **Table 4.3-1** (Column: Rationale for Study Areas).

Table 4.3-1: Valued Components by Subject Area and Proposed Spatial Boundaries Description and Rationale

Valued Components Candidate	Study Area[1]	Description in AIR	Rationale for Study Areas	Rationale for Changes to Study Areas from the AIR
1. Noise and Vibration	LSA **Section 5.1.1, Figure 5.1.1.3-1**	• Mine Site: Approximately circular area within a 1.5 km distance from the proposed mine site permanent noise sources which refers to permissible sound level of 40 decibel, a scale (dBA) likely to be adopted for this open pit mining project. The exact shape of the LSA will depend on results of noise modelling and it will be presented as noise contours. • Transmission Line, Mine Access Road, Airstrip, Freshwater Supply Pipeline, and Kluskus FSR: overlapping the linear component footprint by 1.5 km on each side (3 km wide).	• Includes the mine site where most of the continuous noise generating activities will be located and applies a buffer beyond which noticeable changes in sound levels are not expected to occur. • Overlaps all linear components of the project with 3 km wide corridors beyond which noticeable changes in sound levels are not expected to occur.	• The extent of the LSA for the Mine Site was not modified but 45 dBA was considered a more appropriate permissible level based on the Environmental Code of Practice for Metal Mines (EC, 2009). Nighttime and daytime noise will be the same, the more restrictive 45 dBA was adopted for 24-h operation.
	Regional Study Area (RSA)	• Mine Site: Overlaps the proposed mine footprint by 4 km in each direction. The RSA is centered on and extends over a circular area with a radius of 5 km for area of the proposed mine site open pit mine, processing facilities, and waste disposal sites. • Transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR: overlapping the linear component footprint by 2.5 km on each side (5 km wide).	• Includes the Local Study Area and a buffer to take into account potential interactions with other projects or activities that generate noise.	• The RSA for the fresh water supply system was modified to match the LSA because only low level noise would be generated along that corridor, therefore the buffer of 1.5 km could take into account not only Project effects but potential interactions with effects of other projects or activities.
2. Air Quality 3. Climate Change	LSA **Section 5.1.1, Figure 5.1.1.1-1**	• Mine Site: 40 x 40 km^2 centred on the proposed open pit. • Transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR: 3-km wide corridor (e.g., 1.5 km on each side) along the linear components.	• Includes the mine site where most of the activities that generate particle and combustion gases emissions will be located within a polygon that would define spatial boundaries for air quality modelling. • Feedback provided by the Ministry of Environment on the proposed Air Quality Effects Assessment workplan recommended to define one single area for the assessment of air quality affects by activities taking place at the mine site. This area comprised of a 40km x 40 km square centered on the mine site and was used for defining the spatial boundaries for the air quality model. • Overlaps all linear components of the project with 3 km wide corridors beyond which noticeable changes in air quality are not expected to occur.	• Climate change was assessed at a Provincial and National level given the global nature of this VC.
	RSA	• Mine Site: Same as LSA. Transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR: same as LSA.	• Includes the Local Study Area and a buffer around it to take into account potential interactions with other projects or activities that generate atmospheric emissions.	• Climate change was assessed at a Provincial and National level given the global nature of this VC.
4. Surface Water Flow 5. Surface Water Quality 6. Sediment Quality 7. Wetlands 8. Fish Habitat 9. Fish	LSA **Section 5.1.2, Figure 5.1.2.1-1**	• Mine Site: Entire watersheds of Davidson Creek, Creek 661, Turtle Creek, and Creek 705. Tributaries flowing in to the south side of Tatelkuz Lake. Chedakuz Creek from confluence with Creek 661 to Tatelkuz Lake. Chedakuz Creek from Tatelkuz Lake to confluence with Turtle Creek. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: 100 m on either side of the centre line of these proposed developments (i.e., 200 m total width). • **Note:** wetland spatial boundaries will follow the boundaries associated with ecosystem composition and plant species and ecosystems at risk for the assessment of the transmission line, mine access road airstrip, freshwater supply pipeline and Kluskus FSR.	• Includes all catchments where mine site facilities are located, immediately adjacent watersheds where flow changes are expected due to Project water management plan and Tatelkuz Lake, which is the main source of fresh water for the Project. • Includes all crossing of streams by linear Project components.	• The LSA did change but two small catchments called Chedakuz Creek Local Watersheds were added to the map, which are located on the western bank of lower Chedakuz Creek. These are not true watersheds because they contain no streams, but they were created by defining the boundary of the LSA as the eastern bank of lower Chedakuz Creek. • The study area chosen for wetlands for the Kluskus FSR focuses on those areas where realignment of the existing road is proposed. The road sections proposed for realignment are located within the mine site LSA. Potential effects to wetlands are predicted to only occur in these areas of the LSA.

Valued Components Candidate	Study Area[1]	Description in AIR	Rationale for Study Areas	Rationale for Changes to Study Areas from the AIR
	RSA	• Mine Site: Entire watershed of Chedakuz Creek not included in LSA. Entire watershed of Laidman Lake not included in the LSA. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: Same corridor as LSA. • **Note:** wetland spatial boundaries will follow the boundaries associated with ecosystem composition and plant species and ecosystems at risk for the assessment of the transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR.	• Considers catchments immediately upstream and downstream of the LSA to take into account potential interactions with other projects or activities.	• The study area chosen for wetlands for the Kluskus-FSR focuses on those areas where realignment of the existing road is proposed. The road sections proposed for realignment are located within the mine site RSA. Potential effects to wetlands are predicted to only occur in these areas of the RSA.
10. Groundwater Quantity 11. Groundwater Quality	LSA **Section 5.1.2, Figure 5.1.2.3-1**	• Mine Site: 1 km around the proposed mine footprint. • Transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR: Not required.	• Includes the entire mine site and a buffer around it to capture potential groundwater drawdown effects due to open pit excavation and seepage effects from mine waste management facilities. • Doesn't include linear components because activities along them don't have the potential to affect the groundwater regime.	• n/a
	RSA	• Mine Site: incorporates the Davidson Creek watershed, Tatelkuz Lake, Creek 661 watershed, Turtle Creek watershed, and portions of the upper Fawnie Creek watershed. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: Not required.	• Includes catchments where mine site facilities are located (i.e., Surface Water Flow LSA) and portions of the upper Fawnie Creek watershed to account for overlaps with the groundwater LSA.	• n/a
12. Physiography and Topography 13. Surficial Geology and Soil Cover 14. Soil Quality 15. Ecosystem Composition 16. Plant Species and Ecosystems at Risk	LSA **Section 5.1.3, Figure 5.1.3.2-1**	• Mine Site: 500 m from the proposed Project mine site boundary. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: 100 m beyond the proposed linear component boundary.	• Includes the entire mine site where soil and vegetation will be removed and considers a buffer to take into account potential edge effects and particulate matter deposition. • Includes entire linear components and a buffer to take into account potential edge effects and particulate matter deposition. The buffer for the linear components is smaller given that vegetation or soil removal will be conducted in lower quantities.	• n/a
	RSA	• Mine Site: 3,000 m from the proposed Project mine site boundary. • Transmission line, mine access road, airstrip, freshwater supply pipeline and Kluskus FSR: 500 m beyond their proposed linear component boundary.	• Considers an additional buffer around the LSA to take into account potential interactions with other projects or activities.	• n/a
17. Amphibians 18. Water Birds 19. Forest and Grassland Birds 20. Moose 21. Caribou 22. Grizzly Bear 23. Furbearers 24. Bats 25. Invertebrates	LSA **Section 5.1.3, Figure 5.1.3.4-1**	• Mine Site: Approximate 500 m buffer around the proposed mine site facilities. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: approximately 250 m buffer from each side of the linear component boundary.	• Includes the entire mine site where habitat will be removed and considers a buffer to take into account sensorial disturbances. • Includes all linear components and a 100-500 buffer to take into account sensory disturbance. The buffer along the linear corridors varies because activities along those corridors varies from an access road that may have greater sensory disturbance to a transmission line with limited human activity or traffic after construction.	• n/a
	RSA	• Mine Site: Includes ungulate winter range established for the Tweedsmuir-Entiako caribou herd (U-7-012). The western and southern edges of the RSA outline these winter ranges. The southwestern boundary follows the Upper Blackwater Management Zone where the RSA then follows the Blue Road till it reaches the Ootsa – Kluskus FSR and follows this north until it reaches the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir. • Transmission Line and Kluskus FSR. Approximate 1 km buffer from the linear component boundary. • Grizzly bear RSA will also consider effects in the context of the Provincial Grizzly Bear Population Management Units. • For the caribou RSA the portions of the transmission line and Kluskus FSR located outside of suitable caribou habitat were excluded. Caribou regional effects will also be	• Extends beyond the mine site LSA to consider natural barriers for wildlife such are large water bodies or watershed divides. • For Caribou, *The Tweedsmuir-Entiako and the Itcha-Ilgachuz subpopulation ranges were considered for cumulative effects assessment due to concerns expressed by Aboriginal Groups and the sub-working group on caribou in relation to the potential for cumulative effects and to meet the requirements of assessment of impacts to critical habitat in the final caribou recovery strategy (Environment Canada 2014).* • For Grizzly Bear, *GBPUs overlapping the mine site or in close proximity were considered for cumulative effects*	• n/a

Valued Components Candidate	Study Area[1]	Description in AIR	Rationale for Study Areas	Rationale for Changes to Study Areas from the AIR
		considered in the context of the Ungulate winter range and both herd areas (Tweedsmuir-Entiako caribou herd and Itcha-Ilgachuz caribou herd).	*assessment due to concerns expressed by Aboriginal Groups and MFLNRO in relation to the potential for cumulative effects. Three Grizzly Bear population units were included in the assessment (i.e., Francois, Nulki and Blackwater West-Chilcotin)*.	
26. Provincial Economy 27. Regional and Local Employment and Businesses 28. Regional and Local Government Finance 29. Demographics 30. Regional and Community Infrastructure 31. Regional and Local Services 32. Family and Community Well-Being	LSA **Section 6, Section 7, Figure 6.1.1-1 and Figure 7.1.1-1**	• Statistical reporting units use by Statistics Canada (SC) and the Government of BC: Vanderhoof, Fraser Lake, Bulkley-Nechako Regional District Electoral Area (RDEA) D, Bulkley-Nechako RDEA F, and eleven populated Indian Reserves: Stony Creek 1, Laketown 3, Nautley (Fort Fraser) 1, Seaspunkut 4, Stellaquo 1, Kluskus 1, Tatelkus Lake 28, Sundayman's Meadow 3, Euchinico Creek 17, Trout Lake Alec 16 and Nazco 20.	• Includes the Regional District Electoral Areas (RDEA) overlapping with the mine site of the Project's linear components. Vanderhoof and Fraser Lake, given their proximity to the access route to the mine site, are the populated centers where noticeable migration of workforce is expected.	• n/a
	RSA	• Statistical reporting units use by SC and the Government of BC: Fraser-Fort George RDEA C, Bulkley-Nechako RDEA C and Bulkley-Nechako RDEA B, Prince George, Burns Lake, Fort St. James, and 12 Indian Reserves: Nak'azdli (Necoslie) 1, Sowchea 3, William Prairie Meadow 1A, North Tacla Lake 7, Dzitline Lee 9, Tache 1, Binchie 2 (Pinchie 2), Ye Koo Che 3; Burns Lake 18; Woyenne 27; Duncan Lake 2; and Palling 1.	• Extends beyond the LSA to include the **Regional District Electoral Areas** (RDEA) immediately to the East where Prince George and two RDEA to the North where two other mines are located. Prince George is the main populated center in the region where the Project is located.	• n/a
33. Non-Traditional Land and Resource Use	LSA **Section 7.1, Figure 7.1.1-1**	• 500-m buffer beyond the proposed Project footprint.	• Considers all the land that will be occupied by the project and a buffer around it to understand the use of land in areas immediately adjacent to project components.	• n/a
	RSA	• Based on Vanderhoof Land and Resources Management Plan. Includes all subzones that overlap with LSA or fall within RSAs identified for other disciplines (i.e., aquatics). To provide representative information the eastern RSA boundary was moved towards the west in order to balance out the area on either side of the proposed transmission and Kluskus FSR.	Considers the Vanderhoof Land and Resources Management Plan because the plan covers all aspects of land and resource management within an area of 13,800 square kilometers, which encompasses all Project components and other projects and activities that could interact with the Project.	• n/a
34. Current Land and Resource Use for Traditional Purposes	LSA **Section 7.1, Figure 7.1.1-1**	• Mine site: Same as Aquatic LSA, with some additions to include the west facing slopes of the Nechako Range up to the skyline between Tatelkuz and Kuyakuz mountains. • Transmission Line and Kluskus FSR: same as Wildlife LSA.	• Uses both the aquatic and wildlife local study areas to take into account the potential fishing and hunting practices by Aboriginal Groups.	• n/a
	RSA	• Mine site: same as Wildlife RSA with some additions from the aquatics RSA in the south portion to include the entire watershed of Laidman Lake and Chedakuz Creek. • Transmission Line and Kluskus FSR: same as Wildlife RSA.	• Uses both the aquatic and wildlife regional study areas to take into account the potential for interaction with other projects and activities that could affect fishing and hunting practices by Aboriginal Groups.	• n/a
35. Visual Resources	LSA **Section 7.1, Figure 7.1.1-1**	• A viewshed analyses will be generated using Geographic Information System (GIS) modelling software and a Digital Elevation Model (DEM) to delineate the LSA, where line of sight with project facilities may affect existing land uses and scenic quality.	• Viewsheds defined by line of sight and distance to project components define an area from where visual resources effects can be perceived. Permanent residents within the viewsheds were considered as key receptors for the assessment of effects.	• n/a
	RSA	• An extended viewshed analyses will be generated to delineate the RSA from where specific viewpoints or recreation sites may be affected at a greater distance.	• The viewsheds were extended to cover a larger area to take into account potential interactions with other project or activities that could also affect visual resources.	• n/a
36. Archaeological Sites 37. Historic Heritage Sites 38. Paleontological Resources	LSA **Section 8.1, Figure 8.1-1**	• Mine Site: 500-m buffer around the proposed mine site footprint. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: 500 m from centerline in either direction (1 km total).	• Includes the entire Project footprint, where activities with the potential to generate effects will happen. A buffer has been included to take into account the potential existence of heritage resources immediately adjacent to the Project footprint.	• n/a
	RSA	• Mine Site: 33 km by 25 km rectangle around mine site. • Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: same as LSA.	• Covers an area of 825 km square to provide heritage resources with regional context around the mine site and take into account for effects of other projects or activities. The southern boundary for the RSA is the mountain crest or	• n/a

Valued Components Candidate	Study Area[1]	Description in AIR	Rationale for Study Areas	Rationale for Changes to Study Areas from the AIR
			watershed divide to avoid including areas were no project effects neither other project or activities are expected. • The RSA for linear components is equal to the LSA because there is sufficient comparative archaeological to provide context in the proposed 1 km wide corridor.	
39. Environmental Exposures 40. Workers Health and Safety	LSA **Section 9.1, Figure 9.1-1**	• Same as LSA defined for social and economic VCs. • **Note:** the LSA for environmental exposures may be revised if biophysical effects are demonstrated outside of proposed spatial boundaries.	• The socioeconomic LSA was proposed to consider the populated centers is proximity to the Project.	• The LSA for environmental exposures was revised given the results of the air quality and noise modelling. Main populated centers such as Vanderhoof and Fraser Lake would not be affected by environmental exposures. The LSA applied to the environmental exposures VC is the same as the one for Air Quality which covers the main pathway for contaminants to affect human health. • The LSA for workers health and safety consistent of the socioeconomic RSA, which was the area from where most of the workforce is expected.
	RSA	• Same as RSA defined for social and economic VCs.	• The socioeconomic RSA was proposed to include Prince George – the main populated center in the region and Fort St. James and Burns Lake where other mining activities are taking place.	• n/a

Notes: [1] The proposed Project footprint refers to the land where any proposed Project facilities or infrastructure will be developed. The proposed Project footprint includes the Rights-of-Way for the transmission line, mine access road, airstrip, and the freshwater supply pipeline. The proposed Project footprint does not include existing infrastructure such as the forest service roads or other roads that are currently being used by third parties.
[2] The proposed linear component boundary, also referred to as the corridor width, for each project feature is based upon the feature ROW width, with an additional 50 m buffer on each side. ROW and linear component boundary widths are as follows: transmission line and re-routes - ROW is 40 m width, and linear component boundary is 140 m width, fresh water pipeline and airstrip access road– ROW is 10 m and linear component boundary is 110 m, airstrip - ROW is 100 m and linear component boundary is 200 m, mine site access road – ROW is 20 m and linear component boundary is 120 m.
[3] The terrestrial study areas have been defined in relation to the proposed Project boundaries. When proposed Project components are in close proximity, there is a possibility that study areas would overlap, and if this is the case, the study areas will be merged to avoid duplication.
[4] If the results of the assessments indicate the spatial boundaries need to be adjusted to ensure the full extents of the effects are captured, the boundary will be adjusted for the Application, with supporting justification/rationale.
[5] BC = British Columbia; dBA = decibel A-scale; FSR = Forest Service Road; GIS = Geographic Information System; km = kilometre; km^2 = square kilometre; LSA = Local Study Area; m = metre; NTLRU = Non-Traditional Land and Resource Use; RDEA = Regional District Electoral Area; RSA = Regional Study Area; SC = Statistics Canada; n/a Not Applicable.

4.3.1.2 Temporal Boundaries

This subsection presents the rationale for the proposed temporal boundaries used for the EA including an assessment of the effects for each phase of the Project, including construction (construction includes site preparation), operations and maintenance, closure, and post-closure. Consideration was given to the possibility of social and economic effects occurring before construction (i.e., pre-construction, procurement and or recruitment). For example the participation of First Nation individuals in the fieldwork program is documented in **Section 3** and **Section 17**.

The temporal boundaries for the assessment are aligned with the construction, operations, closure, and post-closure phases of the Project. These temporal boundaries are applied to all VCs.

The temporal boundaries for the Project assessment are as follows:

- The construction phase is scheduled to occur over two years (i.e., Years -2 and -1), starting immediately following receipt of the required permits;
- The operations phase is scheduled to extend for approximately 17 years (i.e., Years +1 to +17), starting once the plant site is constructed, commissioned, and ready for ore processing;
- The closure phase is estimated to occur during the 18 years (i.e., Years +18 to +35) following the cessation of mining and ore processing activities, when the mine site buildings and infrastructure will no longer be needed. Activities will include decommissioning of plant facilities and infrastructure and their abandonment and removal from the mine site, the implementation of the site reclamation plan and the open pit flooding to the point where the mine site starts discharging water back to the environment; and
- The post-closure phase is estimated to start immediately after completion of the closure activities (i.e., following Year +35). Post-closure maintenance and monitoring will be conducted for a minimum of 12 years.

The temporal boundaries proposed above are consistent with the proposed Project Description presented in **Section 2.2**. The Proponent has not made a final decision to construct the Project on a specific date and this will also depend on obtaining provincial and federal approvals, therefore foreseeable modifications to the Project involve only the construction schedule. The assessment presented remains valid as it is independent on when construction phase starts because seasonal factors affecting the construction activities have been taken into account. Also, given the nature of mining developments, there is a possibility that the mine plan be adjusted in the future should additional resources and/or reserves be found. If this is the case, the Proponent will satisfy any applicable permitting requirements.

Seasonal factors affecting any of the valued components have been taken into account in the baseline characterization and the assessment of potential and residual effects of the Project. The Environmental Management Plans (EMPs) presented in **Section 12.2** provide specific information

on any sensitive periods for wildlife and fish and describe the mitigation measures that apply to those periods.

Community and Aboriginal TK is considered in the assessment of potential effects under each VC. If specific information pertaining to temporal boundaries is available, this is incorporated into the assessment of the VC.

4.3.1.3 Administrative Boundaries

Administrative boundaries refer to constraints imposed by data, political, economic, social, or related boundaries. Administrative boundaries may not apply to all VCs, and are most often used to define the LSA and RSA for economic and social VCs. These may include specific aspects of provincial and federal regulatory requirements, as well as regional planning initiatives that are relevant to the assessment of the Project's effects on a specific VC. The regulatory and policy context and the identification and nature of administrative boundaries and their effects on the assessment are described in the scope of assessment section for each VC (**Section 5**, Assessment of Potential Environmental Effects through **Section 9**, Assessment of Potential Health Effects) of the Application.

As appropriate, administrative boundaries were carried forward into the CEA.

4.3.1.4 Technical Boundaries

Technical boundaries refer to the constraints imposed on the EA as a result of limitations in data that can influence or limit the ability to predict potential effects of the Project. Technical boundaries may not apply to every selected VC or every assessment. Where they have been identified, technical boundaries are described for each affected VC in **Section 5**, Assessment of Potential Environmental Effects through **Section 9**, Assessment of Potential Health Effects of the Application.

As appropriate, technical boundaries were carried forward into the CEA.

4.3.2 Existing Conditions

4.3.2.1 Environmental, Economic, Social, Heritage, and Health

Baseline information was used to characterize the pre-Project conditions for each assessment pillar and each VC. The baseline characterizations cover all relevant seasonal and temporal variations, and where information was limited or not available, specific field studies were undertaken to supplement the existing data. This information enables the identification of potential Project-VC interactions and potential effects.

Detailed baseline information and methodologies employed to study baseline conditions for each subject area are provided in reports appended to the Application and summarized in their respective assessment sections (**Section 5**, Assessment of Potential Environmental Effects through **Section 9**, Assessment of Potential Health Effects).

Baseline information within the Project LSA and RSA was assembled from a number of sources, including, but not limited to:

- Government policies and Land and Resource Management Plans (LRMPs);
- Published reports and studies relevant to each discipline or assessment pillar;
- Publically available cultural, ecological, or community knowledge relevant to each discipline or assessment pillar, including data presented in previous environmental assessments of projects in the area;
- Results of field studies undertaken for the Project; and
- Information relevant to each assessment pillar obtained during consultation and engagement with the public, Aboriginal groups, and other stakeholders.

In addition to the description relative to the VC, the scope of the description of existing conditions also includes:

- Natural and/or human trends that may alter the existing conditions irrespective of the changes that may be caused by the proposed Project or other projects and activities in the study area; and
- Description of how other past and present projects and activities in the study area have affected or are affecting each VC.

4.3.2.2 Traditional, Ecological, or Community Knowledge

Traditional, cultural, ecological, or community knowledge is defined as a body of knowledge built up by a group of people through generations of living in close contact with nature. It includes unique knowledge about the local environment, how it functions, and its characteristic ecological relationships. The purpose of gathering this information is an increased understanding, consideration, and integration of local level information into the Application and into Project development and design.

Information was gathered through desk-based review and consultation with potentially affected Aboriginal groups. Traditional, cultural, ecological, or community knowledge was collected on a territory-wide basis and included the Project mine site and off-site components. This information was used to aid in understanding existing conditions in the local and regional environment, selection of VCs, identification and description of potential effects, and selection of locally meaningful mitigation measures to address the concerns and issues of Aboriginal groups. Summaries of the relevant traditional, cultural, ecological, or community knowledge are provided in each VC effects assessment section (**Section 5** through **Section 9**) under the heading Traditional, Cultural, Ecological, or Community Knowledge, and as a whole in **Parts C** and **D** of the Application.

Ongoing consultation and engagement efforts with Aboriginal groups may provide additional information and insight into relevant Aboriginal rights, interests, issues, values, and concerns.

4.3.3 Potential Project Effects

An interaction matrix for selected VCs and Project components was developed in order to identify and asses the links between the Project components and activities and the VCs. Interactions between all Project components and activities listed in **Section 2.2**, and each VC have been identified and described. The interaction matrix is presented in **Table 4.3-2** and the matrix was used to understand the degree of interaction between the Project and VCs, and was the basis for determining whether qualitative, semi qualitative or quantitative methods where required to assess the effects on the VC. Interactions would result in an environmental effect either adverse or beneficial.

Three types of interactions were identified (BC EAO, 2013b):

- Key interaction: resulting in potential significant adverse effect or significant concern; consideration in the assessment.
- Moderate interaction: Potential adverse effect requiring additional mitigation; consideration in the assessment.
- No interaction: No or negligible adverse effect expected; no further consideration needed for the assessment.

VCs with key interactions with the Project are the focus of the EA and quantitative methods are proposed to understand the magnitude, duration and extent of the effect. **Section 4.3.3** identifies the quantitative methods used to assess the key interactions.

Potential Project effects resulting from moderate or key interactions are assessed qualitatively, semi-quantitative or quantitative as appropriate to the nature of the indicator and/or factor selected for each VC. This approach is consistent with a risk assessment framework that categorizes the levels of detail and quality of the data required for the assessment. For key interactions of the Project with environmental components, quantitative methods were preferred over qualitative approaches to be able to quantify the magnitude of the expected change on the VC as a consequence of the Project. Limitations and assumptions for models used to quantitatively estimate Project effects have been clearly stated for each VC.

Potential effects on each VC from interaction with Project components and activities are described in detail in **Section 5** through **Section 9** of the Application for each VC.

Table 4.3-3 presents the methods that were selected for assessing the effects on selected VCs. Detailed rationale and description of the methods applied are presented for each VC in **Section 5** through **Section 9** of the Application.

Table 4.3-2: Project Component and Activity Interaction Matrix for Selected VCs

Project Phase	Project Component	Project Level Interactions	Atmospheric and Acoustic Environment			Aquatic Environment								Terrestrial Environment													Economic			Social								Heritage			Health	
			Noise and Vibrations	Climate Change	Air Quality	Surface Water Flow	Surface Water Quality	Sediment Quality	Groundwater Quantity	Groundwater Quality	Wetlands	Fish	Fish Habitat	Physiography and Topography	Surficial Geology and Soil Cover	Soil Quality	Ecosystem Composition	Plant Species and Ecosystems at Risk	Amphibians	Water Birds	Forest and Grassland Birds	Moose	Caribou	Grizzly Bear	Furbearers	Bats	Invertebrates	Provincial Economy (1)	Regional and Local Employment and Business (1)	Regional and Local Government Finance (1)	Demographics (1)	Regional and Community Infrastructure (1)	Regional and Local Services (1)	Family and Community Well-Being (1)	Non-traditional Land and Resource Use	Current Land and Resource Use for Traditional Purposes	Visual Resources	Archaeological Sites	Historic Heritage Sites	Paleontological Resources	Environmental Exposures	Worker Health and Safety (1)
Construction (Years -2 and -1)	Mine Site	Site clearing, grading, soil salvage, development of borrow pits, construction of main and ancillary facilities, water diversion/collection/treatment, storage and soil stockpiles management of construction materials and waste. Workforce accommodation																																							
	Mine Access Road	Site clearing, grading and road construction including stream crossings. Transportation of workforce and materials																																							
	Fresh Water Supply System	Site clearing and grading, construction of intake, construction of road, installation of water pipeline and fresh water reservoir																																							
	Airstrip	Site clearing and grading, construction of runway and construction of airstrip ancillary facilities. Transportation of workforce																																							
	Transmission Line	Site clearing and grading, construction of access roads, construction of towers and installation of cables																																							
	Kluskus FSR	Road upgrades and transportation of workforce and materials																																							
Operations (Years 1 to 17)	Mine Site	Drilling, blasting, ore and waste rock loading, hauling and dumping, ore crushing, ore processing, tailings deposition, maintenance of equipment, management of materials, workforce accommodation, waste and sewage treatment																																							
	Mine Access Road	Transportation of workforce and materials and maintenance																																							
	Fresh Water Supply System	Pumping of water and maintenance of system																																							
	Airstrip	Maintenance and occasional use for transportation of workforce or materials																																							
	Transmission Line	Maintenance																																							
	Kluskus FSR	Maintenance and transportation of workforce and material																																							
Closure (Years 18 to 35)	Mine Site	Decommissioning and demolition of facilities, re-contouring and revegetation, reclamation of TSF																																							
	Mine Access Road	Maintenance and occasional transportation of people																																							
	Fresh Water Supply System	Pumping of water and maintenance of system until mine site starts discharging water, decommissioning of fresh water supply system and re-vegetation																																							
	Airstrip	Decommissioning and demolition of facilities, replacement of reclamation materials, re-contouring and revegetation																																							
	Transmission Line	Decommissioning and demolition of facilities once FSS is no longer needed, replacement of reclamation materials, re-contouring and revegetation																																							
	Kluskus FSR	Maintenance and transportation of workforce and material until completion of closure measures																																							
Post-Closure (Years 35 +)	Mine Site	Discharge of water back to Davidson Creek, post-closure care and maintenance of site and environmental monitoring																																							
	Mine Access Road	Maintenance and occasional transportation of people																																							
	Fresh Water Supply System	Monitoring																																							
	Airstrip	Monitoring																																							
	Transmission Line	Monitoring																																							
	Kluskus FSR	Occasional transportation of people																																							

Notes:

1 - For this VC, the interaction is with the Project as a whole and the Mine Site is selected as representative for the whole Project.

Legend:

	Key interaction: resulting in potential significant adverse effect or significant concern; consideration in the assessment.
	Moderate interaction: Potential adverse effect requiring additional mitigation; consideration in the assessment.
	No interaction: No or negligible adverse effect expected; no further consideration needed for the assessment.

Source: BC EAO, 2013b

Table 4.3-3: Quantitative and Qualitative Methods for Assessing the Effects on Selected Valued Components

Pillar	VC	Method
Environment – Atmospheric and Acoustic	• Noise and Vibration	• Quantitative: • Stationary sources were assessed using environmental noise model SPM9613, ISO standard 9613 • Aircraft noise assessment used Transport Canada computer model Noise Exposure Forecast – NEFCalc, Version 206
	• Air Quality	• Quantitative: • Emissions from mobile sources are estimated using the US EPA models MOVES2010b and NONROAD • Air quality estimates were prepared using an air quality dispersion model program CALPUFF • Meteorological Input data for CALPUFF was generated using CALMET pre-processor
	• Climate Change	• Quantitative: Emissions from mobile sources are estimated using the US EPA models MOVES2010b and NONROAD
Environment – Aquatic	• Surface Water Flow	• Quantitative: Water balance model was developed using the GoldSim© software package
	• Surface Water Quality	• Quantitative: • Water quality model was developed using the GoldSim© software package Version 11 • Geochemical models were developed to characterize seepage, mine site effluent and pit lake water quality • Mass balance calculations were used to estimate water temperatures at key locations
	• Sediment Quality	• Qualitative: no numerical modeling was conducted and assessment is based on professional opinion
	• Wetlands	• Quantitative: Wetlands habitat losses were quantitatively estimated using Terrestrial Ecosystem Map developed for the Project.
	• Fish	• Semi-Quantitative: Professional judgement that relies on the results of surface water quality estimates
	• Fish Habitat	• Quantitative: • Habitat quantity and quality affected by the Project was assessed using a Habitat Evaluation procedures approach. • The relationship between flow and quantity and quality of fish habitat was quantitatively modeled using an Instream Flow Study consistent with BC Instream Flow Guidelines
	• Groundwater Quantity • Groundwater Quality	• Quantitative: • Two-dimensional modeling to estimate seepage from tailings storage facility using SEEP/W software • Three-dimensional steady-state, regional scale numerical groundwater model was developed using MODFLOW-SURFACT software • Seepage pathway analysis was conducted using MODFLOW-MODPATH particle tracking software
Environment - Terrestrial	• Physiography and Topography	• Quantitative: Digital elevation models were generated considering mine related landforms and quantitative estimates for slope classes were generated
	• Surficial geology and soil cover	• Quantitative: the amount of soils materials affected were quantitatively estimated using project specific terrain and soils mapping
	• Soil Quality	• Semi-Quantitative: Reclamation suitability was assessed qualitatively and quantitatively taking into account thickness, particle size and chemical properties of the soils
	• Ecosystem composition	• Quantitative: Terrestrial ecosystem mapping (TEM) to provincial standards (Resource Inventory Committee 1998), based on three

Pillar	VC	Method
	• Plant species and ecosystems at risk	dimensional aerial photograph interpretation and bioterrain, was completed for the Project and was the basis for assessing effects on vegetation
	• Amphibians • Water Birds • Forest and Grassland Birds • Moose • Caribou • Grizzly Bear • Furbearers • Bats • Invertebrates	• Quantitative: Habitat suitability mapping was developed for all wildlife VCs, which are supported by the Project TEM and VC specific species accounts and habitat rating tables. Habitat suitability maps were the basis for estimating effects on VC habitats
Economy	• Provincial economy • Regional and local employment and businesses • Regional and local government finance	• BC Input-Output model was run by BC Stats using Preliminary Economic Assessment Project financials to estimate effects on the economy of the Province and the region where the Project is located. This model estimates effects on provincial GDP, total employment, household income and government revenue
Social	• Demographics	• Semi-quantitative: Project specific workforce requirements were taken into account together with data from similar project in BC to come up with estimates on demographic changes
	• Regional and community infrastructure	• Semi-quantitative: Using Project description and demographic estimates, effects on regional and community infrastructure are presented
	• Regional and local services	• Semi-quantitative: Using Project description and demographic estimates, effects on regional and community infrastructure are presented
	• Family and community well-being	• Qualitative: Professional opinion based on experience with similar Projects
	• Non-traditional land and resource use	• Qualitative: Professional opinion based on experience with similar Projects
	• Current Land and Resource Use for Traditional Purposes	• Semi-Quantitative: Assessment is supported by quantitative and semi-quantitative estimates of changes in vegetation, wildlife, aquatic and heritage resources
	• Visual resources	• Quantitative: Computer-generated viewshed analyses incorporated terrain elevation, projected crown height of vegetation, and maximum height of proposed facilities to identify and measure direct • line of sight as a main indicator of effect to visual resources
Heritage	• Archaeological sites • Historic heritage sites • Paleontological resources	• Semi-quantitative: • Archaeological Overview Assessments (AOA) were conducted to identify areas having archaeological potential. The Archaeological Impact Assessment (AIA) was focused on areas identified as having archaeological potential in the AOA and also included heritage and cultural resources sites • Paleontological resources were assessed through desktop and field studies to confirm the presence of rock formations with fossil resources
Health	• Environmental exposures	• Quantitative: a Human Health and Ecological Risk Assessment (HHERA) model was develop to quantify effects of environmental exposures on human receptors
	• Workers health and safety	• Quantitative: Professional opinion based on experience with similar Projects

4.3.4 Mitigation of Project Effects

Mitigation includes any action taken to avoid, minimize, restore on-site, compensate, or offset the adverse effects of a project or activity.

Following description of the potential effects for each VC, technically and economically feasible, proven best practice mitigation measures were identified and applied to minimize or offset the potential effects. Those effects remaining after the application of all mitigation measures were identified as residual effects.

Mitigation measures identified to address effects on each VC are proposed to:

- Enhance positive environmental, economic, social, heritage, or health effects;
- Avoid environmental, economic, social, heritage, or health effects (through changes to the Project design, such as alternative approaches, different chemicals or materials used);
- Minimize environmental, social, economic, heritage, or health effects (through use of measures such as berms, training, or pollution prevention equipment/technologies);
- Treatment, for example re-vegetation as described in the Reclamation and Closure Plan (RCP) (**Section 2.6**);
- Restore onsite environmental, social, economic, heritage, and health conditions following an accident or malfunction (e.g., by emergency response, cleanup);
- Compensation, for example as described in the Fisheries Mitigation and Offsetting Plan (FMOP) (**Appendix 5.1.2.6C**) or conceptual wetlands compensation plan (**Appendix 5.3.7A**); and
- Where applicable, offset environmental, social, economic, heritage, or health effects (offsite or onsite) to fully avoid, minimize, and restore where residual impacts remain.

Mitigation measures are discussed in relation to their expected effectiveness and associated risk for each VC in **Section 5** to **Section 9**. Mitigation measures, including management and compensation or offsetting plans that would be implemented to address potential effects, are presented in **Section 12.2.1** (EMPs) and **Section 20** (Summary of Mitigation Measures) of the Application. The Summary of Mitigation Measures is written as specific commitments and clearly describes how the proponent intends to implement them, as per the EIS Guidelines.

Additional details and supporting documentation are provided, as appropriate, where suggested mitigation or enhancement measures are untested in similar circumstances elsewhere, and the response of the target (organism or physical process) is yet unknown. These situations may require consideration of a follow-up program. Follow-up programs or follow-up monitoring is applied with VCs that have a low level of certainty associated with the significance determination or mitigation measures used in the assessment require monitoring to confirm the effectiveness of the performance. **Section 13**, Follow-up Monitoring and Compliance Reporting will summaries these programs.

4.3.5 Evaluating Residual Project Effects

This section describes the steps considered for the evaluation of residual Project effects. The methods proposed in this section also apply to the assessment of cumulative effects described in **Section 4.3.6**.

4.3.5.1 Characterization of Residual Effects

This subsection presents the rationale for describing residual effects and assessing their significance on VCs.

Adverse residual Project effects that remain after the application of effective and feasible mitigation were characterized for each applicable VC using the following attributes (rating criteria):

- **Context:** this refers to the ability of the VC to accept change. For example, the effect of a project may have an impact if it occurs in areas that are ecologically sensitive, with little resilience to imposed stresses;
- **Magnitude:** this refers to the severity of the impact. Impacts can be high magnitude or low magnitude;
- **Geographic Extent:** this refers to the area over which the predicted impact is expected to occur. The geographic extent of effects can be site-specific, local or regional;
- **Duration:** this refers to the length of time the effect lasts. Duration can be defined as short term or long term;
- **Reversibility:** this refers to the ability of the VC to return to its original state once the stressor is removed. Effects can be reversible or permanent; and
- **Frequency:** this refers to how often an effect is expected to occur (may be described as frequent or infrequent, or may be quantified).

For those VCs with standards established by legislation or regulations (such as noise, air quality, surface water quality, and sediment quality), the predicted effect in relation to the standard will serve as the basis for the determination of the magnitude of the effect. For other VCs, the assessment of magnitude will be conducted by analyzing other factors; such as baseline conditions, which will be VC-specific.

The manner in which these criteria are further defined and applied to VCs within each of the pillars of the assessment is set out below in **Table 4.3-4** and **Table 4.3-5**. Magnitude and geographic extent are more specific for each pillar. Those criteria are provided in **Table 4.3-6** and **Table 4.3-7**.

In addition to the attributes described above, direction is used to characterize the project effects on Valued Components, but will not be used for the determination of significance, which only applies to adverse residual effects. Direction is defined as “the degree to which an effect on a valued environmental component will worsen or improve as the action proceeds (i.e., adverse, beneficial or neutral)” (Agency, 1999). Direction was taken into account while assessing the interactions between project components and the Valued Components to ensure that interactions

that will either improve or worsen the condition of the Valued Component will be identified and described in the assessment. In particular, the interactions of the Project with economic, social and heritage Valued Components have the potential to generate both adverse and beneficial effects.

Socio-economic VCs generally do not respond to Project-related activities in the same way that most bio-physical VCs do. Bio-physical VCs typically react to physical interactions with project activities. Socio-economic VCs are dynamic and react in a complex cause-effect manner to project activities/stimuli in combination with all other current human activities in the study area. The other combining influences include public attitudes, government policy and programming and numerous civil society and private sector initiatives. Socioeconomic conditions are almost always the result of combined effects where direct causality is difficult to establish. This dynamism combined with the often subjective nature of the status of social VCs in particular, means analysts have to make point in time assessments of sensitively and resilience based on then-available evidence. The status of potential effects on these VCs is thus most practically described by implicitly incorporating the concept of context in the 'magnitude' attribute – an assessment of the contribution that project effects are likely to make to the condition of the VC in question. Therefore, a 'combined' attribute assessment is used to describe project effects on a VC which in turn responds to combined causal influences. However, if a context attribute were to be applied as an administrative requirement, it would be neutral.

The approach does not apply in the same way to socioeconomic VCs which do respond primarily to physical interactions with project activity; the two best examples are Non-Traditional Land and Resource Use (NTLRU) and Current Land and Resources Use for Traditional Purposes (CLRUTP). The former can and does use context in the assessment because the relevant methods criteria can be practically and usefully applied. In the case of CLRUTP, while there is a direct causal link to physical activities, the nature of this VC dictates that its context is by definition 'High'. This VC is unique because of its legal and regulatory implications (the Honour and Duty of the Crown must be exercised in any assessment decisions). In a given circumstance for a given affected user population, it could be quite resilient, for example because of limited current use and/or high abundance/opportunity, but would still be rated as having a high context.

Table 4.3-4: Environment and Heritage Rating Criteria for Characterizing Residual Effects

Attribute	Rating Criteria Description
Context	
Low	• VC has strong resilience to stress, the VC has not been affected by other projects or activities or natural changes. No listed species or ecosystems identified
Medium	• VC has moderate resilience to stress, the VC has been affected by other projects or activities, or natural changes but still has capacity to assimilate more changes. Presence of blue-listed species or ecosystems
High	• VC has weak resilience to stress, the VC has been severely affected by other projects or activities, or natural changes. Presence of red-listed or SARA-listed species or ecosystems
Duration	
Short-term	• Less than two years (i.e., effects happens during the construction phase only)
Medium-term	• From two to less than 17 years (i.e., effect happens during construction and operations)
Long-term	• From more than 17 to less than 35 years (i.e., effect happens during construction, operations and closure)
Chronic (permanent)	• More than 35 years and beyond (i.e., effect happens from construction through to post closure and beyond)
Reversibility	
Yes	• Effect is reversible over one to a few cycles of the physical event after the impact ceases (physical). Effect is reversible over one to a few life cycles after the impact ceases (biological)
No	• Effect is not reversible over the time scales listed
Frequency	
Once	• Effect occurs on one occasion over the life of the Project
Intermittent	• Effect occurs several times over the life of the Project
Continuous	• Effect occurs continuously over the life of the Project

Table 4.3-5: Economic, Health and Social Rating Criteria for Characterizing Residual Effects

Attribute	Rating Criteria Description
Context	
High	VC has weak resilience to stress; the VC has a low capacity to accommodate growth/change and demonstrates variable or circumscribed responses to management actions. The VC has special legislative or regulatory status
Neutral	VC has demonstrated resilience to stress; the VC has the capacity to accommodate growth/change and is responsive to management actions. The VC has no special legislative or regulatory status
Duration	
Short-term	• Effect extends throughout the construction phase
Medium-term	• Not applicable
Long-term	• Throughout operations and closure
Chronic (permanent)	• During post closure or beyond
Reversibility	
Yes	• Baseline conditions can be re-established after the factors causing the effect are removed
No	• Baseline conditions cannot be re-established after the factors causing the effect are removed (i.e., is permanent)
Frequency	
Once	• Effect occurs on one occasion over the life of the Project
Intermittent	• Effect occurs several times over the life of the Project
Continuous	• Effect occurs continuously over the life of the Project

Table 4.3-6: Criteria Rating for Magnitude for Characterizing Residual Effects

	Environmental: Terrestrial			Environmental: Aquatics						Social and Economic				Heritage	Atmospheric Environment		
Magnitude	**Wildlife**	**Vegetation**	**Soils & Terrain**	**Fish and Fish Habitat**	**Wetlands**	**Surface Water and Sediment Quality[1]**	**Groundwater Quantity**	**Groundwater Quality[2]**	**Surface Water Flow**	**Visual**	**Non-Traditional Land Use (NTLU)**	**Social & Economic**	**CLRUTP**	**Archaeology Palaeontology Heritage**	**Noise[3]**	**Air Quality[4]**	**Health**
Negligible	Effects are not measurable	Effects are not measurable	Effects are not measurable	No detectable change from baseline	No detectable change from baseline in wetland extent or baseline (<1% reduction in area from baseline)	Maximum concentration less than the BC MOE Protection of Freshwater Aquatic Life 30-day average guideline (BCFWG 30-d guide) or all values less than detection	Effects are not measurable (no change in water levels and flows from baseline conditions) *Magnitude: effect considered on groundwater quantity only*	Effects are not measurable (no change in elemental concentrations from baseline conditions) *Magnitude: effect considered on groundwater quality only*	Effects are not measurable (<5% change in flow from baseline conditions)	Change cannot be captured by the human eye	No detectable change from baseline	No detectable change from baseline	No detectable change from baseline	Little or no portion of the site is lost	Effects are not measurable	No effects	Effects may be indistinguishable in the population
Low	A measurable change but within the range of natural variation	1 to 10% reduction in area from baseline	1 to 5% change, depending on the parameter modified	Differs from mean baseline value, but is within range of natural variation, and below guideline or threshold	1 to 10% reduction in wetland area from baseline	Mean concentration above BCFWG 30-d guide up to 4 months, maximum concentration always below the BCFWG maximum guide	Some effects are noticeable, however recovery is relatively rapid and the effects result in either 5% to 10% change in contribution to surface water flow from baseline conditions or 1% to 10% reduction in wetland area from baseline	5 to10% change in quality from baseline conditions with no change constituting a new Contaminated Sites Regulation (CSR) standard exceedance	5 to10% change in flow from baseline conditions	Visible but distant or partially obscured	<1% change	Effect that occurs might or might not be detectable, but is within the normal range of variability	Project overlaps with very small portions of areas used for current traditional land and resource uses (<1% change) but will not impede the activity.	A small portion of the site is lost	Less than 3 decibel increase over the background level	Measured or estimated effect represents less than 1% change in the receptor (quality, quantity, or other attribute) from baseline conditions, and is within the range of normal variability	Effects can be distinguished in the population
Medium	A measurable change but less than high	10 to 20% reduction in area from baseline	5 to 20% change, depending on the parameter	Differs from mean baseline value, approaches limits of natural variation, but is below or equal to guideline or threshold	10 to 20% reduction in area from baseline	Mean concentration above BCFWG 30-d guide 9 or more months, maximum concentration above BCFWG maximum guide up to 4 months	Effects occur and recovery is not relatively rapid and the effects result in either 10% to 20% change in contribution to surface water flow from baseline conditions or 10% to 20% reduction in wetland area from baseline	10 to20% change in quality from baseline conditions with no change constituting a new CSR standard exceedance	10 to 20% change in flow from baseline conditions	Visible but distant	1 to 10% change	Effect is unlikely to pose a serious risk or benefit to the VC or to represent a management challenge	Project overlaps several areas used for current traditional land and resource uses (1 – 10% change), but does not severely limit the ability to practice this activity.	Significant proportions of site are lost	3 to 10 decibel increase over the background level	Measured or estimated effect represents a 1 to 10% change in the receptor (quality, quantity, or other attribute) from baseline conditions, and is unlikely to pose a serious risk to a receptor	Effects are clearly distinguishable and result in elevated awareness or concern among stakeholders or result in measurable change in the well-being of the population
High[5]	A >20% change of density, abundance or distribution for listed species and >30% change of density, abundance or distribution for all other species	>20% reduction in area from baseline	>5 to >20% change, depending on the parameter	Differs from mean baseline value, is outside range of natural variation, and beyond guideline or threshold	>20% reduction in area from baseline	Mean concentration always above the BCFWG 30-d guide, maximum concentration always above BCFWG maximum guide	Change in groundwater levels and flows from baseline conditions are permanent and the effects result in either more than 20% change in contribution to surface water flow from baseline conditions or more than 20% reduction in wetland area from baseline	>20% change in quality from baseline conditions or one or more changes that constitute a new CSR standard exceedance	>20% change in flow from baseline conditions	Proximate and highly visible	>10% change	Effect is likely to pose a serious risk or benefit to the selected VC and, if negative, represents a management challenge	Project overlaps with large areas used for current traditional land and resource uses (>10% change) and severely limits or prevents the ability to practice this activity.	An entire site is lost	More than 10 decibel increase over the background level	Changes in predicted ground-level concentrations are >10% above background and/or exceed a listed AAQO.	Effects are highly distinguishable and result in strong concern among stakeholders or result in substantive changes in the well-being of the population

Notes: Applicable Standards used are:

[1] British Columbia Freshwater Guidelines (BCFWG)
[2] Environmental Code of Practice for Metal Mines. Environment Canada, Mining and Processing Division, Mining Section, Document No. 1/MM/17, 2009
[3] Some air quality impacts may occur beyond the boundaries of the air quality RSA. This is generally true of emissions that are not necessarily pollutants, but may contribute to atmospheric issues on a larger scale. “Global geographic extent” is used to describe impacts beyond the air quality RSA. AAQO = Ambient Air Quality Objectives
[4] Contaminated Sites Regulation (CSR) standard
[5] High: A threshold of 20% change or loss is proposed for high magnitude. This is a general environmental practitioner approach, which has been used and supported in the past for resource development projects, including the Joint Review Panel Report on the Jackpine Mine Expansion Project which decision statement was made under *CEAA 2012*.

Table 4.3-7: Criteria Rating for Geographic Extent for Characterizing Residual Effects

	Environmental: Terrestrial			Environmental: Aquatics						Social and Economic				Heritage	Atmospheric Environment		
Geographic Extent	**Wildlife[1]**	**Vegetation**	**Soils & Terrain**	**Fish and Fish Habitat**	**Wetlands**	**Surface Water and Sediment Quality**	**Groundwater Quantity**	**Groundwater Quality**	**Surface Water Flow**	**Visual**	**Non-Traditional Land Use (NTLU)**	**Social & Economic[2]**	**CLRUTP**	**Archaeology Palaeontology Heritage**	**Noise**	**Air Quality**	**Health**
Site-Specific: Within the Project Site	Local (e.g., effect is closely linked to the footprint but doesn't extend far outside of it); many wildlife effects that extend into the LSA because are referred to as local	Effect is confined to project footprint right of way	Effect is confined to project footprint right of way	Effects confined to the Project site	Effect is confined to the Project site	Effects are downstream of the Tailings Storage Facility	Effects confined to the Project site	Effects confined to the Project site	Effects confined to the Project site	Not Applicable	Confined to the area directly disturbed by the Project	Not Applicable	Confined to the area directly disturbed/affected by the Project (footprint as well as areas now inaccessible due to Project)	The effect is confined to the Project site	Effect occurs within the property boundary	Measured or estimated effect occurs only within the boundaries of the Project site	Effect is limited to the on-site worker population
Local : Within the LSA	Effect is prevalent in the LSA – Landscape effects when the LSA tends to match with watersheds or larger units	Effect is confined to the LSA	Effect is confined to the LSA	Effects confined to the LSA: Local population; linear scale <100 km;	Effect is confined to the LSA	Effect is confined to the LSA	Effect is confined to the LSA	Effect is confined to the LSA	Effect is confined to the LSA	Size of the overlap between the viewshed of the proposed mine site facility or linear feature and the internal viewshed of a potential sensitive receptor within the area of the LSA	Limited to NTLU tenures and dispositions or the stakeholders who possess land use tenures and dispositions or engage in activities in areas that overlap with the area directly disturbed by the Project	Effect is confined to the LSA	Limited to the areas used currently for traditional land and resource uses that overlap with the LSA	Effects on a site or sites (restricted to areas of direct physical disturbance within the LSA)	Effect is confined to the LSA	Measured or estimated effect occurs only within the boundaries of the LSA. For socioeconomic receptors, the effect will be limited to specific persons or communities	Effect occurs within the LSA population
Regional: Within the RSA	Effect is prevalent into the RSA – Regional (e.g., population effects to moose, deer, wolf)	Effect is confined to the RSA	Effect is confined to the RSA	Effects confined to the RSA: Multiple populations or species	Effect is confined to the RSA	Effect is confined to the RSA	Effect is confined to the RSA	Effect is confined to the RSA	Effect is confined to the RSA	Size of the overlap between the viewshed of the proposed mine site facility or linear feature and the internal viewshed of a potential sensitive receptor within the area of the RSA	Effect extends beyond the NTLU tenures and dispositions or the effect extend to NTLU tenures and dispositions that overlap with the area directly disturbed by the Project	Effect is confined to the RSA	Effect extends to current traditional land and resource uses located outside of the LSA to the RSA	Not Applicable	Effect is confined to the RSA	Measured or estimated effect occurs beyond the boundaries of the LSA and mainly within the boundaries of the RSA; the socioeconomic assessment may also include impacts at a provincial level within BC, or effects that extend nationally	Effect occurs within the RSA population

Notes: [1] Wildlife = Geographic Extent: Beyond Regional (effects to grizzly bear and caribou because of large regional movement and population extent).
[2] Provincial Extent was used, which only applies to Economy and Social pillars and is defined by "Within British Columbia".

4.3.5.2 Likelihood

The likelihood of occurrence of a particular residual effect is stated before significance has been determined. It is an important element in understanding the potential significance of a residual effect, but it is not a determinant of significance. Likelihood is the certainty of an event occurring and is stated as a probability. Likelihood is rated as a low, moderate, or high likelihood of occurrence.

- Low = residual effect is unlikely to occur or its occurrence could be considered very rare;
- Moderate = it is possible that the residual effect will occur, as it has occurred in other similar projects but not in all projects; and
- High = residual effect is likely or almost certain to occur as it has normally happened in other similar projects.

Following recent guidance from BC EAO (BCEAO 2013b), likelihood of residual effects is recommended to be assessed prior to the determination of significance. This differs to the approach recommended by the Agency (Agency, 1994), which evaluates probability following determination of significance. While this Application follows the most recent guidance from BC EAO, in order to maintain currency for both EAO and Agency approaches, likelihood has not been considered in the determination of significance. Significance was assessed for all residual effects assuming that they would occur and does not assume a lower level of significance purely based on probability of occurrence; this approach provides an objective consideration of significance and is consistent with the Agency (1994).

4.3.5.3 Significance

The determination of the significance of adverse residual Project effects on VCs is a key step in the assessment process.

For VCs with standards established by legislation or regulations (such as noise, air quality, surface water quality, and sediment quality), the predicted effect, in relation to the standards, served as the basis for the determination of significance. In some cases, thresholds were determined with consideration of background or baseline conditions. For other VCs, determination of significance was established based on qualitative thresholds and factors including experience with similar projects, modified as appropriate by current community, and regulatory perceptions of significance of a particular effect, as determined through engagement throughout the assessment process (**Table 4.3-8** and **Table 4.3-9**).

Adverse residual effects on each VC were determined to be ‘significant’ or ‘not significant.’ ‘Not significant’ effects were further categorized as ‘negligible’, ‘minor’, or ‘moderate.’

In general, to be considered to have potential for a significant effect, the residual effect on the VC being assessed must meet one of the following combinations of criteria:

- Have a high magnitude at a local geographic extent and be long-term or chronic in duration;
- Have a medium magnitude at a regional geographic extent and a long-term or chronic duration; or
- Have a high magnitude at a regional geographic extent of any duration.

- In addition to the combinations presented above, other criteria such as context, frequency and reversibility will be taken into account for the final determination of significance on any VC.

Table 4.3-8: Example of Use of Environment and Heritage Rating Criteria to Evaluate Significance of Adverse Residual Effects

Attribute	Rating Criteria Description
Significance	
Not Significant (negligible)	• Effects are point-like or local in geographic extent, or low context rating, and a negligible magnitude, short-term, reversible, and with a low frequency (once or intermittent)
Not Significant (minor)	• Effects are local in geographic extent, or low magnitude, or low context rating, short-term to chronic, reversible, or low frequency (once or intermittent)
Not Significant (moderate)	• Effects are local to regional in geographic extent, and medium in magnitude, medium context rating, medium-term to chronic, reversible, and occur at all frequencies
Significant	• Effects occur to VCs with a medium to high context rating, high magnitude, regional in geographic extent, long-term to chronic, non-reversible, and occur at all frequencies

Table 4.3-9: Example of Use of Economic and Social Rating Criteria to Evaluate Significance of Adverse Residual Effects

Attribute	Rating Criteria Description
Significance	
Not Significant (negligible)	• No effects are evident
Not Significant (minor)	• Effects are distinguishable, magnitude is low, geographic extent is local, duration is short-term, reversible, and frequency is intermittent, context is neutral
Not Significant (moderate)	• Effects are clearly distinguishable, magnitude is low to medium, frequency is intermittent, reversible, and duration ranges from usually short-term to long-term, context is neutral
Significant	• Effects are highly distinguishable, high in magnitude, provincial in geographic extent, non-reversible, usually chronic in duration, and frequency is continuous, context is high

4.3.5.4 Confidence and Risk

Once the evaluation of significance is determined, the level of confidence in the prediction is considered. Level of confidence can be high, moderate, or low and describes the certainty of the predicted outcome, allowing the decision-maker to evaluate risk. The level of confidence will be explained following the determination of significance for residual effects of each VC. Uncertainty can be addressed through follow-up or monitoring programs.

The levels of confidence associated with the determinations of significance and likelihood are typically based on professional judgement and knowledge of the sources and nature of uncertainty as compounded through all steps in the effects assessment. Confidence and risk are evaluated for each residual effect prediction and each cumulative effect prediction. When there is a low confidence in residual effect prediction the necessity of additional risk analysis may be proposed (**Table 4.3-10**).

Table 4.3-10: Confidence

High	All of the following must be met: • VC is well understood • Project-VC interaction is well understood • Mitigation has been proven effective
Moderate	• VC understood in similar ecosystems and effects documented in the larger regional area or in the literature • mitigation proven effective elsewhere
Low	• VC is not well understood • Project-VC interaction is not well understood • Mitigation has not been proven effective

4.3.5.5 Determining the Need for Cumulative Effects Assessment

The Application includes a rationale for selection of other projects/activities, including consideration of Agency guidance (Agency, 2012), as well as other factors that may inform whether a future development is sufficiently certain to proceed.

The need for a CEA on a VC will be determined according to the following:

- The occurrence of a residual adverse Project effect has been determined, but this residual effect is not expected to be negligible; and
- The residual Project effects must be demonstrated to interact with the effect of other past, present or future projects, or activities.

The following major projects were initially identified as a possible candidate for inclusion in the assessment of cumulative effects:

- Nulki Hills Wind Project;

- Coastal Gas Link Pipeline; and
- Pacific Northern Gas Looping Project.

The following general land uses will be reviewed to determine the potential contribution to cumulative effects:

- Protected areas and parks;
- Recreation/tourism use (e.g., all-terrain vehicle use);
- Mining, exploration, and mineral tenures;
- Forestry and timber resource use;
- Hunting/trapping/guide outfitting;
- Fishing and aquaculture;
- Agriculture and grazing;
- Range use;
- Land ownership and tenures;
- Recreational and commercial use of waterways;
- Groundwater resource use; and
- Surface water resource use.

The potential future expansion of the Project is not considered reasonably foreseeable; therefore, it has not been taken into account in the CEA.

4.3.6 Assessment of Cumulative Effects

This section describes when an assessment of cumulative effects is required and identifies the projects and activities that will be considered for this purpose.

The assessment of cumulative effects identifies the residual effects of the Project with the potential to interact with the residual effects of other projects or activities within the RSA and assess whether this interaction is likely to result in a greater impact to the identified VC.

As for the assessment of Project Effects, the assessment of cumulative effects will consider the following steps:

- Potential cumulative effects;
- Mitigation of cumulative effects; and
- Evaluation of residual cumulative effects.

4.3.6.1 Overview

A CEA must be considered if adverse residual effects are predicted to result from the construction, operation, or closure and post-closure of the Project[2].

A CEA for the Project assesses cumulative effects likely to result from adverse residual Project effects acting in combination with residual effects on the same VCs arising from projects or activities that have been or are likely to be carried out within the RSA. The rationale for the RSA is presented in **Table 4.3-1**. The CEA was conducted based on guidance on CEAs from the BC EAO (2013b) and the Agency (2012). CEAs of most socioeconomic VCs are considered inherently cumulative in nature. The social VCs that have interactions with biophysical components will consider cumulative effects separately.

The CEA was completed for identified residual effects of the Project based on six steps listed below:

1. All potential adverse residual Project effects that were identified and characterized in the Project effects assessment were carried forward into the CEA.
2. Each predicted adverse residual Project effect on a VC was evaluated to determine if it might act cumulatively in space or time with the effects on the same VC caused by projects and activities described in the Project Inclusion List (PIL) (**Appendix 4C**), and if that interaction was likely to occur. If the interaction was determined to be unlikely, the rationale for exclusion was documented, and the residual effect was not carried forward to the CEA. If, in the significance evaluation, the residual effect on a VC was determined to be 'not significant - negligible', that VC was not carried forward into the cumulative effects assessment and the rationale for its exclusion was documented.
3. Potential cumulative interactions or overlaps in space or time that were likely to occur were carried forward into the CEA, including residual effects from historical (closed) projects or activities, existing (currently active) projects and general land use activities, and reasonably foreseeable future projects.
4. Potential adverse cumulative effects were assessed for each VC, and any necessary technically and economically feasible mitigation and enhancement measures were described to address the potential adverse effect. Effects that remained after application of additional mitigation were deemed to be residual cumulative effects and were characterized using the attributes and criteria rating set out in **Section 4.3.5.1**.
5. The significance of residual adverse cumulative effects was assessed using the same attributes and criteria rating applied to determination of significance of residual Project effects (**Section 4.3**, Determination of Significance of Residual Effects) below and aggregated by VC.

[2] Assessment of cumulative effects is considered when the residual effect of the Project on the VC is determined to be other than non-significant (negligible).

6. The results of the cumulative effects analysis for each VC follows the outline set by the AIR and were also compiled into a standalone document of a cumulative effects assessment that meets federal requirements (*CEAA, 2012*), and presented in **Appendix 19A**).

The development of the cumulative effects methods is consistent with the Agency's Operational Policy Statement (OPS) on Assessing Cumulative Environmental Effects under *CEAA, 2012* (Agency, 2012). No committee has been established under section 73 or 74 of *CEAA, 2012* therefore, there are no relevant studies that can be used for CEA.

The potential for cumulative effects for accidents and malfunctions is presented in **Section 10**. The projects or activities in the PIL (**Appendix 4C**) that could have residual effects were reviewed to fully understand the context of potential residual adverse effects interacting with potential effects arising from these four possible accidents or malfunctions associated with the Project. The spatial boundary for this assessment is the RSA.

4.3.6.2 Project Inclusion List

The methodology presented below was used to select and describe past, present, and/or future projects or activities that may interact with the VCs within the Project RSAs.

The selection of which other projects and human activities to consider in the CEA was initially made by reviewing available information for the following:

- Historical (closed) projects or activities within the cumulative effects assessment RSAs;
- Existing (currently active) projects within the cumulative effects assessment RSAs;
- General land use activities within the cumulative effects assessment RSAs; and
- Reasonably foreseeable future projects (i.e., planned and approved projects) occurring within the CEA RSAs.

A PIL was developed for the CEA, which was mainly based on the BC Major Projects Inventory (BC Ministry of Jobs, Tourism, and Skills Training, 2013). This PIL is identifying those projects or human activities that may overlap spatially or temporally with the Project (**Table 4.3-11**). The detailed PIL and descriptions of various projects and activities used for assessing potential environmental, economic, social, heritage, and health effects are presented in **Appendix 4C**, and in their respective sections (**Section 5**, Assessment of Potential Environmental Effects through **Section 9**, Assessment of Potential Health Effects).

Two projects that were listed in the BC Major Projects Inventory for Vanderhoof will not be included in the CEA. These two projects do overlap spatially but not temporally and are not included in the PIL. Descriptions and rationale for exclusion of these projects is provided in **Table 4.3-12**.

Figures and area calculations were generated for the CEAs by investigating and rationalizing items on the Project Inclusion List, to represent past, present, and future activities within the LSA and RSA for the VCs. Where possible, the spatial footprint of a project was captured to enable area

calculations. Activities taking place in a variable manner within a larger area were mapped on a separate figure. The maps to be considered for the CEA as well as the methodological approach to create these maps is provided in **Appendix 4D**.

Table 4.3-11: Summary Project Inclusion List

Project/Land Use	Description/Status	Spatial Overlap with Blackwater within Cumulative Effects RSA	Temporal Overlap with Blackwater
Nulki Hills Wind Project	Wind power project in Nulki Hills; up to 70 turbines; located 60 km north-northeast of mine site; 5 km east of Kluskus FSR pre-application stage with BC EAO	yes	yes
Fraser Lake Sawmill Biomass Project	12 MW power plant using sawmill waste to produce energy – start-up Q2-Q3 2014 permitting in process	yes	yes
Coastal GasLink Pipeline Project	The proposed Project involves the construction and operation of an approximately 650 km long natural gas pipeline 1219 in diameter from near Dawson Creek in northeast BC to the proposed LNG Canada LNG export facility near Kitimat.	yes	yes
Pacific Northern Gas Looping Project	The proposed Project involves the construction of approximately 525 km of new 24-inch pipe, operating in parallel with the existing pipeline.	yes	yes
Mining – exploration	Two developed prospects, exploration programs, and numerous mineral tenures; includes several New Gold mining exploration projects, such as Van Tine, Capoose, Fawnie, Emma, and Auro	yes	yes
Mining – existing	Endako Lake molybdenum mine; 65 km west of Vanderhoof	yes	yes
Forestry – logging	Various historical, active, and pending logging tenures and woodlot licences; private forest lands	yes	yes
Hunting, Trapping, Guide Outfitting	14 guide outfitter areas within the RSA, 78 traplines	yes	yes
Fishing and Hunting Lodges	23 commercial lodges within the RSA	yes	yes
Recreation	RSA supports year-round recreational activities	yes	yes
Agriculture	69 range tenures within the RSA	yes	yes
Transportation	Traffic associated with recreation and other activities along the Kluskus FSR Several airports, airstrips, and aerodromes for fixed wing and seaplanes	yes	yes
Crown Land tenures	25 provincial crown tenures are in place for various activities (agriculture, residential, etc.) in the access road and transmission line RSAs	yes	yes

Note: BC EAO = British Columbia Environment Assessment Office; FSR = Forest Service Road; km = kilometre; MW = megawatt; RSA = Regional Study Area
December 2013 was used as the cut-off date of included projects.

Table 4.3-12: Projects Not Included in Cumulative Effects Assessment

Project/ Land Use	Description	Status	Spatial Overlap with Blackwater within Cumulative Effects RSA	Temporal Overlap with Blackwater
Mining – Chu Molybdenum Mine Project	Open pit molybdenum mine, with an anticipated production of up to 90,000 t/d. Expected mine life is 20 years at this production rate. Withdrawn from BC EAO process due to weak financial markets and the depressed price of molybdenum (http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_doc_index_347.html)	Historical – Withdrawn from BC EAO process on 13 July 2013 (http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_347_35860.html) Project may be re-entered when market conditions improve	Yes	No
Utility – Kenney Dam Cold Water Release Facility	*Description from Major Projects Inventory (June 2013):* Project to protect salmon on the Nechako River through either a cold water release facility (Kenney Dam) or other environmental enhancements, as part of an Aug 1997 agreement with the Government of BC, which resolves issues surrounding the Kemano dam. There are ongoing studies and consultation in progress, although construction is not expected to start for several years. The BC Provincial government is in negotiations with Alcan, First Nations, and local communities	Available information and details provided by the RioTinto Alcan Nechaco Operations Coordinator (Mr. Justus Benckhuysen) indicate that this project is in the early stages of evaluation. Mr. Benckhuysen also indicated that RioTinto Alcan was not a proponent for this project	Unknown - detailed project information unavailable	Unknown - detailed project information unavailable

Project/ Land Use	Description	Status	Spatial Overlap with Blackwater within Cumulative Effects RSA	Temporal Overlap with Blackwater
	Update: Available information indicates that in 1997 Alcan–now Rio Tinto Alcan–agreed to put approximately $50 million into a NEEF to help compensate for the environmental damage done to the watershed. In 2001, NEEF recommended that a cold water release facility be built in Kenney Dam, but that proposal didn't get provincial funding and wasn't followed up on (Globe and Mail 2012; http://www.theglobeandmail.com/news/british-columbia/band-proposes-relief-facility-after-dam-floods-graveyards-bodies-wash-away/article4223724/)			
	Nechako Canyon Protected Area – Purpose Statement and Zoning Plan: Developed in March 2003 and incorporates known management issues associated with the existing operation and the proposed cold water release through Keeney Dam. No specific details regarding schedule were provided			

Note: BC EAO = British Columbia Environment Assessment Office; RSA = Regional Study Area; NEEF = Nechako Environmental Enhancement Fund; t/d = tonnes per day.

4.3.6.3 Evaluation of Residual Adverse Cumulative Effects

Residual adverse cumulative effects that remained after the application of effective and feasible mitigation based on best practices and regulatory requirements were characterized for each VC using the same factors used to characterize residual Project effects. Residual cumulative effects on VCs were rated based on magnitude, geographic extent, duration, frequency, reversibility, context, likelihood, and level of confidence. (**Section 4.3.5.1**, Characterization of Residual Effects and **Table 4.3-4** and **Table 4.3-5**).

4.3.6.4 Significance of Cumulative Effects

The significance of cumulative effects was determined considering the same categories used as for the assessment of residual effects.

Determining the significance of residual adverse cumulative effects is often more complex and challenging than evaluation of direct Project effects because the assessment is much broader, the residual effects of other projects, especially proposed projects, may not have been determined yet or are not well understood, and the ability of one proponent to implement or influence mitigation at this scale is almost always limited. Effective actions to mitigate cumulative effects must be shared with other proponents, agencies, and government, where possible.

For cumulative effects, the approach requires determining the thresholds below which further effects can be sustained by a VC without undergoing changes in condition or state that cannot be reversed with mitigation and/or management. Adverse residual cumulative effects on each VC were determined to be ‘significant’ or ‘not significant.’ ‘Not significant’ effects were further categorized as ‘negligible’, ‘minor’, or ‘moderate.’

In general, to be considered to have potential for a significant effect, the residual cumulative effect on the VC being assessed must operate at a regional level and meet one of the following criteria:

- Have a medium magnitude at a regional spatial extent and a long-term or chronic duration; or
- Have a high magnitude at a regional extent of any duration.

Residual cumulative effects on VCs were rated as significant based on magnitude, geographic extent duration, frequency, reversibility, context, and level of confidence.

4.3.7 Follow-Up Strategy

As may be identified for project effects, or where a residual effect or a cumulative residual effect has been identified, a follow-up strategy has been developed to:

- Identify the measures required to evaluate the accuracy of the original prediction of effects;

- Identify the measures required to evaluate the effectiveness of proposed mitigation measures; and
- Propose an appropriate strategy to apply in the event that the original predictions of effects and mitigation effectiveness are not confirmed. This includes references to further mitigation, involvement of key stakeholders, government agencies, and other measures that may be necessary to manage the issue.

These strategies are summarized in **Section 13** of the Application.

4.4 Limitations

Each VC in the EA presents assumptions and limitations relative to the assessment of Project effects and the assessment of cumulative effects. The assessment has been conducted in a precautionary manner in order to avoid underestimating residual project effects. The effects assessment has been conducted based on the Project Description, as described in **Section 2.2**. If material changes are made to the Project Description, the conclusions of the environmental assessment may be affected.

4.5 Conclusion

Based on the analysis presented, a conclusion with respect to potential residual effects and potential residual cumulative effects and their significance is provided for each VC in their respective assessment section.

4.6 Federal Requirements

Guidance provided by the Agency requires that the assessment present summaries of the results in a manner that aligns with specific federal interests. These requirements were addressed in the following manner:

1. The description of alternative means of undertaking the Project is presented in **Section 2.5** of the Application. A description of predicted future conditions without the Project is also included into this section.
2. Comments from the public and responses are presented in **Section 3.4** Public and Agency Information Distribution and Consultation.
3. Comments from Aboriginal Groups and individuals and responses are presented in **Section 3.3** Aboriginal Groups Information Distribution and Consultation and **Section 17** Aboriginal Groups Consultation.
4. Baseline information on VCs of federal interest, as set out in section 5(1) of *CEAA, 2012*, is included in the baseline descriptions in **Section 5.1** Environmental Baseline, **Section 6.1** Economic Baseline, **Section 7.1** Social Baseline, **Section 8.1** Heritage Baseline and **Section 9.1** Health Baseline.

5. A summary of available information on the potential or established Aboriginal or Treaty rights and related interests of Aboriginal groups that have the potential to be adversely impacted by the Project is included in **Section 14**.
6. Effects of changes to the environment on Aboriginal peoples are included in **Section 15** Aboriginal Rights, **Section 16** Other Aboriginal Interests and **Section 18**, Summary of Aboriginal Groups Information.
7. Stand-alone sections are provided that summarized those changes that may be caused by the Project on the components of the environment listed in section 5(1)(a) of *CEAA, 2012*, namely fish and fish habitat, aquatic species at risk, and migratory birds **(Section 19**, Summary of Effects to Components of the Environment within Federal Jurisdiction). A similar stand-alone section set out changes to federal land or lands outside Canada (**Section 19**, Summary of Effects to the Environment that Would Occur on Federal or Transboundary Lands), and changes to the environment that are incidental to federal decisions that are required to allow the Project to proceed (permits and authorizations) (**Section 19**, Summary of Effects to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions).
8. A summary of residual effects and residual cumulative effects on the areas of federal interest is also provided in **Sections 19** and **Appendix 19A**.
9. A summary of significant adverse environmental effects on areas of federal interest is also provided in **Sections 19**.
10. **Section 20**, summarized the mitigation measures, follow-up, and related commitments identified to address the areas of federal interest specified above. Mitigation measures to address residual Project effects including effects on Aboriginal rights were written as specific commitments made by the Project with clear implementation plans.
11. A standalone cumulative effects assessment is presented in **Appendix 19A**.

Tables TC-1 and **TC-2** present the Provincial and Federal Table of Concordance. These tables provide further information for reviewers and participants in the assessment review process, on how to locate information of specific interest throughout the document.