EAO | Environmental Assessment Office

Application Information Requirements

Michel Coal Project

Final: September 2020

Pursuant to the Environmental Assessment Act, S.B.C. 2002, c.43

BRITISH COLUMBIA

PREFACE TO THE AIR

The Application Information Requirements (AIR) specifies the information that North Coal Ltd. (the Proponent) is required to provide in their Application for an Environmental Assessment Certificate (Application) under the section 16(2) of *BC Environmental Assessment Act* (Act).

The Proponent is proposing to develop the Michel Coal Project (the proposed Project), as described in the Project Description https://projects.eao.gov.bc.ca/api/document/5b86ded53f64cb00249e24e3/fetch/00Michel_PD_22Aug_2018_Rev03_FINAL.pdf. The proposed Project is a metallurgical coal mine including two open pits with an annual production between 2.3 and 4 million tonnes of raw coal for a mine life of up to 30 years. Since the proposed Project is a new mine that exceeds a production capacity of 250 000 tonnes/year of clean coal, it is subject to a provincial EA review under Part 3 of the Reviewable Projects Regulation (BC Reg 370/02) of the Act.

The BC Environmental Assessment Office (EAO) issued a Section 10 Order to the Proponent on October 23, 2015 confirming that the proposed Project requires an Environmental Assessment Certificate (EAC), pursuant to Section 10(1)(c) of the Act, before it may receive provincial permits to construct and operate the proposed Project.

Canadian Environmental Assessment Act 2012 (CEAA 2012) Applicability

The Michel Coal Project is subject to a federal environmental assessment under Canadian Environmental Assessment Act, 2012 (CEAA 2012) and the provincial and federal environmental assessments will be coordinated in accordance with the MOU (https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/environmental-assessments/working-with-other-agencies/substitution-links/eao-ceaa-substitution-mou.pdf). For further information on the federal environmental assessment please visit https://www.ceaa.gc.ca/050/evaluations/proj/80110?culture=en-CA.

List of Reviewing Agencies

In addition to the Environmental Assessment Office, government agencies, local governments, Indigenous Groups and the public have had the opportunity to review and comment on the draft Valued Component Selection Document https://projects.eao.gov.bc.ca/api/document/5d2cc6284de65d00218f4e84/fetch/North%20Coal_VCs_DRAFT_20190702_ver5d_public_comment_.pdf. The Environmental Assessment Office, government agencies, local governments, and Indigenous Groups also had the opportunity to comment on the AIR.

Provincial Agencies:

- Environmental Assessment Office
- BC Ministry of Environment and Climate Change Strategy
- BC Ministry of Forest, Lands, Natural Resource Operations and Rural Development
- BC Interior Health Authority
- BC Ministry of Energy, Mines and Petroleum Resources
- BC Ministry of Transportation and Infrastructure

Federal Agencies:

- Impact Assessment Agency of Canada (formerly Canadian Environmental Assessment Agency)
- Fisheries and Oceans Canada
- Environment and Climate Change Canada
- Health Canada
- Natural Resources Canada
- Crown-Indigenous Relations and Northern Affairs Canada
- Transport Canada

Local Governments:

- District of Sparwood
- City of Fernie
- District of Elkford
- Municipality of Crowsnest Pass
- Regional District of East Kootenay

Indigenous Groups:

- Ktunaxa Nation Council representing:
  - ʔakinḵum‡asnuq‡iʔit - Tobacco Plains Band
  - ʔaq̓ am - St. Mary's Band
  - yaqan nukiy - Lower Kootenay Band
  - ʔakisq̓nuk First Nation

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TABLE OF CONCORDANCE

A Table of Concordance will be included in the Application. The Table of Concordance will demonstrate where the requirements in the AIR are found in the Application, with volume, section, and page references and following the format of Table 1. A well-constructed Table of Concordance will assist in a timely application evaluation to determine whether the application contains the required information.

Table 1: Example Table of Concordance between AIR and Application

AIR Section & Page No.	AIR Title	AIR Section Language	Application Section Title	Application Volume Section, Sub-Section, Page Number	Relevant Appendix

ABBREVIATIONS AND ACRONYMS

- AIA – Archaeological impact assessment
- ASL – Ambient sound level
- BC – British Columbia
- CCME – Canadian Council of Ministers of the Environment
- CEAA – Canadian Environmental Assessment Act
- CEA Agency/IAAC – Canadian Environmental Assessment Agency now renamed Impact Assessment Agency of Canada
- CH_4 - Methane
- CO – Carbon monoxide
- CO_2 – Carbon dioxide
- EAO – Environmental Assessment Office
- EA – Environmental Assessment
- EPT Index – Ephemeroptera, plecopteran, trichopteran index, a sensitivity index for invertebrates based on the community composition of mayflies, stoneflies, and caddisflies
- EVWQP – Elk Valley Water Quality Plan
- GHG – Greenhouse gas
- KNC – Ktunaxa Nation Council
- NA – Not applicable
- N_2O – Nitrous oxide
- NO_x – Oxides of nitrogen
- O_3 - Ozone
- ORP – Redox Potential
- PAH – Polycyclic aromatic hydrocarbon

- Project – Michel Coal Project
- PSL – Permissible sound level
- SO_x – Oxides of Sulphur
- TEM – Terrestrial Ecosystem Mapping
- VOC – Volatile organic compounds
- Teck – Teck Resources Limited

APPLICATION SUMMARY

The Application will include a summary, including the following:

- A summary of the proposed Project including the project scope, project benefits and applicable permits. If the proponent has already requested or intends to request concurrent permitting, this will also be stated;
- A brief overview of the assessment process including project reviewability, and the pre-application and application review stages of the EA;
- A brief overview of consultation approaches with Indigenous groups, the public and government agencies to date;
- A summary of the key issues raised by Indigenous groups, the public and government agencies;
- A summary of key adverse effects on Indigenous Interests and mitigation measures;
- A summary of key effects, proposed mitigation measures and residual and cumulative effects on Valued Components; and
- Proponent's conclusions regarding the potential for significant adverse effects on Valued Components.

PART A - INTRODUCTION

1.0 OVERVIEW OF PROPOSED PROJECT PROPONENT DESCRIPTION

A description of the Proponent is included in the Project Description at https://projects.eao.gov.bc.ca/api/document/5b86ded53f64cb00249e24e3/fetch/00Michel_PD_22Aug_2018_Rev03_FINAL.pdf.

The Application will:

- Describe the Proponent, including history, type of company or organization, affiliations;
- Provide contact information for the Proponent; and
- Include a list of parties involved in the preparation of the Application, their qualifications, and the section(s) for which they were responsible.

1.1 Description of Proposed Project

A description of the proposed Project is included in the Project Description at https://projects.eao.gov.bc.ca/api/document/5b86ded53f64cb00249e24e3/fetch/00Michel_PD_22Aug_2018_Rev03_FINAL.pdf.

The Application will:

- Describe the purpose of the proposed Project from the perspective of the Proponent, and identify whether the objectives of the proposed Project relate to any broader private or public sector policies, plans, or programs;
- Describe the location of the proposed Project and the latitude and longitude coordinates of the site and include maps showing both regional context (identifying nearby communities and geographic features) and the specific location of the proposed project;
- Describe the deposit geology, stratigraphy and structure of the region and the project area. This section should also identify target coal resources and describe the characteristics of the coal seams. The descriptions should be accompanied by supporting maps and figures that show the specific geological cross-sections and stratigraphic sections;
- Describe storage for coarse, fine coal reject and/or tailings where appropriate (i.e., with waste rock or as a separate section);
- Describe all surface water management facilities and diversion structures planned for construction as part of the operational, closure and post-closure phases and include a conceptual design for clearly specified peak flow events, including events when groundwater pumping may be necessary;

- Describe the location of the proposed Project relative to Indigenous groups' asserted traditional territories, and/or Treaty Nation territories;
- Describe all phases of the proposed Project, including their duration and proposed scheduling;
- Describe all on-site and off-site components associated with the proposed Project, with figures;
- Describe the activities associated with the components and phases of the proposed Project, with figures;
- Discuss the relevant history of the proposed Project, including exploratory or investigative history;
- Summarize existing and planned land and marine use and airspace that overlaps or may be potentially impacted by the proposed Project components and activities, including:
    - Land ownership [e.g. private land, provincial Crown land, federal land (including Indian Reserves), Indigenous title];
    - Local government zoning or plans;
    - Tenures (municipal, provincial, federal), licences, permits or other authorizations;
    - Non-tenured current land uses;
    - Current and planned marine use plans;
    - Provincial land use plans (e.g. Land and Resource Management Plans) and provincial land use designations (e.g. Agricultural Land Reserve, Old Growth Management Areas, Forests and Range Practices Act designations) and provincial land use management objectives
    - Any other past, current and foreseeable development or activities, whether or not directly related to the proposed Project;
    - Maps showing location of other uses referenced above in relation to the proposed Project; and
    - References to the Application section that assesses land use and potential overlaps/impacts in more detail.
- Describe the project's economic benefits.
    - Capital construction cost estimates, including:
        - Breakdown of costs (e.g. land, buildings, equipment) associated with the proposed Project;
        - Estimated operating costs over the life of the proposed Project, including breakdown of costs by category (e.g. labour, supplies and materials, administration); and

        - Estimated costs for decommissioning/closure/abandonment/reclamation.

    - Employment estimates including:

        - Direct employment to be created, by job category by project phase, in number of person year (PY) jobs for construction and decommissioning and full-time equivalent (FTE) jobs for operations. Direct employment estimates will be broken down into full-time, part-time and seasonal job categories;

        - Average wages, by major job category, for the construction and operating periods;

        - Breakdown of jobs that will be filled from local, provincial, national or international labour markets;

        - Indirect and induced employment to be generated, by project phase; and

        - Information about an employment strategy, if any.

- Contractor supply services estimates including:

    - List of the major types of businesses/contractors to be used, broken down at the local, provincial, and national level, by project phase;

    - Value of supply of service contracts expected, by project phase; and

    - Information about a local purchasing strategy, if any.

- Annual government revenues, by type (e.g. income tax, licence rent, property tax, mineral tax) and jurisdiction (e.g. local, provincial, federal), for all phases of the proposed Project;

- Any benefits the project may have to the five pillars of assessment (Environmental, Economic, Social, Health and Heritage);

- All Canadian dollar estimates will be provided in real dollars, with an explanation of how they are measured (e.g. discount rates); and

- State all assumptions and references for the above information.

1.2 Applicable Authorizations

A list of required authorizations, to the extent that was known at the time, is available in the Project Description at https://projects.eao.gov.bc.ca/api/document/5b86ded53f64cb00249e24e3/fetch/00Michel_PD_22Aug_2018_Rev03_FINAL.pdf.

The Application will:

- List in table format (see example below) all applicable licences, permits and/or approvals that are already received or required for the phases of the proposed Project, and the associated responsible regulatory body; and
- State if the proponent has or intends to request concurrent permitting under the Act pursuant to the Concurrent Approval Regulation (BC Reg. 371/2002).

Table 2: Authorization Table

Name of Authorization	Statute and Authorizing Agency	Description Need for Authorization
Federal		
Licence	*Explosives Act*, R.S.C., 1985, c. E-17; NRCan	For explosives magazine and explosives factory licence.
Potential Approval	*Canadian Navigable Waters Act (R.S.C., 1985, c. N-22); Transport Canada*	An application to the Minister if he or she proposes to construct, place, alter, rebuild, remove or decommission (a) a major work in, on, over, under, through or across any navigable water; or (b) a work – other than a minor work – in, on, over, under, through or across any navigable water that is listed in the schedule
Potential Railway Operating Certificate	*Railway Safety Act*; Transport Canada	To operate proponent equipment on some portion of a federally regulated track
s. 34.4(2) and 35(2) Authorization	*Fisheries Act*, RSC. 1985, c. F-14 last amended August 28, 2019; DFO	Required in the Act under 34.4 (1) No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish. And 35 (1) No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat. A request for DFO review of the proposed Project will be submitted once detailed information on potential effects of the Project on fish/fish habitat and requirements for mitigation/offsetting habitat become known, after which DFO will determine if an authorization is required.
s. 73 Permit	*Species at Risk Act*, SC 2002, c. 29; Environment and Climate Change Canada (Canadian Wildlife Service)	Required in the event the proposed Project entails salvage and relocation of SARA listed species (to remove such species from harm's way) or for activities that may affect species listed under Schedule 1 as extirpated, endangered, or threated, including their critical habitat or residence as defined under a federal recovery strategy. The prohibitions of the SARA apply to the above-mentioned species if they occur on federal lands, if they are a migratory bird protected under the MBCA, if they are an aquatic species, or if the species is not a migratory bird that is found on non-federal lands but the Government of Canada has issued an order in relation to that species.

Name of Authorization	Statute and Authorizing Agency	Description Need for Authorization
Potential Notification of Emissions	*Canada-U.S. Air Quality Agreement;* Government of Canada	Under Article V of the Canada/U.S. Air Quality Agreement, Canada is obligated to notify the U.S. of any proposed actions, activities or projects which, if carried out, would be likely to cause significant transboundary air pollution. Notification is required for: 1. Any new air pollution source located within 100 km of the Canada/U.S. border that is expected to emit greater than 90 tonnes per year of any one of the common air pollutants: sulphur dioxide (SO2), nitrogen oxides (NOx), carbon monoxide (CO), total suspended particulates (TSP) and volatile organic compounds (VOC), where VOCs are defined as compounds containing at least one carbon atom, excluding carbon monoxide, carbon dioxide, methane and chlorofluorocarbons; or, 2. Major modifications of existing facilities which would result in an increase of 40 or more tonnes per year of one or more common pollutants (see definition in the above bullet); or, 3. Any new source or a modification of an existing source that results in a release of greater than 1 tonne per year of any one hazardous air pollutant. For the purposes of Notification, a hazardous air pollutant is any substance in the National Pollutant Release Inventory (NPRI). The Michel Coal project is located approximately 70 km from the US/Canada border. ECCC recommends that the Proponent consider whether a transboundary notification is required. An online submission of the transboundary notification form is available at: https://www.canada.ca/en/environment-climate-change/services/air-pollution/issues/transboundary/canada-united-states-air-quality-agreement/notifications/form.html
Provincial		
Environmental Assessment Certificate	*Environmental Assessment Act,* SBC 2002, c. 43; MECCS	Certification that the environmental assessment is complete and approved and includes conditions to minimize environmental and social impacts from the project.
Mines Act Permit	*Mines Act,* RSBC 1996, c. 293; MEMPR	Permit covering details to ensure the health and safety of mine personnel and the public, and the protection and reclamation of the land and watercourses affected by the mining activities.
Authorization	*Environmental Management Act,* SBC 2003, c. 53 and *Waste Discharge Regulation* B.C. Reg. 320/2004; FLNRORD	Authorization for air emissions, effluent discharge, and refuse disposal.
Water Licence	*Water Sustainability Act*, SBC 2014, c. 15; FLNRORD.	Approval required for water use, diversions, and storage.

Name of Authorization	Statute and Authorizing Agency	Description Need for Authorization
Notification	*Water Sustainability Act*, SBC 2014, c. 15; *Water Sustainability Regulation*, B.C. Reg. 36/2016, Part 3; FLNRORD	Submission of a Notification(s) may be required for some works affecting smaller watercourses (such as roadside ditches) in the proposed Project area.
Permit (waste oil)	*Environmental Management Act*, SBC 2003, c. 53; Special Waste Regulations, 1988, B.C. Reg. 63/88; MECCS	Permit for waste oil.
Waterworks Permit	*Drinking Water Protection Act*, SBC 2001, c. 9; Ministry of Health	For potable water supply and system.
Fuel Storage Approval	*Fire Services Act,* RSBC 1996, c. 144; Ministry of Public Safety	Approval for fuel storage facilities.
Wildlife Act Permit Access Cb13 - 92300	*Wildlife Act*, RSBC 1996, c. 488; FLNRORD	Management Area Permit for the Corbin Creek Access Management Area (Loop Ridge to Tent Mountain area)
Highway Access Permit	*Highway Act*, RSBC 1979, c. 167, Ministry of Transportation and Infrastructure	Approval for commercial accesses to the highway.
Permit	*Heritage Conservation Act*, RSBC 1996, c. 187; FLNRORD, Archaeology Branch	To conduct archaeological inspections to determine site boundaries and develop pertinent recommendations.
Permit	*Wildlife Act*, RSBC 1996, c. 488; FLNRORD	To handle wildlife.
Other		
Pipeline or Right of Way Permit - Gas Line Crossing Authorization 4200010205	Fortis BC	Authorization for work around the gas pipeline right-of-way.
Pipeline or Right of Way Permit	TC Energy	Authorization for work around the gas pipeline right-of-way.
Agreement	CP Rail	As may be required for railway crossings and use.
Regional Permits (various)	Various bylaws	Various permits may be required for works occurring within the region or affecting regional infrastructure.

1.3 Project Design and/or Alternative Means of Carrying out the Project

Alternatives have been considered while designing a feasible project to take forward into the environmental assessment. Alternatives chosen and fixed include:

- Open pit mining methods were chosen over underground mining since the mineralization is located near surface (i.e., underground mining would prevent mining of resources near surface);
- The locations of the open pits are fixed due to the location of the deposits; and
- Rock storage facilities design options were reviewed and as a result are designed to be constructed from the bottom up in thin compacted lifts rather than conventional methods to reduce mineral oxidation and minimize metal leaching.

Details will be presented to support the rock storage facilities design including the source of fine material for layering and references to examples and studies completed to demonstrate the design will meet the objective of preventing contaminant leaching over the short and long-term.

Further potential Project alternatives will be identified through consultation with the Ktunaxa Nation Council and other interested groups and local communities during the environmental assessment process. The Application will still consider the following alternatives:

- Site infrastructure configurations;
- Power source and location;
- Rock storage locations;
- Tailings blending and management;
- Explosives selection;
- Rail configurations;
- Water withdrawal, management, treatment, and discharge;
- Access road and product transportation options between sites (conveyors versus truck hauling);
- Worker accommodation; and
- Closure and reclamation.

Where existing disturbed areas occur such as access trails and areas previously disturbed by forestry and/or mining activities, and where operational and regional experience supports proven approaches and methodologies, alternatives analysis is considered not to be necessary.

Evaluation of alternatives will consider the economic and technical feasibility of options, as well as the predicted environmental and social short-term (during operations) and long-term (after decommissioning and final closure) effects of the activity.

A multiple accounts analysis, or similar methods will be used to assess and select key alternatives. Accounts considered in the analysis of alternatives will include technical, project economic, socio-economic, and environmental.

The Application will include:

- An assessment of the alternative means of carrying out the proposed Project that are technically and economically feasible including, but not limited to, the alternatives identified in the AIR;
- A design and geotechnical stability assessment for any co-disposed tailings / waste rock storage facilities, meeting minimum requirements outlined in the Health Safety and Reclamation Code for Mines in BC;
- The rationale and criteria used to select the proposed means of undertaking the proposed project; and
- The methodology and criteria used in the assessment of alternatives.

2.0 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Provincial EA Process

The Application will include:

- A statement that the proposed Project is subject to review under the Act, identifying the trigger(s) for the review under the Act;
- A statement that the Application has been developed pursuant to the AIR approved by EAO and complies with relevant instructions provided in the section 11 Order and any other direction provided by EAO;
- A table documenting applicable milestones, including, but not limited to, issuance of section 10 and 11 Orders, working group meetings, any public comment periods or open houses and the issuance of the AIR), including links to documents on EAO's public website;
- A list of the government agencies and Indigenous Groups that participated in the EA; a summary of their participation; and, a list of the key issues raised by each party and the status of issue resolution. (The Proponent will cross-reference, as appropriate, other sections of the Application that deal further with consultation and issues raised); and
- A summary of public participation in the EA, a list of the key issues raised, and the status of issue resolution (with cross-references, as appropriate, to other sections of the Application that deal further with consultation and issues raised).

2.2 Federal EA Process

The Application will include:

- The relevant review threshold that has been met under the federal Regulations Designating Physical Activities;
- Whether the Impact Assessment Agency of Canada (Formerly Canadian Environmental Assessment Agency) has determined that a federal EA is required, including a link to the relevant documents on the CEAA Registry;
- Whether the proposed Project is undergoing a substituted, coordinated, or other type of federal and provincial review process; and
- A table documenting applicable completed and upcoming federal milestones. Milestones include, but are not limited to, any public comment periods, notice of commencement, and finalization of the Environmental Impact Statement Guidelines.

PART B - ASSESSMENT OF ENVIRONMENTAL, ECONOMIC, SOCIAL, HERITAGE AND HEALTH EFFECTS

3.0 ASSESSMENT METHODOLOGY

This section of the Application will describe the methods used to assess the potential adverse effects of the Project. The assessment methodology is based on the EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects (September 2013).

3.1 Issues Scoping and Selection of Valued Components

The following VCs and subcomponents were selected using the methodology and rationale presented in the Valued Components document https://projects.eao.gov.bc.ca/p/58851215aaecd9001b82a8d3/project-details;currentPage=1;pageSize=10;sortBy=-datePosted;ms=1599093657048:

Table 3: Valued Components

Pillar	Valued Component	Valued Subcomponent
Environment – Physical (all intermediate VCs except surface water quantity and quality)	Air quality and emissions Noise / vibration Groundwater quantity and quality Surface water quality Surface water quantity Sediment Terrain stability Soil	
Environment – Aquatic Environment	Fish and fish habitat	Westslope Cutthroat Trout, Bull Trout, Longnose Sucker and Mountain Whitefish
	Aquatic health	Benthic invertebrates, algae, fish downstream of Project, Western toad, Columbia spotted frog
Environment – Terrestrial Environment	Ecosystems (intermediate VC)	Avalanche, grassland, wetland, riparian and floodplain, old forest, mature forest, brushland
	Rare or highly valued plants	Limber Pine, Whitebark Pine, other plants of conservation concern High elevation grasslands

Pillar	Valued Component	Valued Subcomponent
	Wildlife and wildlife habitat	Mammals including American badger, American marten, Canada lynx, Rocky Mountain elk, moose, grizzly bear, Rocky Mountain bighorn Sheep, bison, Little Brown Myotis, wolverine, Columbia ground squirrel, river otter; Birds including American Dipper, Olive-sided Flycatcher, Northern Goshawk, cliff-nesting raptors, Common Nighthawk, woodpecker guild; Amphibians including Western toad, Columbia spotted frog; Gillette's Checkerspot
		Wildlife species of conservation concern (currently includes American Badger, Grizzly Bear, Wolverine, Little Brown Myotis, Northern Myotis, Swainson's Hawk, Bank Swallow, Barn Swallow, Black Swift, Lewis's Woodpecker, Williamson's Sapsucker, Western Screech-Owl, Northern Goshawk, Olive-sided Flycatcher, Common Nighthawk, Western Toad, Gillette's Checkerspot)
		Migratory birds (old forest, mature forest, young forest, grassland, shrubland, wetland, waterfowl, water birds, and raptor guilds)
	Wildlife health	Columbia ground squirrel, Rocky Mountain elk, Rocky Mountain bighorn sheep, Little Brown Myotis, shrew, grizzly bear, vole, American badger, American marten, Canada lynx, wolverine, Dark-eyed Junco, Ruffed Grouse, Olive-sided Flycatcher, Common Nighthawk, American Robin, Song Sparrow, Golden Eagle, moose, River Otter, American Dipper, Spotted Sandpiper, Belted Kingfisher, Red-winged Blackbird, and Mallard
Economic	Employment and income Economic activity	
Social	Education Skills and training Community infrastructure and services Community wellbeing Commercial land use Non-commercial land use / recreation Public safety Visual quality	
Heritage	Heritage resources	Precontact archaeological sites DjPq-38 and DjPq-48
Health	Human health	Traditional foods, community health

Intermediate VCs are pathways to receptor VCs and are included to provide the needed information for the assessment of receptor VCs or where the intermediate VC is more amenable to measurement and monitoring than the receptor VC (e.g., air quality). For water VCs, a holistic, integrated approach will be taken recognizing that groundwater and surface water systems are connected. As such, surface water

quantity and surface water quality are defined as receptor VCs due to their importance to the KNC and will be assessed for significance. It is also recognized that water quality and quantity are linkages on pathways to other receptor VCs. In section 4, the assessment methodology is as follows:

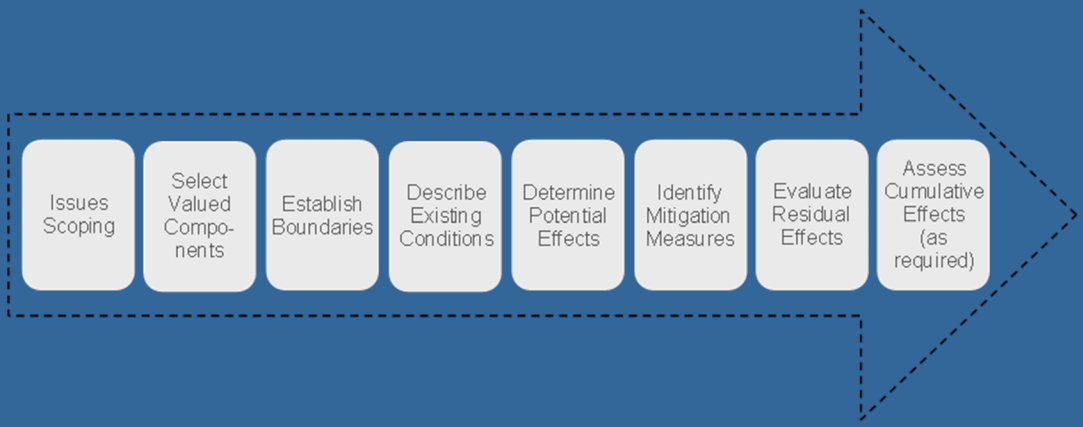
Intermediate VCs: Includes the context and boundaries, existing conditions, potential effects and mitigation measures. Residual effects are not assessed for significance, but will be fully characterized as to context, magnitude, extent, duration, reversibility, and frequency; and

Receptor VCs: Includes the context and boundaries, existing conditions, potential effects and mitigation measures and residual effects are characterised and additionally, includes the methodology for assessing residual effects and their significance, cumulative effects and their significance, and follow-up strategies.

The Application will summarize the process and methodologies used to identify and select the VCs for assessment. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

See EAO's *Guideline for the Selection of Valued Components and Assessment of Potential Effects* for a more detailed discussion about the methodology.

Figure 1 Summary of Methodological Steps



For each Valued Component in Part B, the section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

3.2 Assessment Boundaries

3.2.1 Spatial, Temporal, Administrative and Technical Boundaries

The Application will describe the methods used in identifying spatial, temporal, administrative and technical boundaries. Information on spatial, temporal, administrative and technical boundaries for specific VCs will be included in the appropriate VC sections of this document and will encompass all relevant project phases, components and activities. The Application will include the rationale for any differences in boundaries from those presented in the final AIR.

3.3 Existing Conditions

For each VC section, (Environmental, Economic, Social, Heritage, and Health), the Application will include:

- A description of the existing (or baseline) conditions within the study area in sufficient detail (including maps at the appropriate scale with sample locations as applicable) to enable potential project-VC interactions to be identified, understood, and assessed;
- Baseline programs need to be designed to find representative background locations and consider other activities. The baseline monitoring networks vary depending on the component being addressed and the studies have been designed in consideration of the complexity of the landscape. Sampling locations need to be selected to include background locations, points immediately downstream of other mining operations (current and historical) and at various points along the stream as it passes the proposed North Coal operations and then downstream of the Michel Creek Valley.
- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities;
- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage and health setting, irrespective of the changes that may occur as a result of the proposed Project or other project and/or activities in the area;
- An explanation of if and how other past and present projects and activities in the study area have affected or are affecting each VC;
- Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed;
- Where additional project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods,

where these are available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application; and

- Description of what and how Traditional Ecological Knowledge (TEK), including Indigenous Traditional Knowledge, was used in the VC assessment.

The Application will contain the existing (or baseline) technical reports in the Appendices and will summarize key findings contained in these technical reports directly in the Application, in a manner that allows the reader to understand each VC's effects assessment.

A "pre-development condition" will be presented in Part C by the Ktunaxa Nation Council and this will also be used where possible in the assessment of potential effects.

3.4 Potential Effects

The Application will summarize the overall process and methodologies used to identify and assess the potential effects of the proposed Project on the identified VCs.

For each VC section, the Application will:

- Identify the potential interactions of the proposed Project and the considered and selected VCs;
- Identify and describe the potential adverse effects resulting from the proposed Project; and
- Demonstrate how feedback from Indigenous Groups, the public, stakeholders and government agencies on VC selection and assessment was incorporated, as appropriate.

The Application will identify any project activity-VC interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and input received from EAO, government agencies, Indigenous groups and the public regarding the exclusion.

The following definitions will be applied:

Baseline: Baseline generally denotes the condition prior to the Project being built and this convention will be followed in the Michel Coal Project. The effects of the Project will be evaluated against this baseline condition as is typical for effects assessment. Residual project effects will be evaluated as indicated below.

Pre-development Baseline: It is understood that KNC would also like the effects to be considered, where possible, against a pre-development baseline reflective of condition prior to any industrial development in the region. The Application will define this as the "pre-development condition". The "pre-development condition" will be described, where possible, in Part B as part of identifying the context of valued components. This will include description of any long-term trends related to the valued component. The pre-development condition may also be described in Part C by the KNC.

Future Scenario Without the Mine: A description of a potential future landscape without the Michel Coal Project will be prepared. This will provide information for what is likely to happen if the Project is not developed. This will provide context and environmental trends but cannot be used for the effects assessment due to its speculative nature which would carry too much uncertainty.

Residual Effects: For clarity, residual effects are defined as the change between the current baseline condition and the proposed Michel Coal Project. This recognizes the fact that the environment is dynamic in the Michel Creek and Elk River watersheds with opening and closing mines and timber harvest and forest recovery. A quantitative approach will be taken where possible supplemented with qualitative descriptions.

Precautionary Principle: A precautionary approach will be used when addressing cause-effect relationships that are not fully established scientifically to address uncertainty in predicting future effects. This approach may require: 1) Exploring alternatives 2) Taking preventive actions to manage uncertainty 3) Implementing monitoring strategies that prove performance 4) Working with Indigenous groups, regulators and community to involve them in decision making processes where the precautionary principle is used.

Preliminary project activity-VC interactions tables are presented in the following two tables. The potential interactions are then described the Potential Effects section for each VC in sections 4 through 8. Note that interactions with KNC Rights and Interests (used to represent the KNC VCs) are identified in the Social Components Matrix and are assessed in Part C.

Table 4: Interaction Matrix – Environmental Components*

Activity / VC	Air Quality / Emissions	Noise / Vibration	Groundwater Quantity and Quality	Surface Water Quality	Surface Water Quantity	Sediment	Terrain Stability	Soil	Fish and Fish Habitat	Aquatic Health	Ecosystems	Rare / Highly Valued Plants	Wildlife and wildlife habitat	Wildlife Health
Construction														
Site preparation and clearing	1	1	0	1	1	1	1	2	1	1	2	2	2	1
Site grading, soil & overburden removal & stockpiling	1	1	1	1	1	1	1	2	1	1	2	2	2	1
Procurement of equipment, supplies and services	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Construction materials delivery	1	1	0	0	0	0	0	1	0	0	1	1	1	1
Construction employment	1	1	0	0	0	0	0	0	0	0	1	1	1	1
Infrastructure construction	1	1	0	1	1	1	1	1	2	1	1	1	1	1
Access road changes and construction	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Onsite traffic	2	1	0	0	0	1	1	1	1	1	1	1	2	1
Pipeline relocation	1	1	0	1	0	1	1	1	1	0	1	1	1	1
Loop Ridge open pit development	1	2	1	1	2	1	1	1	1	1	2	2	2	1
Michel Head open pit development	1	2	1	1	2	1	1	1	1	1	2	2	2	1
Waste handling	0	0	1	0	0	0	0	1	1	1	0	0	1	1
Water use and management	0	0	1	2	1	1	0	0	2	2	1	1	1	1
Power line changes	1	1	0	0	0	1	1	1	1	1	1	1	1	1
Worker transport	1	1	0	1	0	0	0	0	0	1	1	1	1	1
Operations														
Open pit operations (including blasting and dewatering)	2	2	2	2	2	1	2	1	1	1	1	2	2	1
Coal washing	0	2	1	1	0	1	0	0	1	1	1	0	1	1
Onsite traffic	2	1	0	1	0	1	1	1	1	1	1	1	2	1
Offsite traffic (highway)	1	1	0	1	0	0	0	1	1	1	1	1	2	1
Coal shipment (rail)	1	1	0	0	0	0	0	1	1	1	1	1	1	1
Loop Ridge tailings and mine rock disposal, seepage and drainage management	2	2	2	2	2	1	2	1	2	2	2	2	2	2

Activity / VC	Air Quality / Emissions	Noise / Vibration	Groundwater Quantity and Quality	Surface Water Quality	Surface Water Quantity	Sediment	Terrain Stability	Soil	Fish and Fish Habitat	Aquatic Health	Ecosystems	Rare / Highly Valued Plants	Wildlife and wildlife habitat	Wildlife Health
Michel Head mine rock disposal, seepage and drainage management	2	2	2	2	2	1	2	1	1	1	2	1	2	1
Water use (potable and non-potable)	0	0	0	0	2	1	0	0	1	1	2	1	1	2
Water management, treatment and discharge	0	1	1	2	2	2	0	0	2	2	2	1	2	2
Waste management	0	1	1	0	2	2	0	1	2	2	2	1	2	2
Powerline use	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Operation Employment	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Procurement of supplies and services	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Closure														
Wash plant decommissioning and reclamation	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Loop Ridge pit reclamation	1	1	1	1	2	1	1	1	1	1	1	1	2	1
Michel Head pit reclamation	1	1	1	1	2	1	1	1	1	1	1	1	2	1
Loop Ridge mine rock storage facilities reclamation	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Michel Head mine rock storage facilities reclamation	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Support infrastructure removal and site reclamation	1	1	1	1	1	1	1	1	1	1	1	1	2	1
Water management and treatment	0	0	1	2	2	1	1	1	1	1	1	1	2	2
Closure employment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Procurement of supplies and services	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Note: 0 – Nominal risk interaction; 1 – Lower risk interaction; 2 – Higher risk interaction

Table 5: Interaction Matrix – Social, Economic, Heritage, and Health Components*

Activity / VC	Employment and Income	Economic Activity	Education	Skills and Training	Community Infrastructure & Services	Community Wellbeing	Commercial Land Use	Non-commercial land use / Recreation	Public Safety	Visual Quality	Heritage Resources	Human Health	KNC Right and Interests
Construction													
Site preparation and clearing	0	0	0	0	0	1	1	2	1	1	2	1	2
Site grading, soil & overburden removal & stockpiling	0	0	0	0	0	1	1	2	1	1	2	1	1
Procurement of supplies and services	2	2	2	2	2	2	2	1	0	0	0	1	2
Construction materials delivery	0	0	0	0	0	1	0	0	1	0	0	1	1
Construction employment	2	2	2	2	2	2	2	1	0	0	0	1	2
Infrastructure construction	0	0	0	0	0	1	0	0	1	1	2	1	1
Access road changes and construction	0	0	0	0	0	1	0	0	1	1	2	1	1
Onsite traffic	0	0	0	0	0	1	0	1	0	1	0	2	1
Pipeline relocation	0	0	0	0	0	1	0	0	1	1	2	1	1
Loop Ridge open pit development	0	0	0	0	0	1	0	0	1	1	2	2	2
Michel Head open pit development	0	0	0	0	0	1	0	0	1	1	2	2	2
Waste handling	0	0	0	0	0	1	0	0	0	0	0	1	1
Water use and management	0	0	0	0	0	1	0	0	0	0	0	1	2
Power line changes	0	0	0	0	0	1	0	0	1	1	2	1	1
Worker transport	0	0	0	0	0	1	0	0	1	0	0	1	1
Procurement of equipment, supplies and services	2	2	2	2	2	2	2	1	0	0	0	0	2

Activity / VC	Employment and Income	Economic Activity	Education	Skills and Training	Community Infrastructure & Services	Community Wellbeing	Commercial Land Use	Non-commercial land use / Recreation	Public Safety	Visual Quality	Heritage Resources	Human Health	KNC Right and Interests
Operations													
Open pit operations (including blasting and dewatering)	0	0	0	0	0	1	0	1	1	1	1	2	2
Coal washing	0	0	0	0	0	0	0	0	1	0	0	1	1
Onsite traffic	0	0	0	0	0	1	0	1	1	0	0	1	2
Offsite traffic (highway)	0	0	0	0	0	1	0	1	1	0	0	1	2
Coal shipment (rail)	0	0	0	0	0	1	0	1	1	0	0	1	1
Loop Ridge tailings and mine rock disposal, seepage and drainage management	0	0	0	0	0	1	0	1	1	1	1	2	2
Michel Head mine rock disposal, seepage and drainage management	0	0	0	0	0	1	0	1	1	1	1	2	2
Water use (potable and non-potable)	0	0	0	0	0	1	0	0	0	0	0	1	1
Water management, treatment and discharge	0	0	0	0	0	1	0	1	0	0	0	2	2
Waste management	0	0	0	0	0	1	0	0	1	0	0	2	1
Powerline use	0	0	0	0	0	1	0	0	0	0	0	0	1
Operation Employment	2	2	2	2	2	2	2	1	0	0	0	0	2
Closure													
Wash plant decommissioning and reclamation	0	0	0	0	0	1	0	0	0	0	0	1	2
Loop Ridge pit reclamation	0	0	0	0	0	1	0	1	1	1	0	1	2
Michel Head pit reclamation	0	0	0	0	0	1	0	1	1	1	0	1	2
Loop Ridge mine rock storage facilities reclamation	0	0	0	0	0	1	0	1	1	1	0	1	2
Michel Head mine rock storage facilities reclamation	0	0	0	0	0	1	0	1	1	1	0	1	2
Support infrastructure removal and site reclamation	0	0	0	0	0	1	0	0	1	0	0	1	2

Activity / VC	Employment and Income	Economic Activity	Education	Skills and Training	Community Infrastructure & Services	Community Wellbeing	Commercial Land Use	Non-commercial land use / Recreation	Public Safety	Visual Quality	Heritage Resources	Human Health	KNC Right and Interests
Water management and treatment	0	0	0	0	0	1	0	0	0	0	0	2	2
Closure employment	1	1	1	1	1	1	1	1	0	0	0	0	1
Procurement of supplies and services	1	1	1	1	1	1	1	1	0	0	0	0	1

*Note: 0 – Nominal risk interaction; 1 – Lower risk interaction; 2 – Higher risk interaction

3.5 Mitigation Measures

For each VC section, the Application will:

- Describe the approach (following the Environmental Mitigation Policy hierarchy, BC MOE, 2014) to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent, which will be implemented to address potential effects;
- Describe the mitigation measures incorporated into the project, including site and route selection, project scheduling, project design (e.g. equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices;
- Describe any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices;
- Clearly indicate how the mitigation measures will mitigate the potential adverse effects on the VC;
- Provide the rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset;
- Evaluate the anticipated success of each mitigation measure and describe rationale and analysis for these evaluations. If there is little relevant/applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, describe the potential risks and uncertainties associated with use of the mitigation, and alternative measures or actions that would be taken if the mitigation is shown not to be effective;
- Include the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility; and
- Summarize the mitigation measures for potential Project effects by project phase and identify any mitigation measures that are in management or compensation plans.

3.6 Characterization of Residual Effects

The Application will describe, in a table format, the residual effects using the residual effects criteria context, magnitude, extent, duration, reversibility, and frequency, as defined in EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects. Where feasible, these criteria will be described quantitatively in the Application for each VC. When residual effects cannot be characterized quantitatively, the Application will characterize these effects qualitatively. Definitions will be provided

when qualitative terms are used. Where relevant, the likelihood and confidence will be presented along with the characterisation of residual effects.

The use of any qualitative terms (e.g. high, moderate, low, etc.) will be accompanied by distinct definitions for each of these rankings. An explanation will be included for the conclusion reached for each criterion used to characterize a residual effect.

When residual effects on a VC are determined and the VC is also considered a "pathway" for other potential effects on other VCs, the Application will identify the linkages between the VCs and the discipline-specific studies to which the information has been forwarded for further evaluation.

3.7 Likelihood

The Application will assess the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as 'low', 'moderate', or 'high' probability will be provided.

3.8 Proponent's Determination of Significance

The Application will present the process and methodology used to define and evaluate the significance of residual effects, including how the term "significance" has been used in relation to each VC using quantitative and qualitative thresholds.

A conclusion of significance of residual adverse effects will be provided for each receptor VC.

3.9 Confidence and Risk

A precautionary approach with an appropriate level of conservatism will be taken for the project design and throughout the effects assessment. All assumptions will be documented and uncertainty will be stated.

The Application will summarize the process and methodology used to evaluate the levels of confidence associated with residual effects predictions and in particular, how any identified uncertainty may affect either the likelihood or the significance of the predicted residual effect. The Application will also describe any measures proposed to reduce uncertainty through monitoring, adaptive management or other follow-up programs. The mitigation hierarchy of avoid, minimize, restore, and any proposed offset will be applied prior to the characterization of the significance of residual and cumulative effects.

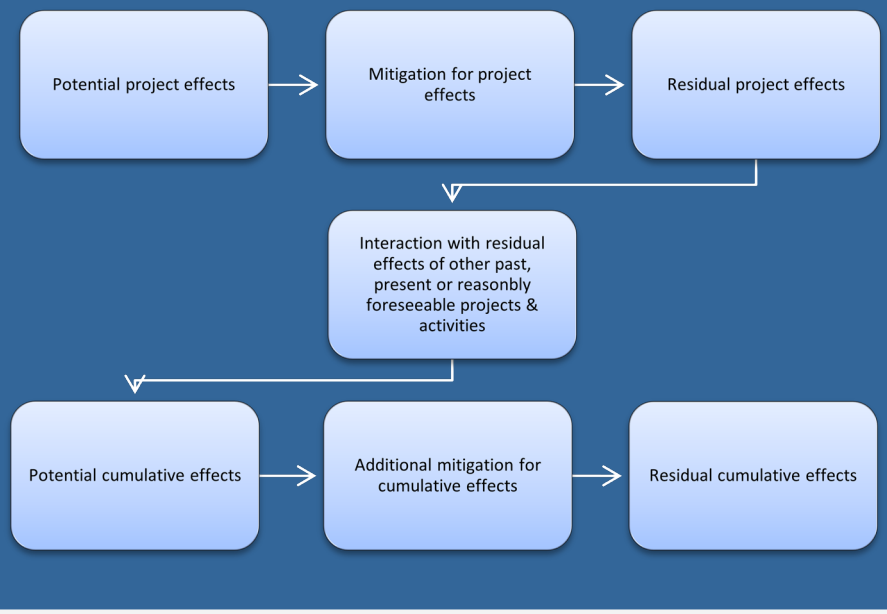
The Application will summarize the process and methodology used to determine if additional risk analysis is required. If additional risk analysis is required, the Application will summarize the process and methodology used for this analysis and the conclusions, including the range of likely, plausible and possible outcomes with respect to likelihood and significance.

3.10 Cumulative Effects Assessment

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

As identified in *EAO's Guideline for the Selection of Valued Components and Assessment of Potential Effects*, the Application will use the steps outlined in the figure below to determine residual project effects and the subsequent cumulative effects assessment:

Figure 2 Steps to Determine Residual Project & Cumulative Effects



The following development categories will be considered in the Application:

- Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project (i.e. certain); and
- Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project (i.e. reasonably foreseeable).

Cumulative effects will be assessed at the regional study area boundaries for the respective components. A preliminary project inclusion list is presented in Table 6 that will be used to assess cumulative effects.

Modifications to the list may be necessary depending on changes to the status of existing and proposed developments at the cut-off date. The cut-off date for the inclusion list is six months prior to submission of the Application. Six months will allow sufficient information to be gathered for the assessment to be completed.

Table 6: Preliminary Project Inclusion List for Cumulative Effects

Timing	Project Name / Area	Proponent/Owner	Type of Project / Activity	Description	Timing
Past	Natural resource extraction	Various	Mining	Past mining operations including Balmer, J-Area (Sparwood Operations), Natal Ridge, Michel Creek, Sparwood Ridge, Hosmer Wheeler, McGillivray, Tent Mountain.	Past
Past	Coal Mountain	100% Teck	Open pit coal mine	Mine reserves depleted. Processing final coal and Elkview coal at 3.5 Mt/y clean coal and scheduled to be closed soon, but date not available (Teck website, Nov 2018).	Closed in 2019. In reclamation phase
Existing	Elkview	95% Teck and 5% Nippon Steel & Sumitomo Metal Corporation and POSCO	Open pit coal mine	Current production 7.0 Mt/y clean coal with proven and probable reserves for 42 years (Teck website, Nov 2018).	Existing – 38 years, to 2057
Existing	Line Creek	100% Teck	Open pit coal mine	Current production 3.5 Mt/y clean coal with proven and probable reserves for 18 years (Teck website, Nov 2018).	Existing – 18 years, to 2037
Existing	Fording River	100% Teck	Open pit coal mine	Current production 9.5 Mt/y clean coal with proven and probable reserves for 45 years (Teck website, Nov 2018).	Existing – 43 years, to 2062
Existing	Greenhills	80% Teck and 20% POSCO	Open pit coal mine	Production between 5 and 6 Mt/y clean coal (Teck 2017 Annual Mine Permit Report) with proven and probable reserves for 31 years (Teck website, Nov 2018).	Existing – 28 years, to 2047
Existing	Elkhorn Quarry West / Kootenay West	Certain Teed Gypsum Canada Inc.	Open pit gypsum mines	Production at Elkhorn Quarry to be replaced by Kootenay West (certificate issued in 2018).	Existing – Elkhorn to 2020, estimated 43 year mine life for Kootenay West.

Timing	Project Name / Area	Proponent/Owner	Type of Project / Activity	Description	Timing
Existing	Tent Mountain Coal Mine	Montem Resources Alberta Operations Ltd.	Open pit coal mine	Previously mined periodically from 1943 to 1984. The current permit expires August 28, 2021; however, Montem is conducting a feasibility study and applying to amend the permit to restart the mine once feasible and permitted. http://montem-resources.com/new-page	Existing – mined from 1948 to 1983 and may restart once designed and amendment permitted.
Existing	Marten and Barnes Lake projects	Fertoz	Phosphate exploration	Exploration work including bulk sampling in the Michel Creek watershed.	Existing
Existing		Fortis BC	Gas Pipeline	Pipeline close to loop Ridge Pit Northern extent	Existing
Existing		TC Energy	Gas pipeline	Pipeline crosses Loop Ridge Pit and will be relocated.	Existing
Existing		BC Hydro	Powerlines	Various powerline routes in the Elk Valley.	Existing
Existing		CP Rail	Railways	Rail lines and spur lines along the Elk Valley, Crowsnest highway, and Michel Creek.	Existing
Existing		BC Government and privately owned	Highways and forest service roads	Highway #3, Highway #43, and various other roads throughout the Elk Valley.	Existing
Existing		Canwel Building Materials Group Ltd.	Private land timber harvest		Existing
Existing			Crown land timber harvest	Including associated road construction	Existing
Existing			Recreation	Various recreational activities throughout the Elk Valley and considering current recreational tenure and proposed applications.	Existing
Existing	Sparwood		Town and industrial lands		Existing
Existing	Fernie		Town and industrial lands		Existing
Existing	Fernie Alpine Resort	Fernie Alpine Resort	Recreational ski resort		Existing
Existing			Recreational and traditional hunting		Existing

Timing	Project Name / Area	Proponent/Owner	Type of Project / Activity	Description	Timing
Proposed	Baldy Ridge Extension	Teck	Open pit coal mine		Proposed – 25 years, to 2045
Proposed	Crown Mountain Coking Coal	NWP Coal Canada Ltd.	Open pit coal mine		Proposed – 16 years
Proposed	Bingay Main Coal	Centermount Coal Ltd.	Open pit coal mine	EA in progress. Proposed 2 Mt/year clean coal production for 13-year life of mine. Project description last revised in 2016.	Proposed 13-year mine life, but no start date.
Proposed	Grassy Mountain Coal Project	Riversdale Resources Limited	Open pit coal mine	Alberta and federal EA (by review panel) is in progress.	Proposed 23-year mine life. Targeting Q1 2022 for commercial coal production.
Proposed	Castle Mountain	Teck	Open pit coal mine	Details still to come	Details still to come

The Application will describe the methodology for identifying potential interactions between residual project effects and the effects of other developments, including a description of the following:

- The spatial boundaries for the cumulative effects assessment for each VC, including maps;
- The spatial and temporal boundaries of other developments; and
- The potential for interaction (spatial and temporal) and linkages (overlap) of VCs with other developments.

The Application will include:

- A table of all past, present and reasonably foreseeable developments that will be included in the cumulative effects assessment, should one be required for a particular VC;
- A general description of the information sources used to identify reasonably foreseeable developments and activities; and
- A map showing the location of the projects and activities.

3.10.2 Conducting a Cumulative Effects Assessment

The Application will summarize the process and methodology used to conduct the cumulative effects assessment, including the identification of potential cumulative effects (incorporating climate change

effects as applicable), identification of additional mitigation measures, and evaluation of any (residual) cumulative effects using the same methodology described above in sections 3.6 to 3.9 of this AIR.

The application will identify all anticipated cumulative effects, including additive (spatial and temporal overlap) and synergistic effects, as well as any anticipated compensatory or masking effects (CEAA, 2014, Appendix 2). To align the cumulative effects more closely with the Elk Valley CEMF, the cumulative effects assessment will account for natural disturbance and climate change.

3.11 Follow-up Strategy

Where a residual adverse effect and/or cumulative effect has been identified for a specific VC, the Application will include a description of a follow-up strategy, where appropriate, that:

- Identifies the measures to evaluate the accuracy of the original effects prediction;
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures; and
- Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected. This includes reference to further mitigation, involvement of key stakeholders, Indigenous groups, government agencies and any other measures deemed necessary to manage the issue.

4.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The Application will include an assessment of Environmental Effects VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section 3.0 Assessment Methodology of the AIR, using the organizational structure demonstrated in this section.

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The following VCs have been identified for assessment under the environmental pillar:

- Air Quality and Emissions;
- Noise and Vibration;
- Groundwater;
- Surface Water Quantity;
- Surface Water Quality;
- Sediment;
- Terrain Stability;
- Soil;
- Fish and Fish Habitat;
- Aquatic Health;
- Ecosystems;
- Rare and Highly Valued Plants;
- Wildlife and Wildlife Habitat; and
- Wildlife Health.

The following table summarizes the environmental VCs, subcomponents and their respective assessment endpoints and measurement indicators.

Table 7: Environmental VCs, Subcomponents, Assessment Endpoints and Indicators

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Air quality and emissions		Changes in concentrations of PM_{10}, $PM_{2.5}$, NO_2, SO_2, TSP (aka dust), relative to BC and Canadian ambient air quality objectives/standards. Qualitative changes for non-threshold contaminants in comparison to published literature. GHG emissions (CO_2, CH_4, N_2O) with respect to BC and Canadian emission goals.

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Noise and vibration		Changes in daytime and nighttime noise, tonal and impulsive noise, low frequency noise and vibration levels relative to potential human and wildlife receptors for all Project phases. Compliance with threshold noise level for sleep disturbance and long-term annoyance from noise to impacted receptors, including Indigenous Peoples.
Groundwater quantity and quality		Changes in groundwater quantity (i.e. groundwater levels, groundwater flows, groundwater discharge to streams (baseflows) and springs if present. Groundwater indicators also include changes to surface water quantity or quality. In this regard, effects on groundwater are assessed within the context of the overall project water balance. Project effects on groundwater will also have the potential to affect surface water flows and surface water quality in receiving streams relative to baseline conditions, BC and Canadian water quality guidelines and the quality objectives set in the Elk Valley Water Quality Plan.
Surface water quantity		Maintenance of environmental flow needs in Michel Creek and tributaries Seasonal streamflow distribution Peak flow regime
Surface water quality		Changes in water quality relative to the existing conditions in Michel Creek Changes in concentrations of constituents of interest relative to existing conditions, BC, Canadian, and site-specific standards consistent with the Elk Valley Water Quality Plan Lake Koocanusa site-specific standards being developed by the BC Government and State of Montana (the status of which will be presented in the Application)
Sediment		Changes in quality relative to BC and Canadian standards. Changes in quantity and distribution relative to pre-mine conditions.
Terrain stability		Changes to terrain stability and assessed geohazards.
Soil		Changes to quality, quantity, and distribution. Contaminated sites soil quality guidelines and the Canadian Soil Quality Guidelines for the protection of human health.

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Fish and fish habitat	Westslope Cutthroat Trout, Bull Trout, Longnose Sucker and Mountain Whitefish	Habitat quality and quantity relative to baseline (e.g., changes in channel morphology, substrates, stream flow, substrates and calcite formations, changes in habitat connectivity, and, changes in habitat availability). Fish growth, survival, and reproduction; and, metal concentrations in fish (if the monitoring program can be tied into regional monitoring to avoid harm of fish populations).
Aquatic health	Benthic invertebrates, algae, fish downstream of Project, Western toad, Columbia spotted frog	Evaluations of invertebrate community metrics such as abundance and fish population indices (e.g., growth, condition factor) in addition to changes in baseline surface water quality and changes in tissue metal concentrations including selenium and other metals. Benthic Invertebrates - Changes in distribution, diversity indices, EPT (an indicator of sensitive species including mayflies, stoneflies, and caddisflies) index, relative abundance, and community structure relative to baseline and local reference tributaries. Algae - Changes in relative abundance, distribution, and community structure relative to baseline and local reference tributaries. The indicators will not be assessed individually, but a qualitative statement defining the condition as protective or not of aquatic life will be made. By extension, each of these indicators will considered.
Ecosystems (intermediate VC)	Avalanche, grassland, wetland, riparian and floodplain, old forest, mature forest, brushland	•Changes in ecosystem quantity, distribution, function and condition (i.e., changes to quality such as groundwater, surface water, soil, species richness, rare species, presence of invasive species, wildlife, and trees). •Change in size and distribution of ecosystem patches, interior to edge distance, type of old growth, and seral stage for old forests and mature forests. •Changes relative to targets for old forests and mature forests in the Kootenay-Boundary Higher Level Plan Order, in consideration of private land use constraints.
Rare or highly valued plants	Limber Pine, Whitebark Pine, other plants of conservation concern	Changes in distribution of rare or important plant species and habitat. Loss of any designated critical habitat for endangered and threatened species will be identified and quantified and the mitigation hierarchy of avoidance, minimization, reclamation, and offsets will be followed.

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Wildlife and wildlife habitat	Mammals including American badger, American marten, Canada lynx, Rocky Mountain elk, moose, grizzly bear, Rocky Mountain bighorn Sheep, bison, Little Brown Myotis, wolverine, Columbia ground squirrel, river otter	Changes to habitat availability, habitat distribution, species richness, diversity and relative abundance to the extent possible. The applicability of these indicators to each species or group of species depends on availability of information. For example, indicators for grizzly bear include changes in avalanche chute and alpine habitat, riparian and floodplain habitat, road density, mortality and connectivity. For bighorn sheep, indicators include change in suitable habitat, mortality, population, contact with domestic sheep and goats for bighorn sheep.
	Birds including American Dipper, Olive-sided Flycatcher, Northern Goshawk, cliff-nesting raptors, Common Nighthawk, woodpecker guild	Changes to habitat availability, habitat distribution, species richness, diversity and relative abundance to the extent possible.
	Amphibians including Western toad, Columbia spotted frog	Changes to habitat availability, habitat distribution, species richness, diversity and relative abundance to the extent possible.
	Gillette's Checkerspot	Changes to habitat availability.
	Wildlife species of conservation concern (currently includes American Badger, Grizzly Bear, Wolverine, Little Brown Myotis, Northern Myotis, Swainson's Hawk, Bank Swallow, Barn Swallow, Black Swift, Lewis's Woodpecker, Williamson's Sapsucker, Western Screech-Owl, Northern Goshawk, Olive-sided Flycatcher, Common Nighthawk, Western Toad, Gillette's Checkerspot)	Changes in habitat availability, distribution, and relative abundance to the extent possible. Loss of any designated critical habitat for endangered and threatened species will be identified and quantified and the mitigation hierarchy of avoidance, minimization, reclamation, and offsets will be followed..
	Migratory birds (old forest, mature forest, young forest, grassland, shrubland, wetland, waterfowl, water birds, and raptor guilds)	Changes to migratory bird species richness and diversity and relative abundance.
Wildlife health	Columbia ground squirrel, Rocky Mountain elk, Rocky Mountain bighorn sheep, Little Brown Myotis, shrew, grizzly bear, vole, American badger, American marten, Canada lynx, wolverine, Dark-eyed Junco, Ruffed Grouse, Olive-sided Flycatcher, Common Nighthawk, American Robin, Song Sparrow, Golden Eagle, moose, River Otter, American Dipper, Spotted Sandpiper, Belted Kingfisher, Red-winged Blackbird, and Mallard	Wildlife health indicators are comparisons of estimated contaminant exposure from dietary sources (food, water and incidental ingestion of soil or sediment) to literature-based toxicological effects data.

4.1 Air Quality and Emissions

Air quality and emissions is presented as an intermediate valued component that addresses all atmospheric emissions from the Project. In addition to air quality being measurable and regulated, air provides a pathway to other VCs including ecosystems, rare plants, aquatic health, wildlife habitat, wildlife health, and human health.

Air quality effects will be assessed against BC Ambient Air Quality Objectives (BCAAQO) and Canadian Ambient Air Quality Standards (CAAQS) of the following air contaminants of potential concern from activities associated with the Project:

- Total suspended particulates (TSP);
- Particulate matter of up to 10 µm diameter (PM_{10});
- Particulate matter of up to 2.5 µm diameter ($PM_{2.5}$);
- Nitrogen dioxide (NO_2); and
- Sulphur dioxide (SO_2).

The following air contaminants with BCAAQO or CAAQS will not be considered in the Application:

- Formaldehyde (HCHO): There are no known substantial sources of HCHO associated with proposed Project activities;
- Total Reduced Sulphur (TRS): There are no known substantial sources of TRS associated with proposed Project activities;
- Carbon monoxide (CO); and
- Ozone ($O_{3)}$.

Insufficient amounts of HCHO, TRS, or CO are emitted in the Project area or from proposed Project activities to warrant an assessment of their ambient concentrations. In addition, there are no CAAQS for CO, and the 1- and 8-hour CO BCAAQO are pollution control objectives for references purposes and only apply to specific activities which are not occurring in the Project area. Ozone is a secondary pollutant formed by a complex chemical reaction network requiring sufficiently high total emissions of O_3 precursors (specifically, NO_2 and VOCs) over a large area to permit enough chemical interaction time within a very large plume. In Canada, these conditions are only met in large urban areas such as the Lower Fraser Valley or the Greater Toronto Area. In the Project area, neither the areal extent nor the density of NO_x emissions is high enough to cause any substantial photochemical production of O_3. Any plumes from NO_x emission sources in the Project area will be dispersed to negligible NO_2 levels before the photochemical reactions can produce any substantial amount of O_3.

Greenhouse gas (GHG) emissions can contribute to climate change and associated potential effects. The following GHGs are expected to be emitted and will be indicators with respect to BC and Canadian emission goals:

- Carbon dioxide (CO_2);
- Methane (CH_4); and
- Nitrous oxide (N_2O).

The Proponent's air quality and health consultants will collaborate to identify and assess non-regulated air contaminants of concern such as:

- Metal species of concern in dustfall; and
- Polycyclic aromatic hydrocarbons (PAH).

The Proponent's air quality consultants have determined that volatile organic compounds (VOC) are not of concern for the proposed Project; therefore, they will not be assessed.

Ammonia (NH_3) was not included as an indicator for Air Quality, because there are no BCAAQO or CAAQS. Ammonia is primarily a concern as a precursor to photochemical smog. Similar to precursor emissions for ozone formation, sufficiently high total emissions of NH_3 over a large area, typically from agricultural activities, would be required for photochemical smog formation. The Project area is not meeting these NH_3 emissions characteristics. In addition, there are no substantial NH_3 sources from Project activities to raise concerns for worker, public, fish, and wildlife health; therefore, the impact of NH_3 emissions will not be assessed.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

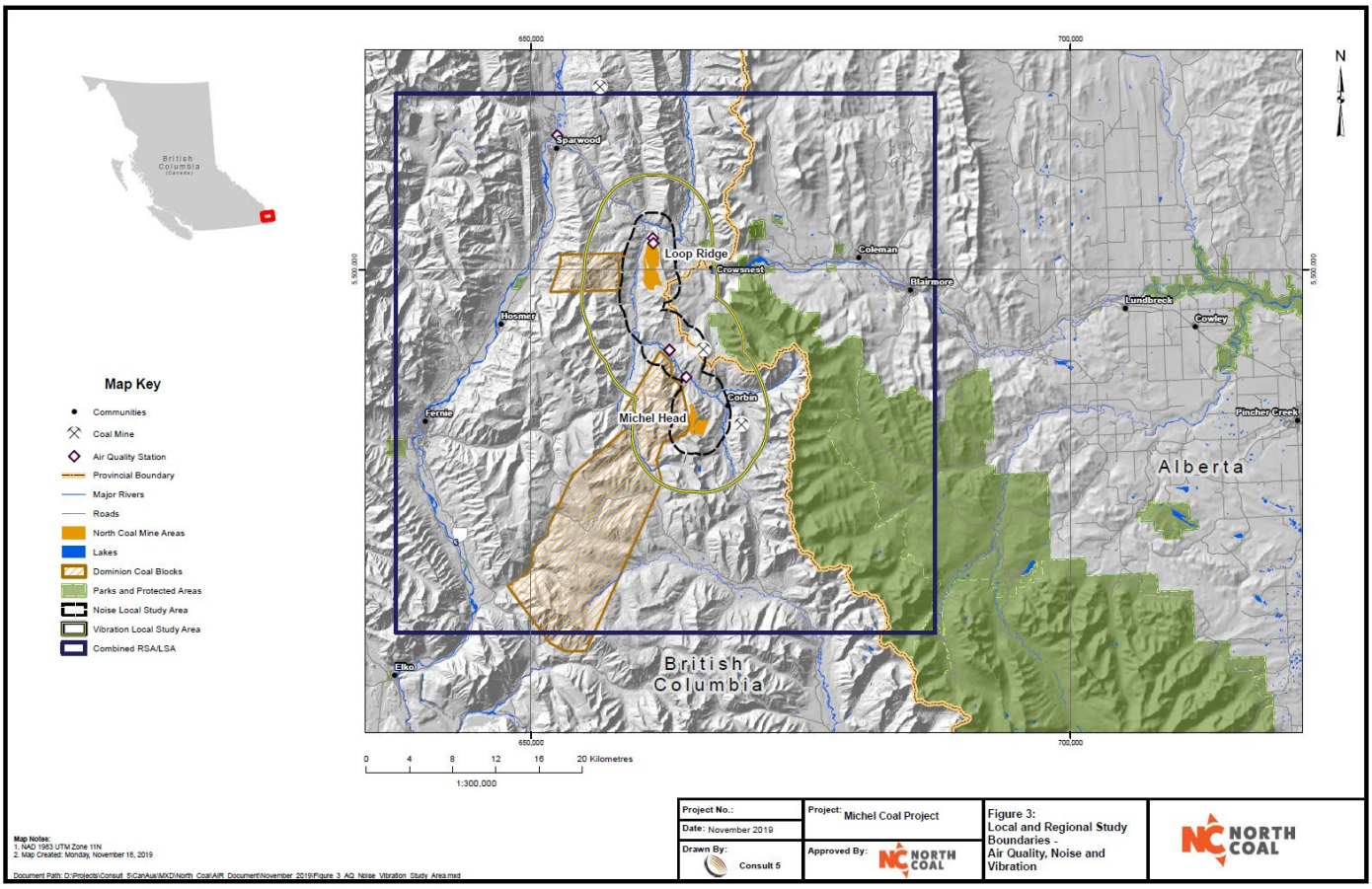
Two distinct spatial boundaries are defined:

- Local Study Area (LSA): The LSA represents the area in which air quality effects from the Project are most likely to occur; and
- Regional Study Area (RSA): The RSA has historically been chosen to provide a broader context of regional emission sources that contribute to background concentrations.

In consultation with the BC Ministry of Environment and Climate Change Strategy in early 2019, it was decided to the merge LSA and RSA when considering air quality and emissions, because the ministry no longer updates its emission inventory. In addition, the pertinent emission sources of the air contaminants considered in the Application are generally known and reflected in available measurements of background concentrations. In consultation with BC Ministry of Environment and Climate Change Strategy, it was decided to select a common 50-km by 50-km LSA and RSA roughly centered on the Tent Mountain air quality station (Figure 3).

The temporal boundaries encompass the existing (pre-Project baseline) conditions, worst-case operations phases, closure, and post-closure conditions.

Figure 3 Local and Regional Study Boundaries – Air Quality, Noise and Vibration



4.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

The following approach is being used to provide baseline data on air for analysis of air quality and greenhouse gas emissions.

The Application will provide baseline information to characterize ambient air quality and meteorological conditions. The scope for the meteorology and air quality baseline assessment will include a review of historical information and analysis of recent observations. Specifically:

- Review of all available meteorological data from Environment and Climate Change Canada (ECCC) and North Coal monitoring stations near the Project and development of a representative meteorological dataset in support of dispersion modelling of Project emissions;
- Review of available information from regional emission sources to determine background Criteria Air Contaminant (CAC) concentrations to be used for dispersion modelling; and
- Review of provincial and national emission inventories for the air regional study area. The purpose of this information is to provide context for estimated emissions associated with the Project.

The Application will provide baseline information to characterize current climatic conditions both at a regional and site-specific level (for stations with at least one complete year of data). Regional and local data will be collected and summarized in the Application.

Baseline ambient air quality conditions will be established from data collected from regional air quality monitoring stations operated by the BC Ministry of Environment and Climate Change Strategy, as well as from a site-specific air quality program.

Dustfall measurements have been collected over a three-year period. Total and speciated dustfall data are collected monthly (usually during the first week of each month) from three sites (Loop Ridge, Tent Mountain, and Michel Head) and are expected to give an indication of the metals composition in dustfall and in suspended particulate matter for the unpopulated areas of the RSA and LSA. The limitations of dustfall measurements will be clearly presented.

To assess existing conditions of air quality, measured background concentrations will be used to represent the contribution from other natural and anthropogenic sources in accordance with the British Columbia Air Quality Dispersion Modelling Guideline (AQDMG) (BC MOE, 2015). No air dispersion modelling will be completed for existing conditions because the project site is not active and existing conditions in the region are well captured through the baseline monitoring and expressed as background values for the assessed air contaminants.

4.1.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section. The effects modeling and analysis will incorporate sources of emissions from the Project, surrounding activities, and receptors.

Logging has previously affected the area, and future logging is planned to begin prior to the Project construction. Furthermore, mining took place in the Project area in the 1960s, 1993, and 1998. The nearest mining developments are Teck Coal's recently closed Coal Mountain Operations and existing Elkview Operations, located 18 km southeast and 10 km northwest of Loop Ridge, respectively. The nearest communities are the town of Sparwood (12 km to the northwest of the Project boundary), and the hamlet of Corbin (17 km southeast of Loop Ridge and within 1 km of the Michel Head boundary). Fernie, Crowsnest Pass, Coleman, and Blairmore also fall within the RSA boundaries.

The largest sources of particulate emissions in the RSA are industrial point sources (e.g., surrounding mine operations) and area sources (e.g., road dust and rail dust). The largest sources of NO_X emissions in the RSA and LSA are point sources (e.g., mining and rock quarrying). The largest sources of SO_X emissions in the RSA and LSA are area sources, such as diesel equipment related to mining and quarry operations. The largest sources of CO emissions in the RSA and LSA are mobile sources (e.g., vehicles and non-road equipment). Facilities for processing are planned near to existing railway, power, and road infrastructure. Product (i.e., clean, washed coal) will primarily be transported west along existing CP Rail-operated train lines, past the municipality of Sparwood.

Emissions Estimations

An emissions inventory will be developed. Air contaminant emissions for quantifiable parameters will be estimated using actual measurements and manufacturer specifications in preference to generic emission factors. Within the range of expected uncertainties, estimates will be based on conservative assumptions.

The air quality effects assessment will include the estimation of emission rates for fugitive dust (particulate matter) and criteria air contaminants (CAC) by undertaking air dispersion modelling to determine ground-level ambient air concentrations resulting from the project emissions. The air dispersion model will include point, non-point, and mobile source. Non-point sources will be evaluated by the model to predict fugitive dust dispersion from mine facilities and infrastructure including open pits, stockpiles and roads. The air dispersion modelling will follow the recommendations from British Columbia Ministry of Environment (BC MOE 2015) Guidelines for Air Quality Dispersion Modelling in British Columbia (the "Guidelines"). The results of the dispersion modelling will include predicted ground level concentrations for particulate matter and combustion gases, and dust deposition rates at the proposed mine site boundary and for each sensitive receptor for comparison to the applicable ambient air quality objectives and consideration in the health effects assessment. The results should include 3 scenarios: All sources, fugitive dust sources, then other sources not included in the fugitive dust scenario (point and mobile). Prior to commencing with

modelling for point and mobile sources a model plan must be submitted and approved by BC ENV.

Greenhouse gases will be emitted as a result of Project activities and potentially coal seam gas. The extent of GHG emissions will be determined using several approaches depending on the types of GHG and sources. Expected total fuel consumption is a preferred estimator of CO_2 emissions from equipment. Emission factors for CH_4 and N_2O for equipment categories are available from Canada's National Inventory Report (ECCC, 2019), references therein, and other industry-specific guidance. The mine rock management facilities will also be investigated as a source of nitrous oxide and estimated for inclusion in the inventory, if possible.

Greenhouse gas emissions from deforestation can be substantial, particularly CO_2 emissions because of the high carbon density in wood and below-ground organic material. Emissions of N_2O and CH_4 associated with deforestation are mostly expected from brush burning. Estimation of CO_2 emissions are an ongoing research topic because of uncertainties for example in soil and above-ground recovery and mid- to long-term storage of carbon in wood products that are manufactured from salvaged timber. The *2014 & 2015 B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions* (MOE, 2014) will be followed taking into consideration the existing levels of deforestation. Modifications will be considered if a more accurate local estimate of above-ground biomass is available.

The contributors and calculations of potential emissions will be used to develop mitigations and management plans to minimize emissions from the Project. It is anticipated that reported emissions will be used by provincial and federal governments to track and meet GHG emission reduction targets.

Residual effects will be assessed for the worst-case Project-only and cumulative cases after application of mitigation measures for regulated air contaminants and GHG emissions. Residual effects of PAHs and metals of concern will be assessed in the aquatic health, wildlife health, and human health risk assessments.

This Section will provide a qualitative assessment of the carcinogenic risk of diesel exhaust associated with the project. This will include different elements to ensure transparency: i) identification of the main sources of diesel exhaust for the project and assessment of the relative importance of diesel exhaust as a source of air pollution for the project; ii) recognition that diesel exhaust has been declared a human carcinogen by international agencies including Health Canada, WHO (IARC), the US EPA and the California EPA; iii) the rationale for not undertaking a quantitative analysis of diesel exhaust carcinogenic risk for the project.

Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.2 Noise and Vibration

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Noise and vibration emitted from mining, processing, and transport activities are intermediate VCs and pathways to potential adverse effects on Indigenous peoples, workers, public, fish, wildlife and wildlife habitat, and wildlife health, and public wellbeing.

Key indicators include changes in daytime and nighttime noise, tonal and impulsive noise, low frequency noise and vibration levels relative to potential human and wildlife receptors for all Project phases. Indicators also include compliance with threshold noise level for sleep disturbance and long-term annoyance from noise to impacted receptors, including Indigenous Peoples.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.2.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

In areas where there are no nearby residents, as is the case of the Project, guideline noise level limits are set at a distance of 1.5 km from the “facility fence line” based on the criteria compliance distance in the Oil and Gas Commission (OGC) noise guidelines (BCOGC 2018). These limits around the Project footprint also reflect the potential location of people using the area for traditional land use, seasonal cabins at Corbin, and recreation. For the purpose of assessment, the “facility fence line” has been defined as 1.5 km from the Project disturbance footprint boundary.

In addition to the Project disturbance boundary, noise study boundaries will also extend to the first row or nearest homes located along the CP Rail mainline in Sparwood to analyze increased train traffic effects on the mainline.

A larger (regional) study area is not being considered because Project-related noise is expected to attenuate to acceptable sound levels within one kilometre of the operational footprint; however, the study area will be expanded if this is assumption is found to be incorrect during the analysis.

The assessment will cover construction, operational, closure and post-closure periods.

4.2.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on noise and vibration.

The purpose of the noise and vibration baseline study is to provide sufficient information on the existing environment to conduct an assessment of Project effects on ambient noise and vibration levels on sensitive receptors.

Existing ambient sound levels (ASLs) were measured at six noise receptors outside of, and six monitoring locations within the Project boundary. Of the six receptor locations outside the Project boundary, four were within the OGC-specified 1.5 km of the Project boundary; a known wildlife corridor located approximately 1 km east of the Project (NRL03); a location frequented for camping along Corbin Road (NRL02); a natural area currently affected by highway and rail noise (NRL04) and the hamlet of Corbin (NRL12) . Ambient noise monitoring was conducted at the two nearest dwellings outside the noise study boundaries, in Sparwood (NRL01) and a cabin located 1.6 km north of Corbin (NRL05). The District of Sparwood is 12 km to the northwest of the Project and is unlikely to be affected by noise emanating directly from the Project; however, increases in railway traffic, due to shipment of product from the Project may affect noise levels in Sparwood. Noise monitoring was conducted at the seasonal cabin near Corbin, near an existing third-party mining operation to assist with the assessment of potential cumulative noise effects.

Six receptor sites (i.e., NRL06, through NRL12) were chosen to establish existing natural sound levels within the Michel Creek area. These receptor locations are considered representative of areas sensitive to First Nations for activities such as hunting or harvesting.

The noise baseline study was conducted using methods consistent with the requirements of the *British Columbia Noise Control Best Practices Guideline* (BC OGC 2018). The British Columbia OGC guideline assesses noise at receptors using a permissible sound level (PSL). The PSL is selected based on the density of development or proximity of receptors to transportation routes.

Guidance used in BC on similar projects to outline methods and indicators for baseline determination is the BC OGC Noise Control Guideline (BC OGC 2009), the Ontario Ministry of Environment NPC Vibration Criteria (OMOE 1985) and Health Canada guidance for CEAA assessments (HC 2017).

4.2.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Noise will occur from all equipment and machinery and human activity from mine construction and operations. Facilities for processing are planned in proximity to existing railway, power, and road infrastructure. Product will be transported west along existing CP Rail-operated train lines, past the municipality of Sparwood. Noise modeling will be conducted to determine potential noise levels at receptor sites and then taken forward for the assessment of receptor VCs.

Vibration will occur from heavy equipment, processing machinery, and active blasting in the area.

Noise and vibration levels from the Project activities will be modelled and compared to the standards for the indicators presented above. Maps with noise contours around stationary and mobile equipment corridors in the Project area will be presented at an appropriate scale. Results will be compared to the BC OGC Noise Control Guideline (BC OGC 2009) and the Ontario Ministry of Environment NPC Vibration Criteria (OMOE 1985). Results will be carried forward for assessment of the other pathway receptor VCs.

The Application will provide an estimation of the furthest extent of human perceivable industrial noise under most-vulnerable seasonal conditions for both continuous (normal construction and operations noise) and episodic (anticipated spikes in noise or vibration during construction and operations).

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.2.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.3 Groundwater Quantity and Quality

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Groundwater is an intermediate VC and a potential pathway to receptor VCs including surface water quantity and quality, fish and fish habitat, aquatic health, wildlife and wildlife habitat, wildlife health, and community health.

Groundwater indicators include changes in groundwater quantity (i.e. groundwater levels, groundwater flows, groundwater discharge to streams (baseflows) and springs if present) and groundwater quality. Groundwater quality indicators must include physico-chemical parameters consistent with those screened using the guidance *Defining Parameters of Concern for Mine Effluent Discharge Authorization Applications* (Ministry of Environment and Climate Change Strategy, 2019). Groundwater indicators also include changes to surface water quantity or quality. In this regard, effects on groundwater are assessed within the context of the overall project water balance. Project effects on groundwater will also have the potential to affect surface water flows and surface water quality in receiving streams relative to baseline conditions, BC and Canadian water quality guidelines and the quality objectives set in the Elk Valley Water Quality Plan. Indicators also include compliance of groundwater quality with the BC Environmental Management Act, Contaminated Sites Regulation.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

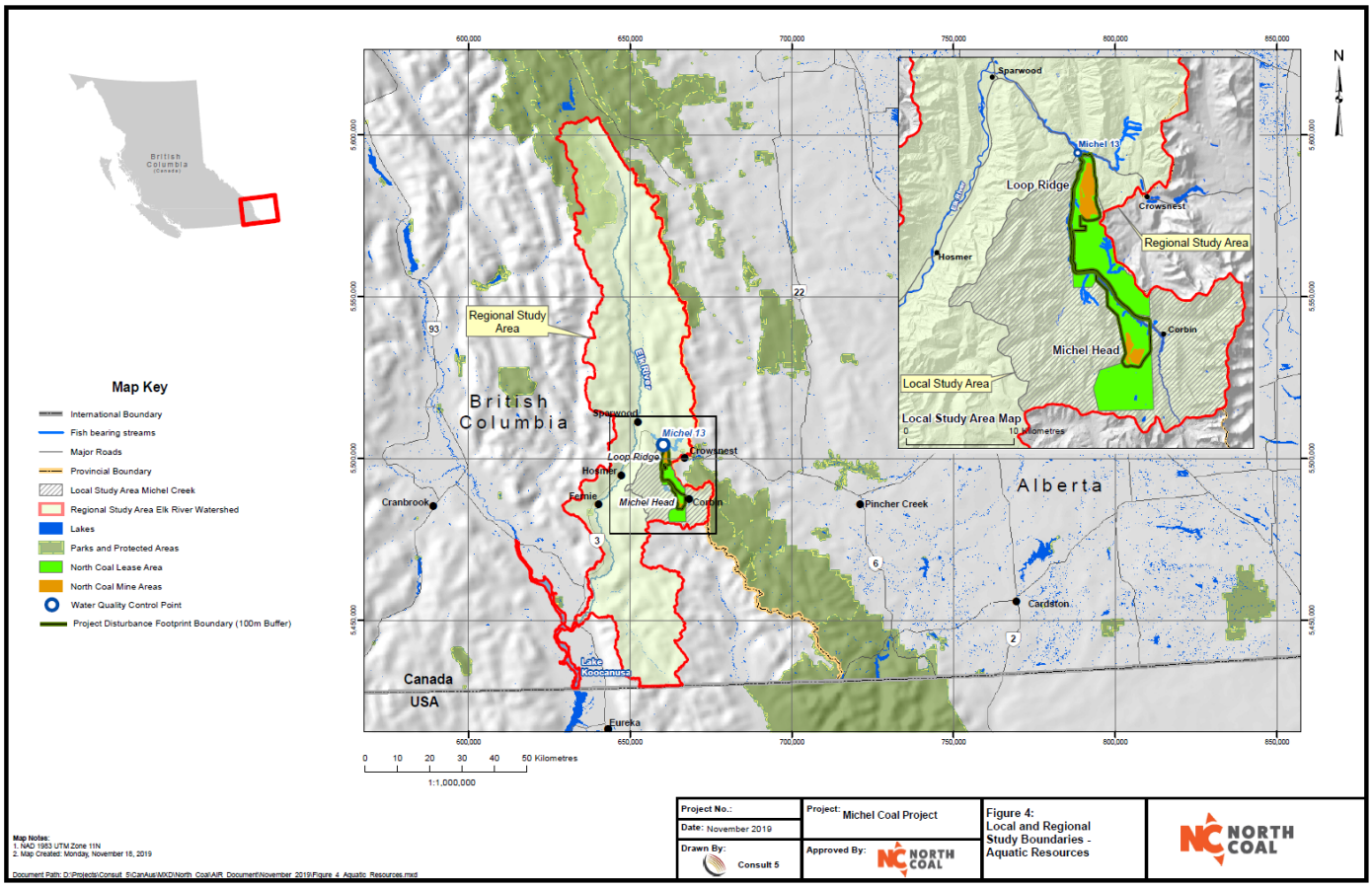
4.3.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

Groundwater study area boundaries are the same as the aquatic resource boundaries and are defined by watershed boundaries where potential effects may occur (Figure 4). The local study area (LSA) is the Michel Creek watershed including the confluence with Alexander Creek watershed. The regional study area (RSA) includes the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan.

The assessment will cover construction, operational, and post-closure periods.

Figure 4 Local and Regional Study Boundaries – Aquatic Resources



4.3.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline groundwater data.

Multiple hydrogeological field investigations have been undertaken at the Project between 2014 and 2019. The field programs have established an initial network of hydrogeological monitoring installations in, around and downgradient of proposed major mine facilities. The program follows the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2016) with the following objectives:

- Provide baseline on the extent, physical and chemical characteristics, uses, and potential resource in and around the proposed development for water quantity and quality impact prediction and monitoring;
- Outline measures to maintain and preserve groundwater resources;
- Characterize groundwater flow regime for development of conceptual and analytical groundwater models;
- Evaluate seasonal changes in groundwater flow patterns, water levels, and quality;
- Evaluate groundwater flowpaths and to assess possible changes resulting from development; and
- Additionally, specific characterization and monitoring activities include:
    - surface water measurements (including seasonal baseflow);
    - characterization of site geology and hydrogeology (e.g., geologic mapping and hydraulic conductivity measures);
    - groundwater elevation (minimum one year of continuous water levels); and
    - groundwater quality (minimum of one year of quarterly sampling) including samples collected during times of maximum/minimum hydrologic conditions.

The baseline data will characterize bedrock groundwater quality, deep overburden groundwater quality and shallow overburden groundwater quality on site including seasonal variability. Future groundwater monitoring wells along the expected primary groundwater flowpaths between the ex-pit MRSF and Michel Creek at Loop Ridge in the Michel Creek valley bottom aquifer will be required. These would not be disturbed by mining activities and would provide an enhanced understanding of baseline conditions.

Sampling locations will be described and presented on a map at the appropriate scale in the Application. The Application will include a description of modeling locations and how these may or may not be used for future monitoring sites.

The groundwater baseline will present geological and geophysical information used for the interpretation and understanding of the groundwater regime throughout the Project.

Exploration drillholes were developed into monitoring wells and tested for hydraulic conductivity using rising and falling head and slug tests using industry standard procedures. Water quality samples have

generally been collected on a quarterly schedule and for wells installed prior to 2018 a record of 2 years, and longer, for select wells, is available for each region of the Project. Most wells have been outfitted with a continuous water level recorder, supplemented with manual water level readings when dataloggers are downloaded

Baseline characterization will include a review of available mapping and exploration data to provide insight on the potential for karst features in areas of potential interaction with Project infrastructure and activities. Baseline groundwater conditions will identify significant springs, if any, in areas of potential interaction with Project infrastructure and activities. Any significant springs will be characterized prior to construction and integrated as needed into the water management plan.

Water sampling and testing was conducted in a manner described in the *BC British Columbia Field Sampling Manual* (Clark, 2002).

Groundwater is protected under the BC Groundwater Protection Regulations under the *BC Water Sustainability Act*. The regulations are intended to ensure that activities affecting groundwater (specifically related to wells) are conducted in an environmentally safe manner. A survey of existing wells and groundwater users will be conducted.

4.3.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Open pit mining and the mine rock management facilities directly and indirectly interact with the groundwater system. Seepages from mine rock management facilities (including seepage from the saturated disposal of mine rock), pit dewatering, diversions and storage ponds may also interact with the groundwater system.

Groundwater quantity and quality is an intermediate VC due to the indirect connection between groundwater and surface water systems and associated aquatic health. Seepages with potential contaminants of concern from project development have the potential to influence groundwater quality with hydraulic connection to surface water and therefore is the pathway to potential adverse effects on the public, fish, and wildlife health.

A conceptual groundwater model will be developed for the site including consideration of the influence the proposed open pits and ex-Pit MRSF on the groundwater system. Groundwater fluxes will be estimated using 2-D and 3-D analytical solutions integrated with the water balance model. The model approach and assumptions will be presented along with model sensitivity analyses. The Application will present details on the integration of groundwater estimates into the water balance model.

Groundwater quality data collection will be based on the geochemical characterization as described in the BC *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2016).

Information will be included to detail measures to limit seepage with potential contaminants of concern from impacting groundwater quality and quantity and the potential for adverse effects from seepage in the receiving environment. The potential for contaminants to bypass collection infrastructure will be assessed.

The effects on both shallow and deep groundwater will be assessed. The assessment will characterize if and how the workings will discharge to surface and what the quality of that discharge is expected to be.

Results from the groundwater analyses will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.3.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.4 Surface Water Quantity

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The surface water quantity VC will be assessed. Surface water quantity is an intermediate VC on pathways to effects on aquatic and terrestrial resources, fish and wildlife health, and human health. In addition, surface water quantity is also considered a receptor VC by the KNC.

Key indicators for surface water quantity include:

- Maintenance of environmental flow needs in Michel Creek and tributaries;
- Seasonal streamflow distribution; and
- Peak flow regime.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.4.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The surface water study area boundaries are the same as the aquatic resource boundaries and are defined by watershed boundaries where potential effects may occur (Figure 4). The local study area (LSA) is the Michel Creek watershed including the confluence with the Alexander Creek watershed. The regional study area (RSA) includes the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan.

The assessment will cover construction, operational, closure, and post-closure periods.

4.4.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

The surface water baseline characterizes the surface hydrology on and around the project area. Following the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2016), the objectives of this baseline assessment are to:

- Determine the baseline conditions of surface waters potentially affected by the project before the effects of the proposed mine occur.

Following provincial standards (BC MOE, 2016; RISC, 2018) the baseline hydrology program will:

- Conduct baseline hydrometric monitoring data in a manner consistent with collecting at minimum Grade B quality hydrometric data, as defined in the *Manual of British Columbia Hydrometric Standards* (RISC, 2018);
- Provide streamflow data for the development of integrated mine site water balances and/or hydrologic regionalization (including rating curves, manual discharge measurements for the rating curves, pictures, and daily streamflow records for each station in Excel format);
- Evaluate seasonal and inter-annual patterns in surface water discharge (including intermittent/ephemeral streamflow);
- Provide baseline information on the surface water resource for subsequent water quantity and water quality modelling and monitoring (dilution modelling, in-stream flow estimates, runoff modelling etc.); and
- Provide annual and event data for flow frequency analyses (i.e., low flows, peak flows, etc.).

The hydrological baseline has been developed using a combination of regional data sources, local field data, and hydrological modeling.

The hydrological baseline data and modeling will:

- Provide results from the monitoring of sub-catchments near the proposed Project site(s) and the Michel Creek mainstem for a period of over two years;
- Employ a hydrological model to generate a record of daily streamflow from 1981 – 2019 at several points of interest in order to characterize the hydrologic regime of the Michel Creek watershed and its tributaries in and near the Project site as well as quantify model accuracy and uncertainty;
- Incorporate subsurface flows to the extent possible when representing total watershed runoff and for calibrating hydrologic models;
- Utilize existing monitoring points and data for the Elk Valley Water Management Plan as applicable and available;
- Provide robust estimates of annual and event data including average, high, and low flows, and extreme rainfall and snowmelt for the Michel Creek watershed and sub-catchments using the baseline and regional data in concert with modelled results; and
- Evaluate seasonal and inter-annual patterns in simulated and observed streamflow in the Michel Creek watershed using modelled results.

In order to estimate the interactions between the proposed Project, projected climatic change, and the existing streamflow regime of the Michel Creek watershed. of the Michel Creek watershed, the model will be re-run using weather data from three climate stations (Sparwood, Fernie, and Crowsnest), scaled by an ensemble climate change projection based on the General Circulation Model outputs driven by the Representative Concentration Pathway (RCP) Scenario 4.5. North Coal will use a 1x1 degree ensemble of GCM projections from the Coupled Model Inter-comparison Project Phase 5 (CMIP5) hosted by Environment and Climate Change Canada (ECCC). The dataset uses 29 climate models incorporated into the projection, which produces an estimate of future climate. This dataset has a flexible time-series, meaning that historical gridded data fully capture our study period (1980-2018) and that future projections can be made for any time period between 2021 and 2100. This allows for a reliable bias correction procedure; therefore, provides future climate change projections.

Relative to using RCP 4.5 vs. RCP 8.5, North Coal will use RCP 4.5. The RCP 4.5 Scenario is being chosen given that the probability of any future emissions trajectory is not well understood. In addition, recent literature suggests using extreme scenarios can lead to poor planning as well as a lack of desire to implement mitigation and adaptation strategies (Hausfather and Peters, 2020). Overall, choice for using of RCP 4.5 was based on the uncertainty in future climate scenarios and on the need to develop robust and realistic mitigation and adaptation strategies. This will allow for example post-closure water management and cover effectiveness assumptions to be verified and to determine how sensitive they are to climate change.

4.4.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Surface water quantity interacts with various Project activities including open pit mining, mine rock storage facilities runoff and seepage, process water use, site surface water runoff from other infrastructure, and effluent discharge from the wash plant and water treatment plant. These Project interactions may cause changes in patterns and timing of flow conditions in the receiving surface water. Pit dewatering effects on the groundwater discharge to streams (baseflow) will also be analyzed. The resulting water balance model and water quality model (that both incorporate groundwater changes) will be used for the fish and wildlife habitat assessments. Changes in fish and wildlife habitat can affect the non-commercial use / recreational values in the area.

The application will include a water quantity model developed to predict water quantity inputs and outputs from the project. At a minimum, the model will:

- Operate on a monthly or shorter timestep for all phases of the Project from construction through post-closure;
- Track changes to project infrastructure on an annual or shorter timestep;
- Model the volume of water input, stored (if applicable) and output from all major project components (i.e. open pits, rock storage facilities, tailings facilities, collection and diversion ditches, etc.) for each model timestep;
- Model volume of discharge from the project to the receiving environment from both surface and sub-surface pathways, including seepage from and bypass of water collection works;
- The model will include a range of hydrologic conditions that includes reasonable dry and wet extremes;
- Include sensitivity scenarios the help understand key model uncertainties (i.e. climate change, groundwater discharge rates, collection works seepage rates, runoff coefficients, etc.); and
- All assumptions in the model will be supported by baseline hydrometeorological information or referenced literature.

The in-pit saturated backfill design requirements and component of the water balance will consider: water escaping through faults, seasonal water-level changes, impacts of climate change on predicted water levels, and seepage from pits.

Results will be presented in respect to the standards and indicators presented above. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.4.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.4.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.4.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.4.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.5 Surface Water Quality

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

The surface water quality VC will be assessed. Surface water quality is an intermediate VC on pathways to effects on aquatic and terrestrial resources, fish and wildlife health, and human health. In addition, surface water is also considered a receptor VC by the KNC.

Key indicators for surface water quality include:

- Changes in water quality relative to the existing condition in Michel Creek;
- Changes in concentrations of constituents of interest (CI) relative to existing conditions, BC, Canadian, and/or site-specific standards consistent with the Elk Valley Water Quality Plan; and
- Lake Koocanusa site-specific standards being developed by the BC Government and State of Montana (the status of which will be presented in the Application)

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.5.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The surface water study area boundaries are the same as the aquatic resource boundaries and are defined by watershed boundaries where potential effects may occur (Figure 4). The local study area (LSA) is the Michel Creek watershed including the confluence with the Alexander Creek watershed. The regional study area (RSA) includes the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan.

Water quality for the Project will be measured locally at Mich 13.0 (Water Quality Control Point) and the first Elk Valley Water Quality Plan (EVWQP) point downstream of the confluence of Michel Creek with Alexander Creek. The following are the key monitoring points for water management within Michel Creek (LSA) and the Elk River watershed (RSA):

- **Mich 13.0 (Michel 13)**: This site is located 13 km upstream of the Michel Creek confluence with the Elk River, upstream of Alexander Creek. The site is situated downstream of all Project-related inputs, upstream of inputs from Elk View Operation, and downstream from Coal Mountain Operation. This is a water quality prediction point for North Coal that is not present in the EVWQP but captures the majority of mine related loadings (current and predicted) within the Michel Creek watershed, upstream of Elkview Operations;

- **Discharge Point**: These will be specific to each Michel Coal mine site and will enter Michel Creek upstream of Mich 13.0 and are where effluent regulations will apply (at end-of-pipe);
- **Mich 1.0 (Michel 1)**: This site is situated 1 km upstream of the Michel Creek confluence with the Elk River, and located downstream of Mich 13.0, Alexander Creek and the load inputs from the Elkview Operation and the recently closed Coal Mountain Operation. It is a compliance point in the EVWQP for the Elkview Operation. Predictions for surface water quality will be provided for this node as part of the cumulative effects assessment; and
- **Lake Koocanusa Inlet**: North Coal has received adequate data on flows and water quality to be able to predict selenium concentrations and loadings at the Lake Koocanusa inlet (EVWQP node = RG_DSELK_Inflow; E300230). Predictions for surface water quality will be provided for this node as part of the cumulative effects assessment.

Modeling locations will be described and presented on a map at the appropriate scale in the Application. The Application will include a description of modeling locations and how these may or may not be used for future monitoring sites.

The assessment will cover construction, operational, closure, and post-closure periods.

4.5.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on surface water quality.

The surface water quality baseline characterizes the chemical and physical surface water quality parameters on and around the Project. Following the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2016), the objectives of this baseline assessment are to:

- Determine the baseline conditions of surface waters potentially affected by the project before the effects of the proposed mine take effect; and
- Identify whether the baseline concentrations exceed provincial or federal water quality guidelines and determine if site specific guidelines need to be created.

Additionally, this baseline assessment will fulfill the requirements and management objectives outlined in the EVWQP and integrate revisions presented in the 2019 Implementation Plan Adjustment (Teck, 2019). The objectives were met primarily through surface water quality sampling to BC standards (BC MOE 2016) and relating results to the water quality targets and guidelines outlined in the EVWQP, the *British Columbia Approved Water Quality Guidelines for Aquatic Life* (BC WQG; BC MECCS, 2019) and the *Canadian Council of Ministers of the Environment's Canadian Environmental Quality Guidelines* (CEQG; CCME 2017). This information will be used for the effects assessment and to identify site-specific and regional mitigation actions required to support responsible resource development by North Coal.

Water quality sample locations were selected throughout the LSA and RSA including reference stations. Effort was made to pair locations with surface hydrology and aquatic health sites where possible. Where possible, additional monitoring data from other sources will be used to augment the understanding of baseline water quality conditions within the LSA and RSA.

Field methods for sample collection followed those outlined in the BC *Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013). Parameters analyzed were in accordance with those listed in the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE 2016).

Since 2014, water quality samples have been collected from 62 sites in the LSA. The baseline assessment occurred from 2014-2016 and sampling was conducted monthly at 32 sites with existing or potential future exposure to mine activity. In 2017, 13 of the 32 baseline sites were selected for continued seasonal monitoring, based on possible future mining influence or for reference purposes. Seasonal sampling was aimed at capturing the ascending, peak, descending and baseflow limbs of the hydrograph. In 2018, three sites were added to this list bringing the total up to 16. Two of these will be added to the baseline assessment once a two-year data set has been compiled. Results from the ongoing seasonal sampling are statistically compared to the monthly baseline sampling completed in 2014-2016, using the rank based non-parametric seasonal Mann-Kendall test, to assess if there were any changes in water quality over time and as a result of ongoing logging activity.

In 2019 an aquatic health assessment was conducted throughout the valley and water quality was collected to accompany and support the tissue chemistry and sediment analyses from 17 sites. In addition to these, water quality was also collected from nine wetlands with potential future mining influence.

The water monitoring quality assurance, quality control program will be summarized in the Application. The program consists of field blanks, duplicate samples, and use of only certified laboratories to complete the analysis.

Parameters of Potential Concern will be screened following the provincial methodology outlined in *Defining Parameters of Concern for Mine Effluent Discharge Authorization Applications* (Ministry of Environment and Climate Change Strategy, 2019). To aid in the identification of Contaminants of Potential Concern (COPCs), water quality data for coal mine operations in Northeast and Southeast BC will be screened against applicable water quality guidelines (WQGs). Comparison will focus on drainages exhibiting strong mine-related influences (waste rock seepages and sediment ponds). Parameters will be identified as COPCs if exceedances are observed to either chronic or maximum WQGs.

Water quality modeling will be completed using GoldSim software and will be integrated with the Elk Valley Water Quality Plan based on information available to North Coal at the time of analysis. Water quality modeling will be completed to determine concentrations of contaminants of potential concern for a range of conditions at potentially affected sites for each Project phase. Surface Water Quality will be modelled to produce baseline trends associated with scenarios that represent variability in seasonal, spatial and hydro-climatic conditions. Continued monitoring, beyond the baseline, will be used to assess

the variability within the data record. Results will also be discussed regarding the four water quality constituents listed in the EVWQP – selenium (total), nitrate, sulphate, and cadmium (dissolved).

Water quality is protected by the following key pieces of legislation:

- The BC *Water Sustainability Act* [SBC 2014] c. 15 regulates the use of surface water while the BC *Environmental Management Act* [BC 2003] c.53 regulates discharge to surface water;
- The Canadian *Fisheries Act* [RSC 1985] c.F-14 prohibits discharge of deleterious substances to fish habitat;
- Protection of water resources is guided by the BC and Canadian Council of Ministers of the Environment (CCME) water quality objectives under the BC *Environmental Management Act* [SBC 2003] c. 53 and the *Canadian Environmental Protection Act* [S.C. 1999] c.33;
- Elk Valley Water Quality Plan sets water quality targets for the Elk Valley watershed for Se, NO_3, Cd, and SO_4 under Section 89 of the BC *Environmental Management Act* [SBC 2003] c.53;
- BC *Public Health Act* [SBC 2008], c. 28, s. 15 and the *Drinking Water Protection Act* [SBC. 2001] c. 9 include requirements that the project will not cause or contribute towards any public health hazard or adversely contaminate any drinking water supply; and
- *International Boundary Treaty Act* [R.S.C., 1985] c. I-17, article 4 that says interference in transboundary waters will not result in any injury on the United States side of the boundary.

4.5.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Surface water quality interacts with various Project activities including open pit mining, mine rock storage facilities runoff and seepage, intermediate and/or temporary stockpiles, site surface water runoff from other infrastructure, and effluent discharge from the wash plant and water treatment plant. Each has the potential to impact water quality and discharges to surface water may contain contaminants generated from coal mining as well as equipment and vehicle operations.

The results of water quality modeling will be used to assess the Project's potential water quality effects on aquatic health, wildlife health, and human health as applicable.

The application will include a water quality model developed to predict water quality inputs and outputs from the project. At a minimum, the model will:

- Be based on the water quantity model described in Section 4.4.3 above;
- Incorporate geochemical mass loading terms for all relevant project infrastructure (open pits, coal rejects, waste rock, water quality treatment, etc.). These terms will be based on results of bench and field tests and supported by applicable literature;

- Geochemical mass loading terms will be developed for a full suite of water quality parameters including metals and nutrients;
- Include sensitivity analyses to the help understand key geochemical uncertainties (i.e. range in mass loading, variability in timing, efficacy of mitigation activities, etc.);
- Predictions of receiving environment water quality will be completed at all downstream Order Station locations (EV_ER1, RG_ELKORES and RG_DSELK), as defined in the Elk Valley Water Quality Plan. These predictions will be developed using outputs from Teck Coal Ltd.'s Regional Water Quality Model as provided by the Ministry of Environment and Climate Change Strategy; and
- Predictions of receiving environment water quality will also occur, at a minimum, downstream of each Project mine area (Loop Ridge and Michel Head), downstream of the entire project but upstream of Alexander Creek, and near the mouth of Michel Creek.

Geochemical modelling will be presented in a clear and transparent manner and the methods, assumptions and rationale used to estimate source terms will be thoroughly explained, including the use of relevant analogues and scale-up methods.

Results of static and kinetic tests will be used to predict discharge water quality from each mine component (e.g., waste rock stockpiles, overburden stockpiles, coal stockpiles), including estimates of sulphate, selenium and any constituents identified as potential issues from coal mining sites within the Elk Valley or in the test data. The lag time to ML/ARD onset will be assessed for all potentially acid generating materials and this information will be utilized in the development of management plans.

Water quality modeling results will be compared to relevant water quality targets and guidelines outlined in the EVWQP, the British Columbia Approved Water Quality Guidelines for Aquatic Life (BC WQG; BC MECCS, 2019) and the Canadian Council of Ministers of the Environment's Canadian Environmental Quality Guidelines (CEQG; CCME 2017). In cases where water quality is predicted to exceed relevant water quality guidelines, additional analysis will be conducted using toxicology data and site-specific information to characterize effects. Water quality predictions will be presented in a clear and comprehensive manager for all phases of the project, including summary statistics, graphs, and raw data appended. All model source terms, assumptions and input parameters will be listed, and the rationale for source term selection clearly supported. Characterization of uncertainty and conservatism of the water quality model will also be described.

If waste rock segregation is proposed, the application will demonstrate the feasibility to successfully segregate potentially acid generating (PAG) and non-PAG mine waste materials during operations, propose geochemical segregation criteria and identify operational methods to achieve geochemical characterization and segregation during operations (i.e., geochemical surrogates, on site lab, procedures needed, etc.). The application will include a sensitivity analysis to assess the effects of imperfect segregation of waste rock.

If engineered cover systems are proposed as a ML/ARD mitigation plan for the project, a conceptual design will be provided including the design objectives and principles, the characteristics and volumes of cover materials required, construction methods, assessment of expected performance and long-term

effectiveness under the expected range of climatic conditions, monitoring and maintenance requirements, contingency plans, costs of constructing and long-term monitoring and maintenance (refer also to ML/ARD Guidelines).

If blending of PAG and non-PAG materials to produce a benign composite is proposed as a ML/ARD mitigation strategy, information will be presented on the geochemistry of individual materials and mixed materials including metal release characteristics, site specific management criteria for blending, detailed materials handling and placement plans, demonstration of adequate proportions of PAG and non-PAG materials throughout mine life, an assessment of anticipated mine rock hydrology, proposed operational monitoring plans and contingency plans for seepage water quality management.

Water quality predictions will be included for water treatment inflows and outflows. Details regarding associated risks and uncertainties for all proposed water treatment options (active, passive, and/or semi-passive) will be provided along with supporting data and relevant analogues to demonstrate the effectiveness of these options. If drainage collection and treatment is proposed as a mitigation strategy for the project, a conceptual design will be provided including location, characterization of influent and effluent chemistry and flow, demonstration of the effectiveness of the drainage collection and holding system, conceptual design information on the treatment process, predicted reagent use, assessed performance under the expected range of flow and climatic conditions, sludge disposal plan, the operating, monitoring and maintenance requirements to ensure successful treatment is sufficient to achieve long-term environmental protection requirements, and anticipated capital and operating costs (refer also to ML/ARD guidelines). Please note that drainage collection and treatment should be viewed as a mitigation strategy of last resort, only to be considered if other prevention/mitigation methods are not feasible.

If an in-situ biological treatment technology is proposed as a mitigation strategy for the project, a conceptual design of the mitigation measure/treatment facility will be provided including the design objectives and principles, construction method(s), physical and geochemical characteristics and volumes of materials required, constituent release and (bio)geochemical reaction characteristics, reagent and/or nutrient usage, assessment of expected performance and long-term effectiveness under the expected range of climatic conditions, monitoring and maintenance requirements, contingency plans, costs of constructing and long-term monitoring and maintenance detailed information. Development of a reactive transport model will be required to support the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility. The results of these model simulations will clearly indicate how the mitigation measures will mitigate the potential adverse effects on surface and groundwater quality.

ML/ARD prevention and management strategies are required for temporary closure or early-permanent closure scenarios.

ML/ARD prevention and management strategies are required for temporary closure or early-permanent closure scenarios.

Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.5.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.5.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.5.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.5.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.6 Sediment

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Sediment is an intermediate VC that is a pathway to effects on aquatic health (algae and benthic invertebrates), fish and fish habitat, ecosystems, plants, wildlife habitat, wildlife health, and human health.

Sediment indicators include changes in quality relative to BC and CCME standards and changes in quantity and distribution relative to pre-mine conditions which includes existing timber harvest.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.6.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

Aquatic resource boundaries are defined by watershed boundaries where effects will be measurable (Figure 4). The local study area (LSA) for aquatic resources is the Michel Creek watershed including the confluence with the Alexander Creek watershed. The LSA extends downstream to include areas that may be affected by the Project, but not by Teck mines other than Coal Mountain. The regional study area (RSA) is the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan.

The assessment will cover construction, operational, and post-closure periods.

4.6.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect sediment baseline data.

Sediment sampling followed the guidance provided in the *BC Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC MOE 2013) and *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE 2016).

Sediment samples were collected at stations corresponding to the water quality and fish habitat study sites. Sediment quality was then analyzed for comparison with sediment quality guidelines, to assist in the

assessment of aquatic health, fish and fish habitat, and for future monitoring of potential contaminants of concern. The sediment sampling program is summarized in the following table.

Table 8: Sediment Sampling Program

Year	Sample Sites	Analyses
2014	19 (Loop Ridge, Michel Head, Michel Creek and reference sites)	PAH/organics, particle size and metals on the <63 micron particle size fraction
2015	11 (Loop Ridge, Michel Creek and reference sites)	
2018	12 (Loop Ridge, Tent Mountain, Michel Head, Michel Creek and reference sites)	
2019	23 (Loop Ridge, Michel Head, Michel Creek and reference sites)	

4.6.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Discharge of particulates and potentially associated contaminants from the mine mainly from earthworks and effluent discharges can be transported in the water column of streams and/or settle in stream substrates. This is a pathway to potential adverse effects on habitat and health of aquatic plants, invertebrates, fish, ecosystems, plants, wildlife habitat, wildlife health, and human health.

Estimated changes to sediment quantity and quality will be presented qualitatively and calculated quantitatively where possible for comparison of the indicators with the standards presented above. Where possible, the analysis will need to consider the source of sediments from the Project and other activities (e.g., logging) in the Michel Creek watershed and will integrate information from the terrain stability analyses. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.6.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.7 Terrain Stability

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Terrain stability is an intermediate VC that will be used in the assessment of ecosystems, aquatic health, fish habitat, plants, wildlife and wildlife habitat, and public safety.

Terrain stability indicators include changes to terrain stability and assessed geohazards.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

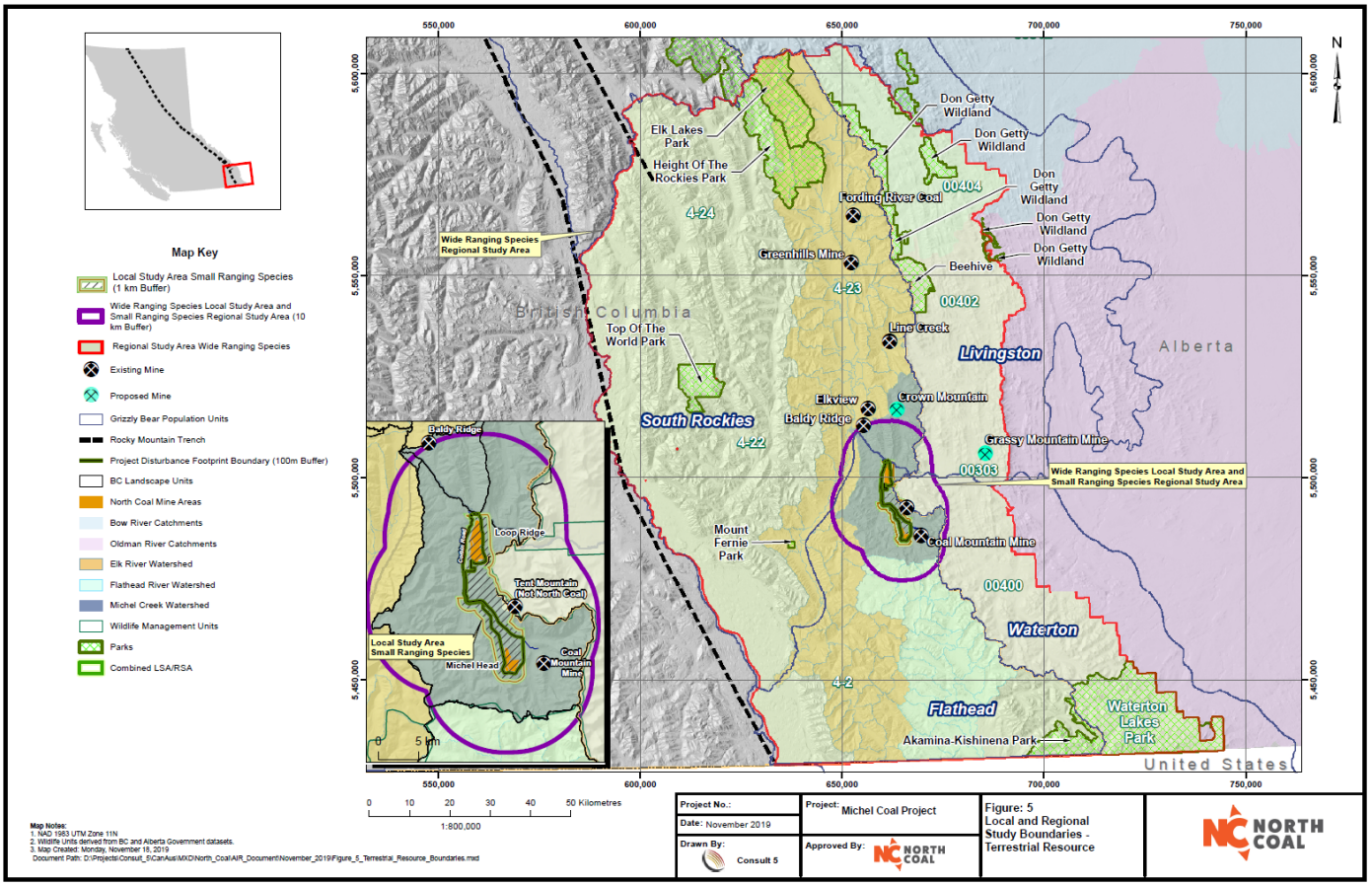
4.7.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study areas for terrain stability are the same as those defined for small-ranging wildlife species in the terrestrial resource boundaries shown in Figure 5. The LSA is the 1 km buffer boundary around the Project footprint, and the RSA is the 10 km buffer boundary around the Project footprint. Note that the 1 km buffer is limited by land ownership on the west side of the Loop Ridge infrastructure and on the east side of the Michel Head infrastructure. Field studies could not be conducted outside these limits; therefore, the LSA boundary was adjusted accordingly. Within these assessment boundaries, the hazards assessment focused on the Michel Creek watershed within which the geomorphological, fluvial processes and risks interact with the Project.

The assessment will cover construction, operational, and post-closure periods.

Figure 5 Local and Regional Study Boundaries – Terrestrial Resources



4.7.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

Studies for terrain stability include a terrain stability and geohazard assessment and a fluvial hazards assessment.

The terrain stability and geohazard assessment follows guidance from Howes and Kenk (1997), Hungr et al. (2001), Hungr et al. (2014), Chatwin et al. (1994), RIC (1996), CAA (2002), Fell et al. (2008) and includes the following work:

- Review of existing data, in addition to literature and desktop mapping using LiDAR, satellite imagery, and aerial photographs;
- Field verification of mapping – visiting sites to intensity level C (20-50% of polygons verified) within the Project footprint and intensity level D (1-20% of polygons verified) within the remaining mapped area including soil pits where needed;
- Terrain stability classification - design criteria to define terrain stability classes and completed terrain map GIS linework; and

Geohazard and risk assessment - estimate geohazards likelihood, determine encounter probability, assess qualitative risk scenarios, and the influence of climate change. The fluvial hazard assessment follows guidance from Lewis (2004), Craig (2018), Brunner (2016), FPTCCCEA (2003), CEAA (2003), and includes the following:

- Desktop assessment of reach and local-level geomorphic conditions and historical channel changes to determine conditions that could affect the potential for flood and erosion hazards along Michel creek;
- Field assessment to support hydraulic modelling and flood hazard assessment to determine risks of flooding and bank erosion within the study area; and
- Peak flow analysis and development of a hydraulic model to inform areas of potential flood inundation associated with the 200-year return period flood levels.

4.7.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Interaction with terrain stability can occur from development of open pits, rock storage facilities, and haul road construction and operation that could result in landslides. Terrain stability is a pathway to potential effects on terrestrial and aquatic habitat, fish and wildlife. Changes in terrain stability can also result in potential increased risk to public safety.

Estimated changes to terrain stability will be calculated using the same methodology as for the baseline assessment for the new landforms for comparison to the indicators presented above. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.7.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.8 Soil

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Soil is an intermediate VC that is a pathway to receptor VCs including ecosystems, aquatic health, wildlife health, plants, wildlife and wildlife habitat, human health, and community health.

Indicators include changes to quality, quantity, and distribution of soils. Soil quality will be compared to contaminated sites soil quality guidelines and the Canadian Soil Quality Guidelines for the protection of human health.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.8.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study areas for soils are the same as the LSA and RSA defined for small-ranging wildlife species in the terrestrial resource boundaries shown in Figure 5. The LSA is the 1 km buffer boundary and the RSA is the 10 km buffer around the Project footprint.

The assessment will cover construction, operational, and post-closure periods.

4.8.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on soils.

A soil classification map was completed at a 1:20,000 scale for the study area. The methodology consisted of four steps: i) review of background information; ii) terrain mapping; iii) soil field work program including soil profiling along terrain traverses for each area of the Project, and, iv) soil characterization.

Regional descriptions of the existing soils in the East Kootenay Area (Lacelle, 1990) and the Canadian System of Soil Classification (Agriculture and Agri-Food Canada, 1998) were used to guide local soil classifications. The soils baseline field program will validate the soil type distribution map through site descriptions, soil profiles, and classifications of representative soil pit/soil exposure sites.

The soil erosion potential mapping assigns ratings of surface erosion to the terrain units in order to provide a qualitative assessment of the likelihood of sediment detachment by overland water flow in absence of vegetation. The surface erosion ratings are intended to identify potential problematic areas for mining development so that appropriate preventive or remedial action can be planned. Erosion potential is classified by a 5-class system ranging from very low to very high. The classes will only be considered a relative assessment of erosion potential if surface disturbance occurs.

Soil quality is governed by the BC *Contaminated Sites Regulation* (B.C. Reg. 375/96) under the *Environmental Management Act* [SBC 2003] c. 53 and the *Canadian Environmental Protection Act* [S.C. 1999] c.33 with environmental quality guidelines *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* published by CCME (2007).

4.8.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects on soil from Project earthworks, equipment and machinery use, and processing include:

- Changes in soil quantity, quality, and distribution when stripped for construction and replaced during reclamation;
- Potential loss of soil from erosion when soil is exposed, prior to reclamation; and
- Changes in soil distribution and erosion potential from the Project layout will be estimated qualitatively and quantitatively where possible for comparison of the indicators with the *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CCME, 2007).

Results will be carried forward for assessment of the other pathway receptor VCs including human health.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.8.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.9 Fish and Fish Habitat

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Fish and fish habitat will be assessed for subcomponent species including Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*), Bull Trout (*Salvelinus confluentus*), Longnose Sucker (*Catostomus catostomus*), and Mountain Whitefish (*Prosopium williamsoni*). Fish and fish habitat are a pathway to aquatic health, ecosystems, plants, wildlife and wildlife habitat, wildlife health, and human health.

Indicators include habitat quality and quantity relative to baseline (e.g., changes in channel morphology, stream flow, substrates, and calcite formations, changes in habitat connectivity, and changes in habitat availability); fish growth, survival, and reproduction; and, metal concentrations in fish (if the monitoring program can be tied into regional monitoring to avoid harm of fish populations).

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.9.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

Aquatic resource boundaries are defined by watershed boundaries where any effects will be measurable (Figure 4). The local study area (LSA) for aquatic resources is the Michel Creek watershed including the confluence with the Alexander Creek watershed. The regional study area (RSA) is the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan. The aquatic study boundaries extend downstream to include areas that may be affected by the Project, but not by Teck mines other than Coal Mountain.

The assessment will cover construction, operational, and post-closure periods.

4.9.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal's general approach with respect to existing conditions of fish and fish habitat includes the following:

- A review of literature describing fish species occurrence and distribution, and fish habitat characteristics (i.e., riparian vegetation, streambed type, water quality);
- Characterization of habitat conditions in Michel Creek and all tributaries (including overwintering and spawning fish habitat potential, Level 1 Fish Habitat Assessment Procedures, field data on sediment and water quality, calcite visual assessment, and considering the range of historic and current flow regimes presented in the hydrological assessment);
- Field surveys to characterize fish habitat and confirm the presence and distribution of fish in watercourses (Michel Creek and all tributaries) potentially affected by the proposed Project (including spring and fall spawning surveys, fish inventory, fish community assessment, and snorkel surveys), and
- Assessment of fish habitat connectivity.

Fish and fish habitat studies used the following standards:

- Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2012);
- BC Channel Assessment Procedures (BC MOF 1996);
- Fish Habitat Assessment Procedures (Johnston & Slaney, 1996); and
- Reconnaissance (1:20,000) fish and fish habitat inventory: Standards and procedures (RISC, 2001).

The fish sampling program is summarized in the following table.

Table 9: Fish Sampling Program

Year	Sample Sites	Analyses
2014	13 sites	Spring spawning surveys
2013 to 2015, 2018	50 reaches from 35 creeks	Reconnaissance-level fish and fish habitat inventory, overwintering habitat assessment, snorkel surveys on Michel Creek

Regulation and management of fish and fish habitat in B.C. occurs through the following provincial and federal legislation:

- B.C. Fish Protection Act;
- B.C. Water Sustainability Act, S.B.C. 2014, c.15;
- B.C. Wildlife Act, R.S.B.C. 1996, c.488;
- Federal Fisheries Act, R.S.C. 1985, C. F-14; and
- Federal Species at Risk Act (SARA), S.C. 2002, c.29.

4.9.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects from the mine footprint (e.g. open pits and rock storage facilities), water use, and discharges which could result in changes in water and/or sediment quality, quantity, and distribution that can result in reduced abundance, diversity, distribution, and/or fewer sensitive species of fish. There could also be potential loss of fish and/or fish habitat in the Michel Creek watershed and downstream creeks or rivers depending on the location and magnitude of changes resulting from the Project.

Changes in fish and fish habitat will be estimated qualitatively and quantitatively where possible (calculated in habitat units) for comparison of the indicators with the standards presented above and against water and sediment quality guidelines. Results will be carried forward for assessment of the other pathway receptor VCs.

If harmful alteration, disruption or destruction of fish habitat is anticipated to result from the project then the impact assessment (application) include a proposed fish habitat offset plan with adequate detail (location, site plan and objectives) to demonstrate technical feasibility and effectiveness. If a fish habitat offset plan is included then it may be taken into consideration as a mitigation measure in characterization of the significance of residual and cumulative effects on fish habitat.

If tributaries are affected by the Project, their effect on environmental flows for fish will be quantified. Depending on the results, appropriate mitigation measures will be defined and included in a Tributary Management Plan if needed.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.9.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.9.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.9.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.9.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.10 Aquatic Health

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Aquatic health is a receptor VC. Aquatic health is linked to water quality and sediment quality. Subcomponents of aquatic health include benthic invertebrates, algae, fish downstream of Project, Western toad, and Columbia spotted frog. Aquatic health is also a pathway to wildlife and human health.

Indicators for aquatic health include evaluations of invertebrate community metrics such as abundance and fish population indices (e.g., growth, condition factor) in addition to changes in baseline surface water quality and changes in tissue metal concentrations including selenium and other metals.

Indicators for benthic invertebrates include changes in distribution, diversity indices, EPT index (an indicator of sensitive species including mayflies, stoneflies, and caddisflies), and community structure consistent with regional monitoring efforts.

Indicators for algae include changes in relative abundance, distribution, and community structure consistent with regional monitoring efforts.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.10.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The aquatic health study area boundaries are the same as the aquatic resource boundaries and are defined by watershed boundaries where potential effects may occur (Figure 4). The local study area (LSA) is the Michel Creek watershed including the confluence with Alexander Creek watershed. The regional study area (RSA) includes the Elk River watershed where cumulative effects and objectives are determined by the Elk Valley Water Quality Plan.

The assessment will cover construction, operational, closure, and post-closure periods.

4.10.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on algae and benthic invertebrates.

The sampling methods were guided by the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2016) and the BC *Field Sampling Manual* (MWLAP, 2003).

Sample site locations for algae and benthic macroinvertebrates were tied into the water quality and fish and fish habitat study programs. Sample locations will be described and presented on a map at the appropriate scale in the Application. The Application will include a description of locations and how these may or may not be used for future monitoring sites.

Sampling for benthic macroinvertebrates followed the Canadian Benthic Aquatic Biomonitoring Network (CABIN) field and laboratory protocols (Environment Canada 2012). Triplicate samples were collected at 10% of the sites to assess within-site variability. Taxonomic analysis of samples will be used to assess relative abundance and calculate diversity and sensitivity indices. The algae and benthic invertebrate sampling program is summarized in the following table.

Composite periphyton (attached algae) samples were collected from five rocks at each site. Samples were collected for taxonomy (community composition) and two biomass measurements: ash-free dry biomass and chlorophyll-a. Triplicate samples were collected at 10% of the sites to assess within-site variability.

Table 10: Algae and Benthic Invertebrate Sampling Program

Year	Sample Sites	Analyses
2014	21 periphyton and 20 benthic invertebrate sample sites (Loop Ridge, Michel Head, Michel Creek and reference sites)	Periphyton – Taxonomy, chlorophyll-a, biomass, tissue metals Benthic Invertebrates – Taxonomy, chlorophyll-a, biomass, tissue metals
2017	21 periphyton and benthic invertebrate sample sites (Loop Ridge, Michel Head, Michel Creek and reference sites)	Periphyton – Taxonomy, chlorophyll-a, biomass Benthic Invertebrates – Taxonomy, biomass
2018	12 periphyton and 11 benthic invertebrate sample sites (Loop Ridge, Tent Mountain, Michel Head, Michel Creek and reference sites)	Periphyton – Taxonomy, chlorophyll-a, biomass, tissue metals. Benthic Invertebrates – Taxonomy, biomass, tissue metals
2019	23 (Loop Ridge, Michel Head, Michel Creek and reference sites)	Periphyton – Taxonomy, chlorophyll-a, biomass, tissue metals Benthic Invertebrates – Taxonomy, biomass, tissue metals

North Coal is using the following approach to assess aquatic health.

Baseline samples were collected and analyzed to determine the current concentrations of constituents (including selenium) in fish tissue, benthic invertebrate tissue, periphyton tissue. Methods follow the guidance *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE 2016).

Results from baseline sampling will be combined with other available tissue data in the region (when local data is limited, e.g. Westslope Cutthroat Trout) along with the baseline information collected for sediment, water quality, benthic invertebrate, periphyton, fish, and amphibians as outlined in the previous sections to analyze potential effects on aquatic health as outlined below.

Table 11: Sampling Program to Support Aquatic Health Assessment

Year	Sample Sites	Analyses
2014	21 periphyton and 20 benthic invertebrate sample sites (Loop Ridge, Michel Head, Michel Creek and reference sites)	Periphyton – tissue metals Benthic invertebrates – tissue metals Fish (Eastern Brook Trout) - tissue metals Sediment - metals
2015	Michel Creek	Westslope Cutthroat Trout – muscle plugs tissue metals

Year	Sample Sites	Analyses
2015	Collections from 5 sites around Michel Creek and Tent Mountain (15 other sites surveyed but insufficient quantities for analysis)	5 Spotted Sandpiper eggs – metals analyses Amphibians (Columbia Spotted Frog, Western Toad) eggs – metals analyses
2017	15 sites along the length of Michel Creek	8 Red-winged Blackbird eggs – metals analyses Amphibians (Western Toad, Long-toed Salamander) eggs – metals analyses
2018	12 periphyton and 11 benthic invertebrate sample sites (Loop Ridge, Tent Mountain, Michel Head, Michel Creek and reference sites)	Periphyton – tissue metals Benthic invertebrates – tissue metals Fish (Westslope Cutthroat Trout, Mountain Whitefish, Eastern Brook Trout, Longnose Sucker) - tissue metals Sediment - metals
2019	23 (Loop Ridge, Michel Head, Michel Creek and reference sites)	Periphyton – tissue metals Benthic invertebrates – tissue metals Fish (Westslope Cutthroat Trout, Mountain Whitefish, Eastern Brook Trout, Longnose Sucker) - tissue metals Sediment - metals

Applicable legislation protecting aquatic health includes the BC *Environmental Management Act* [SBC 2003] c. 53, Canadian *Fisheries Act* [R.S.C. 1985] C. F-14, and the Canadian *Environmental Protection Act* [S.C. 1999] c.33.

4.10.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

The changes in water and/or sediment quality and quantity and habitat changes from the mine footprint, water use, and discharges can result in effects on aquatic health including algae and benthic invertebrate communities. These effects can include reduced abundance, reduced diversity, changes in distribution, fewer sensitive species, and/or increased invasive species. These changes are also potential pathways for adverse effects on fish and wildlife.

Changes in algae and benthic invertebrate communities (with respect to abundance, diversity, distribution, sensitive species, and invasive species) will be estimated qualitatively for comparison to baseline conditions in water quality, sediment quality, and habitat availability. There are no standard methodologies for predicting changes in algae and benthic invertebrate communities. Results will be carried forward for assessment of the other pathway receptor VCs.

Potential effects on aquatic health can occur from potential contaminants from the mine entering the aquatic environment. Potential sources of contaminants from the mine are from discharges from the open pits, mine rock storage facilities, and process plant predominantly during operations.

There are no standard methods for assessing aquatic health. The application will identify potential environmental effects to aquatic and aquatic dependent (e.g. amphibians and waterbirds) life as a result of interactions with components of the Project during all phases (e.g., construction, operation, closure). The focus of the aquatic effects assessment will be on ecosystem components that may ultimately influence fisheries resources. Changes in water and sediment quality could affect benthic, periphyton, amphibian and fish communities. Therefore, the aquatic health assessment will consider results of the balance and water quality modelling (which incorporates groundwater seepage), as well as available baseline characterization data, to evaluate potential effects in receiving aquatic environments. The assessment will evaluate invertebrate community metrics such as, abundance and fish population indices such as growth and condition factor, in addition to changes in baseline surface water quality and changes in tissue metal concentrations, including selenium. Variability in effects between lentic and lotic habitats will be considered in the assessment. Measured indicators may include, but not be limited to benthic invertebrate community metrics and tissue chemistry, periphyton taxonomy, biomass (chlorophyll a) and tissue chemistry evaluations, fish tissue chemistry, amphibian egg chemistry, and markers of general health status (e.g., growth). The assessment will be completed within the framework of the Elk Valley Water Quality plan and will reference the body of scientific work on environmental toxicology and bioaccumulation recognizing the importance of chronic toxicity with selenium concentrations in fish reproductive tissue. The *Ambient Water Quality Guidelines for Selenium Technical Report* (Beatty and Russo, 2014) will also be referred to for the assessment.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.10.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.10.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.10.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.10.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.11 Ecosystems

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Effects on ecosystems will be completed for avalanche, grassland, wetland, riparian and floodplain, as well as old forest, mature forest, and brushland subcomponents. Ecosystems is an intermediate VC with linkages to aquatic health, fish and fish habitat, rare and highly valued plants, wildlife and wildlife habitat, non-commercial land use / recreation, and visual quality.

Indicators for ecosystems include:

- Changes in ecosystem quantity, distribution, function and condition (i.e., changes to quality such as groundwater, surface water, soil, species richness, rare species, presence of invasive species, wildlife, and trees);

- Change in size and distribution of ecosystem patches, interior to edge distance, type of old growth, and seral stage for old forests and mature forests; and
- Changes relative to targets for old forests and mature forests in the Kootenay-Boundary Higher Level Plan Order, in consideration of private land use constraints.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.11.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

Ecosystems spatial boundaries will use the three terrestrial resource boundaries including the 1 km buffer boundary around the Project footprint the 10 km buffer boundary around the Project footprint and the RSA boundary for wide-ranging species as shown in Figure 5.

The assessment will cover construction, operational, closure and post-closure periods.

4.11.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on ecosystems.

The objective of the baseline investigations was to create a survey intensity level four, 1:20,000 scale Terrestrial Ecosystem Mapping (TEM) following standard methods (Ecosystems Working Group, 1998; McKillop and Ehman, 2016) for the LSA around North Coal's disturbance footprint area. The total area covered by the TEM is 10,916 ha. and it will be used for habitat modelling, effects assessment, mitigation, and management planning.

Initial map polygons were delineated by photointerpretation and pre-typing. Field sampling was then conducted to verify and update the mapping. After the final publication of the Biogeoclimatic Ecosystem Classification for the East Kootenay (MacKillop et al., 2018), additional field checks were completed in 2018 to incorporate classification changes into the TEM.

4.11.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects on ecosystems could occur from clearing of land for mine construction and operations beyond areas already cleared by existing timber harvest. Changes could result in loss or degradation of important ecosystems; changes in abundance and distribution of blue- and red-listed ecological communities; changes in wetlands and wetland functions from contaminants; changes in wetland and wetland functions, including all ecological, biochemical, and hydrological functions that wetlands in the project area provide, as it relates to migratory birds and species at risk. The Application will use the indicated study methods of quantifying and/or qualifying the predicted changes in abundance and distribution and current scientific literature on ecosystem function and dynamics to inform the assessment and mitigation strategies and consult with appropriate authorities on sensitive species and habitats, as applicable.

Ecosystem changes are a pathway to potential effects on fish and wildlife communities, wildlife and aquatic health, as well as social, cultural, and health effects on humans.

The effects assessment will present the predicted changes (qualitatively and/or quantitatively where possible) for the ecosystems and indicators presented above. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.11.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.12 Rare and Highly Valued Plants

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Subcomponents to assess rare or highly valued vascular and non-vascular plants include Limber pine (*Pinus flexilis*), Whitebark pine (*Pinus albicaulis*), and other species of conservation concern, which under provincial and federal legislation, includes red-listed moss species (Bryum moss (*Bryum calobryoides*), Compact grimmia (*Schistidium confertum*), Tortella moss (*Tortella humillis*)) and red-listed lichen species (Snow-white dimple (*Squamarina lentigera*), Homosekikaica pixie-cup (*Cladonia homosekikaica*)). High elevation grasslands have also been noted by the BC government as rare habitat and is included as a subcomponent.

Indicators include changes in distribution of rare or important plant species and habitat. Loss of any designated critical habitat for endangered and threatened species will be identified and quantified and the mitigation hierarchy of avoidance, minimization, reclamation, and offsets will be followed.

Culturally important plant lists are kept confidential. The list of plants identified through baseline field studies will be provided to KNC for assessment in Part C.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.12.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study areas for rare or highly valued plants are the same as the LSA defined for small-ranging wildlife species in the terrestrial resource boundaries shown in Figure 5. The LSA is the 1 km buffer boundary around the Project footprint.

The assessment will cover construction, operational, closure and post-closure periods.

4.12.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on rare and highly valued plants.

Within the Kootenay region, key habitat types for listed plants are typically non-forested ecosystems as they make up a smaller portion of the landscape and are more likely to contain rare species or ecosystems due to their uncommon habitat attributes (e.g., BC MOE, n.d.; GCC, 2017). For this study, ecosystems with the highest potential for listed plants were determined to be wetlands and warm aspect slopes that are permanently non-forested because of factors such as recurrent fire, difficult site conditions, terrain, and/or herbivory.

Listed plants and ecological communities with the potential to occur in the study area were identified by reviewing the BC Conservation Data Centre (BC CDC) database via the BC Species and Ecosystems Explorer (BC CDC, 2018). Based on the results of the data search, a field survey plan was then developed and executed to target potential habitats where the listed plants and ecological communities might be found. Field surveys of listed (rare and endangered) plant species were carried out during the Terrestrial Ecosystem Mapping (TEM) field surveys discussed previously.

For limber pine and whitebark pine, an initial targeted search in suitable habitat was conducted on Loop Ridge and Tent mountains in 2017 to verify presence and gather preliminary data on species distribution, health, and reproduction. In 2018, focus was placed on delineating the distribution of limber and

Whitebark pine throughout the study area, which included Michel Head Mountain; assessing potential critical habitat for Whitebark and Limber pine in the LSA following guidance in the *Recovery Strategy for the Whitebark Pine (Pinus albicaulis) in Canada [Proposed)* (ECCC, 2017); and health assessments of limber and whitebark pine.

Protection of species of conservation concern and critical habitat is regulated under the federal *Species at Risk Act* (SARA), S.C. 2002, c.29.

Plant tissue analysis will include traditionally important species and the results will be taken forward in the assessment on human health.

4.12.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Clearing of land for mine construction and operations, beyond that already cleared by existing timber harvest, could potentially result in loss of rare or highly valued plants and encroachment by invasive species. Effects on Limber pine and Whitebark pine will consider cumulative effects from timber harvest.

The assessment will also consider changes in the concentration of contaminants in plant tissue and their toxicity effects on plant health and growth.

The Application will use the indicated study methods of predicting losses or threats to rare and highly valued plants and current scientific literature on the ecology of, threats to, and any recovery plans for rare and highly valued plants to inform the assessment and mitigation strategies and consult with appropriate authorities on sensitive species and habitats, as applicable.

The effects assessment will present the predicted changes (qualitatively and/or quantitatively where possible) for the rare and highly valued plants for the indicators presented above.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.12.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.12.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.12.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.12.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.13 Wildlife and Wildlife Habitat

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Subcomponents to assess wildlife and wildlife habitat include the following:

- Mammals: American badger, American marten, Canada lynx, Rocky Mountain elk, moose, grizzly bear, Rocky Mountain bighorn sheep, American bison, Little Brown Myotis, wolverine, river otter, Columbia ground squirrel;
- Birds: American Dipper, Olive-sided Flycatcher, Common Nighthawk, woodpecker guild, Northern Goshawk, cliff-nesting raptors;
- Amphibians: Western toad, Columbia spotted frog;
- Insects: Gillette's Checkerspot;
- Wildlife species of conservation concern, which under provincial and federal legislation currently includes:
    - Endangered (federal) and/or Red list (BC): American badger (E, Red), Little Brown Myotis (E, Yellow), Northern Myotis (E, Blue), Swainson's Hawk (Red), Black Swift (E, Blue), Williamson's Sapsucker (E, Blue), Gillette's Checkerspot (Red);
    - Threatened (federal): Barn Swallow (T, Blue), Lewis's Woodpecker (T, Blue), Bank Swallow (T), Western Screech-Owl (T, Blue);
    - Special Concern (federal) and/or Blue list (BC): grizzly bear (SC, Blue), wolverine (SC), Northern Goshawk (Blue), Olive-sided Flycatcher (SC, Blue), Common Nighthawk (SC), Western toad (SC); and
- Migratory birds (old forest, mature forest, young forest, grassland, shrubland, wetland, waterfowl, water birds, and raptor guilds).

Indicators for wildlife and wildlife habitat include changes to habitat availability, habitat distribution, species richness, diversity and relative abundance to the extent possible. The applicability of these indicators to each species or group of species depends on availability of information. For example, indicators for grizzly bear may include changes in avalanche chute and alpine habitat, riparian and floodplain habitat, road density, mortality and connectivity. For bighorn sheep, indicators may include change in suitable habitat, mortality, population, contact with domestic sheep and goats for bighorn sheep. A smaller subset of species and indicators may be chosen for ongoing monitoring depending on the results of the effects assessment.

Loss of any designated critical habitat for endangered and threatened species will be identified and the mitigation hierarchy of avoidance, minimization, reclamation, and offsets will be followed.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.13.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study/analysis areas were defined for habitat modeling and subsequent assessment of Project impacts for selected VCs. Consistent with standard methodology in defining project areas for application of wildlife habitat ratings (RIC 1999), a larger RSA was defined within which a smaller LSA was nested. However, there are wide ranging and small ranging species and as a result, three wildlife boundaries have been defined, a RSA for wide-ranging species, a LSA for small-ranging species and an intermediate common boundary representing and LSA for wide ranging species and an RSA for small ranging species (Figure 5). Wildlife VC subcomponents considered to be wide-ranging species include Canada lynx, Wolverine, American badger, Rocky Mountain elk, Rocky Mountain bighorn sheep, and grizzly bear. All others will be assessed at the LSA and RSA boundaries for small-ranging species. Implications of the scale of assessment relative to the study areas will be discussed in the application to provide context as needed specific to each species' ecology where a species' seasonal movements and territories vary from the standard boundaries.

The RSA was defined to ensure that the larger regional population context was appropriately captured for each species addressed. Such context should be ecologically meaningful, reflecting population distribution and allowing for inferences of variation in population density, core habitat areas and landscape-level population connectivity. The RSA should also encompass an area over which a quantitative analysis can be carried out for comparison against established standards and thresholds. In this case, the RSA includes the Elk Valley Cumulative Effects Management Framework (CEMF; 3,314 km^2). It would also include the Flathead grizzly bear population unit (GBPU; 3,434 km^2) in which the Project falls. While satisfying these criteria, wildlife management units (WMUs) were selected within British Columbia and Alberta to encompass a regional area around WMU 4-23 in which the project falls. These include WMUs 4-1, 4-2, 4-22, and 4-24 in British Columbia, and WMUs 404, 402, 303, 400, and Waterton Lakes National Park in Alberta. Based on these criteria, the multi-species RSA encompasses >6,000 km^2 that is not restricted by jurisdiction (Figure 5).

In addition to the RSA, a single LSA was selected for application in modeling and quantitative assessment of individual and cumulative impacts for wide-ranging terrestrial mammals. An appropriate localized scale of assessment for these species was selected to equate to an occupied landscape area of 300 km^2. A 10 km radius was applied as a buffer around the Project footprint to objectively delineate the LSA for small-ranging species.

Within this 10 km LSA, a finer-scale LSA was also defined as a 1 km buffer around the Project footprint, limited on the western edge by the private and mineral land tenure limitations. This 1 km LSA is appropriate for small range VCs and provides potential for more detailed habitat modeling based on TEM data. However, this scale of assessment is limited in understanding impacts for species that typically move and use resources over a much larger area.

As noted, the RSA and LSA and constituent units within them define the scale for predicting and understanding individual and cumulative impacts associated with the Project. This may involve both qualitative and quantitative assessment.

The temporal boundaries include construction, operations, closure, and post-closure.

4.13.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data and completing the assessment on wildlife and wildlife habitat.

The objective of the wildlife baseline programs is to determine the presence, distribution, and relative abundance (if possible) of key wildlife species in and adjacent to the study area in the Michel Creek watershed. Baseline data were collected from literature searches, existing databases, incidental observations, grizzly bear and elk tracking collar study data, Project-specific field surveys (as outlined below), and habitat suitability mapping for a range of species. Year-to-year variability should be considered in the baseline. Wildlife surveys note any incidental wildlife habitat features such as mineral licks, roosts, wallows, and wildlife trees which are then considered in the effects assessment. The baseline data collection methodology should incorporate regional, provincial, indigenous, and federal species objectives and ongoing studies into the assessments (including grizzly bear, moose, Rocky Mountain elk, Rocky Mountain bighorn sheep).

Existing conditions will include acknowledgment of cumulative development impacts at the time of baseline data collection and an explanation of how this has been interpreted. The interpretation will be informed by applicable literature that will be presented in a table.

The understanding of wildlife and wildlife habitat in the Project area was augmented by a furbearer study conducted by Ktunaxa First Nation members, elders, knowledge holders, land users, and staff, led by The Firelight Group with contributions from the Sparwood and District Fish and Wildlife Association.

Snow Tracking

Snow track surveys were guided by RISC standards (1998a, 1998b, and 1998e). A preliminary scoping track survey was conducted on March 24, 2014. In 2015, transects were surveyed twice during the winter (January 20-23 and March 4-6) and transects were surveyed during the 2016 winter (January 11-12, 26-28) to capture variation in seasonal habitat use. The same survey transects were repeated each survey wherever possible, though some transects had to be adjusted due to forest harvesting, access difficulties, and avalanche hazard. Potential transect routes were identified through representative coniferous, mixed wood, and regenerating forest cover types. Route placement considered likely travel corridors for wildlife species (e.g., topographic features such as valley bottoms, riparian areas, ridges, saddles), accessibility by snow machine or by foot (i.e., snowshoes or skis), and avalanche risk for field personnel. In general, safety

considerations precluded snow tracking in higher elevation ESSF habitats considered complex avalanche terrain.

Camera Traps

Camera trap methods were guided by RISC standards (1998e and 1999b). Four grid cells with dimensions of 10 km by 10 km were identified to optimise study area coverage. The grid size was equivalent to that recommended for wolverine (100 km^2) and also equivalent to the size commonly used in other inventory projects for detecting wide-ranging carnivores in southern British Columbia. One bait/scent station (bait, scent, camera, hair snares) location per grid cell was established in high-quality habitats in January 2015 and 2016. Camera units were set up to detect any carnivores attracted to the site. Barbed wire was wrapped around the tree trunk below the bait to collect hair samples for DNA analysis. Bait/scent stations were checked and maintained monthly and dismantled at the end of March in 2015 and in mid-May 2016 to avoid attracting bears.

Eleven unbaited trail cameras recorded wildlife starting in August 2017.

Ungulate Aerial Surveys

Aerial ungulate surveys were completed over a four-year period to assess the distribution and relative abundance and distribution of ungulates. Methods followed *Aerial-based inventory methods for selected ungulates* (RISC, 2002). Follow-up aerial surveys were conducted in 2019 focusing on the late-spring, late-summer and winter periods.

American Badger and Columbia Ground Squirrel

American badger and Columbia ground squirrel surveys were completed to determine the occurrence of American badger and Columbia ground squirrel, distribution, and describe the extent of suitable habitat. Methods followed *Inventory methods for medium-sized territorial carnivores: Badger* (RISC, 2007).

Bats

Acoustic detectors were remotely deployed at 18 sites in 2017. The 1998 RISC bat inventory guidance is outdated for acoustic work; therefore, this work was informed by acoustic training in detector deployment and data analysis. Follow-up acoustic monitoring was conducted in 2019 including establishment of a long-term North American Bat Monitoring Program grid cell, consisting of four stationary detectors and one driving transect within the project area. Mist netting to confirm the presence of Little Brown Myotis occurred in 2018.

Survey methods included stationary acoustics including targeting potential hibernacula and roosting habitat (based on habitat suitability mapping), mobile acoustic, and live capture.

Birds

Point count spring breeding bird surveys were completed in 2015 and 2017, and 2019 following *Inventory Methods for Forest and Grassland Songbirds* (RISC, 1999a).

Point count surveys were completed in early spring 2018 and 2019 and fall 2018 to provide baseline data on migratory birds.

Targeted surveys were also completed for:

- Harlequin Duck in May 2018 to determine presence following *Inventory Methods for Riverine Birds: Harlequin Duck, Belted Kingfisher and American Dipper* (RISC, 1998d);
- Common Nighthawk following Draft Canadian Nightjar Survey Protocol (2017) in July 2018, and *Inventory methods for nighthawk and poorwill* (1998b) in July 2019;
- Barn Swallow using 20-minute standwatch surveys in July 2018 and targeted nest searches in July 2019; and
- Woodpeckers in June/July 2019 using *Inventory Methods for Woodpeckers* (Section 3.3.2 – Wildlife Tree/Sign Surveys; BC Resources Inventory Branch 1999).

Migratory Birds

For migratory bird species (i.e., including SARA-listed and COSEWIC–assessed) that the Project may impact:

- Project effects be identified, assessed, and mitigation and monitoring plans be provided;
- If a species is not identified, surveyed, and/or assessed as part of the Application, then a justification should be provided;
- Migratory bird survey data be evaluated in relation to habitat use, specifically: species abundance, distribution, and density in each habitat of the Project area;
- Migratory bird surveys be conducted following appropriate Resource Inventory Committee Standards and other available standard protocols; and
- Assess and evaluate of migratory bird use (breeding, migration, and overwintering) in the Project area.

Raptors

Standwatch surveys were completed in 2018 to determine presence of raptors following *Inventory Methods for Raptors* (RISC, 2001). Aerial survey for cliff-nesting raptors, Northern Goshawk call playback surveys, Western Screech Owl surveys were conducted in 2019.

Amphibians and Reptiles

Visual encounter and dipnet surveys were conducted in May 2015 and July 2017 and follow *Inventory methods for pond-breeding amphibians and painted turtle* (RISC, 1998f). Follow-up visual encounter surveys for amphibians were conducted in 2019.

A desktop assessment of available regional data and local knowledge will be completed to identify known amphibian crossing concerns.

Insects

Surveys were completed in July 2014 and 2019 to determine presence/absence for Gillette's checkerspot (*Euphydryas gillettii*). Surveys targeted adults, larvae, and egg masses.

Habitat Suitability

Habitat suitability mapping will be completed using Habitat Suitability Index (HSI) or Resource Selection Function (RSF) modeling for representative species (RSF for grizzly bear, Rocky Mountain bighorn sheep, and Rocky Mountain elk, and HSI for moose, wolverine, Canada lynx, American badger, American marten, Little brown Myotis, Olive-sided Flycatcher, Common Nighthawk, American Dipper, and Western toad) in order to provide a spatial context of suitable habitat and to be able to estimate magnitude of habitat changes to the extent possible.

The following standards are used for the wildlife baseline studies and effects assessment. Modifications to methods and use of any other references and standards will be described in the Application.

- Resource Inventory Standards Committee (RISC) standards including:
  - Inventory Methods for Bats (1998);
  - Inventory Methods for Forest and Grassland Songbirds (1999);
  - Inventory Methods for Medium-Sized Territorial Carnivores - Coyote, Red Fox, Lynx, Bobcat, Fisher, and Badger (1999);
  - Inventory Methods for Riverine Birds: Harlequin Duck, Belted Kingfisher and American Dipper (1998);
  - Inventory Methods for Marten and Weasel (1998);
  - Inventory Methods for Wolf and Cougar (1998);
  - Aerial-Based Inventory Methods for Selected Ungulates: Bison, Mountain Goat, Mountain; Sheep, Moose, Elk, Deer and Caribou (2002);
  - Inventory Methods for Swallows and Swifts (1998);
  - Inventory Methods for Woodpeckers (1999);
  - Inventory Methods for Raptors (2001);
  - Inventory Methods for Nighthawks and Poorwills (1998);
  - Inventory Methods for Waterfowl and Allied Species (1999);
  - Inventory Methods for Shorebirds (1997);
  - Inventory Methods for Pond Dwelling Amphibians (1998); and
  - Wildlife Habitat Rating Standards (1999).
- BC Ministry of Forests and Range and BC Ministry of Environment (2010) Wildlife Habitat Assessment and Suitability Modelling Field Manual for Describing Terrestrial Ecosystems; and
- Hanson et al. 2009, A framework for the scientific assessment of potential project impacts on birds - CWS Technical Report series No. 508.

4.13.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects from the Project construction and operations of all mine facilities include direct and indirect habitat loss from disturbance and displacement (determined from scientific literature), reduced reproductive success, increased roadkill/train mortality, avoidance and altered movement patterns for grizzly bear. Clearing of land for mine construction and operations could result in loss of wildlife habitat quantity or quality and/or changes in the connectivity and security of wildlife habitat, potentially including fragmentation/loss of physical connectivity corridors needed to maintain populations, genetic variability, migration or movement. In addition, changes in air, water, sediment and soil quality could affect wildlife health. An additional pathway of effects on wildlife could arise from changes in public access/use. Note that effects assessments of little brown myotis and northern myotis will consider roosting habitats.

Direct and indirect changes in wildlife and wildlife habitat will be estimated qualitatively and calculated quantitatively where possible (calculated in habitat units, hazard ratings, or other applicable unit) for comparison of the indicators presented above with baseline conditions.

Development of mitigations and determining the level of effects and determination of significance will look at the individual species and groups as defined in the subcomponents lists. For species of conservation concern, species-specific mitigations and assessments are needed for any listed wildlife species to conform with section 79(2) the *Species at Risk Act*. Migratory birds need to be assessed as a whole to conform with Section 5(1) of *CEAA* 2012.

The Application will use the indicated study methods of quantifying and qualifying habitat changes, habitat connectivity, and mortality and current scientific literature on species-specific responses and effects from mining to inform the assessment and mitigation strategies and consult with appropriate authorities on sensitive species and habitats, as applicable.

Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.13.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.13.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.13.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.13.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

4.14 Wildlife Health

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Wildlife health is a receptor VC and will be integrated into the assessment of the wildlife and wildlife habitat VC. Wildlife health is linked to water, sediment and air quality. The subcomponents for wildlife health were chosen to represent a broad suite of wildlife habitat niches and include Columbia ground squirrel, Rocky Mountain elk, Rocky Mountain bighorn sheep, Little Brown Myotis, shrew, grizzly bear, vole, American badger, American marten, Canada lynx, wolverine, Dark-eyed Junco, Ruffed Grouse, Olive-sided Flycatcher, Common Nighthawk, American Robin, Song Sparrow, Golden Eagle, moose, river otter, American Dipper, Spotted Sandpiper, Belted Kingfisher, Red-winged Blackbird, and Mallard.

Wildlife health indicators are comparisons of estimated contaminant exposure from dietary sources (food, water and incidental ingestion of soil or sediment) to literature-based toxicological effects data.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

4.14.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study/analysis areas were defined for habitat modeling and subsequent assessment of Project impacts for the selected VCs. Consistent with standard methodology in defining project areas for application of wildlife habitat ratings (RIC 1999), a larger RSA was defined within which a smaller LSA was nested. However, there are wide ranging and small ranging species and, as a result, three wildlife boundaries have been defined: a RSA for wide-ranging species, a LSA for small-ranging species and an intermediate common boundary representing an LSA for wide-ranging species and an RSA for small-ranging species (Figure 5). Wildlife VC subcomponents considered wide-ranging species include Canada lynx, wolverine, American badger, Rocky Mountain elk, Rocky Mountain bighorn sheep, and grizzly bear. All other species will be assessed at the LSA and RSA boundaries for small-ranging species.

For the health assessment of waterbirds, the assessment will include relevant exposure pathways from the Elk River watershed downstream of Michel Creek.

The assessment will cover construction, operational, closure, and post-closure periods.

4.14.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to assess and collect baseline data on wildlife health.

A wildlife health risk assessment will be completed to assess potential effects of the Project on wildlife health. The assessment begins with problem formulation through which the proposed project activities and potential sources and types of contaminants are identified. A Conceptual Site Model (CSM) including COPCs, endpoints, and pathways will be presented. Site-specific measured baseline data on contaminant concentrations in abiotic exposure media (e.g., surface water, soil, sediment), terrestrial dietary items (including vegetation and berries), and aquatic dietary items (including aquatic invertebrates, periphyton, and fish tissues) are used in wildlife risk assessment. For dietary items where measured tissue concentrations are not available (e.g., terrestrial invertebrates as food source to insectivorous birds and mammals), modelled or predicted concentrations based on site-specific relationships or existing literature will be used in the wildlife risk assessment. Sampling to support the wildlife health assessment is summarized in the following table.

Table 12: Sampling Program to Support Wildlife Health Assessment

Year	Sample Sites	Analyses
2015 (Jul, Aug, Sep); 2017 (Jul, Aug)	87 sites distributed throughout the LSA (including Loop Ridge, Tent Mountain, Michel Head) Soil samples sites corresponded to vegetation sample sites	Vegetation (Redtop, Saskatoon, Kinnikinnick, Bourgeau's Milk-Vetch, Beaked Sedge, Black Cottonwood, Wood's Rose, Thimbleberry, Scouler's Willow, Soopolallie, Black Huckleberry, Grouseberry) – moisture content, metals and PAH analyses Soils - moisture content, pH, metals, and PAH analyses
2015	Collections from 5 sites around Michel Creek and Tent Mountain (15 other sites surveyed but insufficient quantities for analysis)	5 Spotted Sandpiper eggs – metals analyses Amphibians (Spotted Frog, Western Toad) eggs – metals analyses
2017	15 sites along the length of Michel Creek	8 Red-winged Blackbird eggs – metals analyses Amphibians (Western Toad, Long-toed Salamander) eggs – metals analyses

A list of receptors is then developed that covers all wildlife niches and links these species to the species being assessed for the wildlife and wildlife habitat VC where possible. Protection goals, endpoints, exposure pathways, and risk characterization strategy are identified.

An exposure assessment is completed that quantifies the total dietary exposure to potential contaminants (i.e., from all relevant exposure media). The list of contaminants that will be considered in the wildlife risk assessment will be determined by comparing chemical concentrations (primarily metals and polycyclic aromatic hydrocarbons [PAHs]) in exposure media (e.g., soil, surface water) against relevant and scientifically defensible environmental quality criteria (provincial and federal) appropriate for protection of

wildlife. Exposure media and routes of exposure for wildlife include ingestion of surface water as drinking water, incidental soil and sediment ingestion, and consumption of aquatic and terrestrial food items (e.g., vegetation, fish). Total exposure across these media and routes of exposure will be predicted for birds and mammals using a multi-media food chain. To characterize baseline risks, total exposure estimates for each combination of receptor and contaminant are compared to literature-based effects measures (e.g., toxicity reference values); the potential for adverse effects is expressed as a hazard quotient (i.e., exposure estimate as numerator and toxicity reference value as denominator). Methods for estimating exposure and effects, and for characterizing risk will be consistent with guidance for ecological risk assessment from federal (e.g., FCSAP 2012) and provincial (e.g., SAB 2008) agencies. Risk estimates are coupled with a discussion on the magnitude and sources of uncertainty.

The risk assessment will incorporate conservative assumptions, while aiming to screen out unrealistic predictions of harmful effects. The risk assessment will also balance complexity with simplicity in order to allow for a rigorous review while still being transparent and easy to understand.

Applicable legislation protecting wildlife health includes the BC *Environmental Management Act* [SBC 2003] c. 53, Canadian *Migratory Birds Convention Act* [SC 1994] c.22, and the Canadian *Species at Risk Act* [SC 2002] c.29.

4.14.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 4 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects on wildlife health are from potential Project-related contaminants from air emissions and/or water discharges mainly during operations. The effects assessment will present changes in exposure risks to selenium and other contaminants, and their toxicity effects on wildlife health and productivity, to the extent possible. Toxicity will consider synergistic effects of contaminants.

Prediction of adverse effects will follow the same methods described in section 4.15.2, but where exposure assessment is adjusted to reflect changing site conditions related to the development. The risk assessment will assess potential toxicological effects from incremental exposure to project-related contaminants.

The wildlife risk assessment (WRA) will account for selenium bioaccumulation (and other COPCs in the food chain) in the following exposure media (e.g., periphyton, aquatic invertebrates, fish, terrestrial plant tissues, terrestrial invertebrates, and terrestrial small mammals). The wildlife risk assessment will assess toxicological effects to birds and mammals. Amphibian health is being addressed in the aquatic health assessment. The WRA will consider exposure to selenium (and other COPCs) in the food chain during baseline and development-related scenarios.

Results are determined for the indicators to protect wildlife health as required by legislation as presented above.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

4.14.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

4.14.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.14.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

4.14.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

5.0 ECONOMIC EFFECTS ASSESSMENT

The Application will include an assessment of economic VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section 3.0 Assessment Methodology of this AIR and reported using the organizational structure demonstrated in the section 4.0 Environmental Effects Assessment.

The following VCs have been identified for assessment under the economic pillar:

- Employment and Income; and
- Economic Activity.

The following table summarizes the economic VCs, subcomponents and their respective assessment endpoints and measurement indicators.

Table 13: Economic VCs, Subcomponents, Assessment Endpoints and Indicators

Valued Component	Assessment Endpoints and Indicators
Employment and income	Measures of employment opportunities and income generation (labour force participation rates, employment rates, unemployment rates, employment by industry, labour force skills levels, and personal income levels).
Economic activity	May include absolute level and rates of change in household income, firm expenditures, employment opportunities, training opportunities, gross-domestic product, firm count, and estimates of business demand.

5.1 Employment and Income

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Employment and income indicators for the assessment will include measures of employment opportunities and income generation. Measurements include labour force participation rates, employment rates, unemployment rates, employment by industry, labour force skills levels, and personal income levels.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

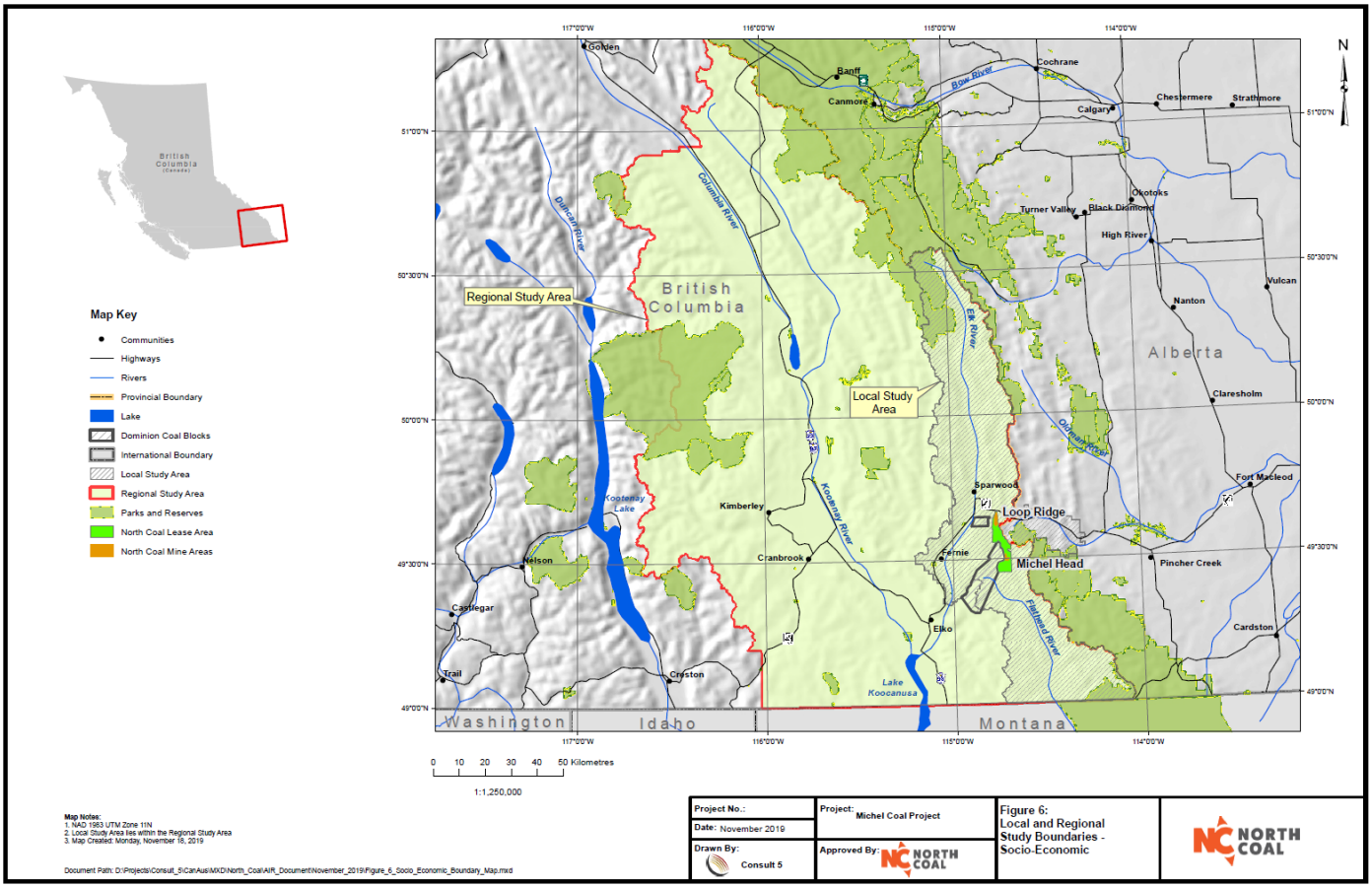
5.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be measurable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which illustrates the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA defined by the Elk Valley Subregion. Some effects will be measurable at a coarser geographic scale, where appropriate or when limited by data.

The temporal boundaries include construction, operations, closure, and post-closure.

Figure 6 Local and Regional Study Boundaries – Socio-economic



5.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data and analyze employment and income.

Socio-economic baseline data were compiled primarily from Statistics Canada and BC Stats. Additional sources describing southeastern British Columbia and its communities, economy, infrastructure and services were also consulted. Examples of the latter are the community profiles prepared by the Columbia Basin Rural Development Institute, as well as annual reports, Official Community Plans and other documents issued by the Regional District of East Kootenay and municipal governments. Studies undertaken for specific purposes, such as affordable housing needs for Elkford, Sparwood and Crowsnest Pass were also used.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

Baseline employment data compiled information on labour market characteristics including labour force participation rates, employment rates, unemployment rates noting current trends. Statistics were also compiled for employment by industry in the region and community, personal income levels, and labour forces skills levels. Baseline conditions also compiled information on market trends and available training programs.

There are no methods or standards for characterizing employment and income existing conditions. Baseline data will be compiled and reported in text and summary tables.

5.1.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects on employment and income from Project development and operation occur from employment for construction, operations, and closure and will be assessed and will be linked to other VCs (e.g. housing demand, demand for social services etc.) as necessary. The assessment will consider potential barriers for access to employment opportunities.

Population and demographic modeling and economic modeling will be completed to support analysis and assessment of the socio-economic effects. The Statistics Canada Input-Output model will be used to support the employment and income assessment.

Changes in employment and income indicators presented above will be estimated qualitatively and quantitatively where possible for comparison to baseline conditions. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

5.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

5.1.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

5.1.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

5.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

5.2 Economic Activity

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Economic activity is a selected VC. Measurable indicators of economic activity may include the absolute level and rates of change in household income, firm expenditures, employment opportunities, training opportunities, gross-domestic product, firm count, and estimates of business demand.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

5.2.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the majority of socio-economic effects are likely to accrue. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

5.2.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on economic activity.

Socio-economic baseline data were compiled primarily from Statistics Canada and BC Stats. Additional sources describing southeastern British Columbia and its communities, economy, infrastructure and services were also consulted. Examples of the latter are the community profiles prepared by the Columbia Basin Rural Development Institute, as well as annual reports, Official Community Plans and other documents issued by the Regional District of East Kootenay and municipal governments. Studies

undertaken for specific purposes, such as affordable housing needs for Elkford, Sparwood and Crowsnest Pass were also used.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

Baseline economic activity data compiled information on gross domestic product, tax revenues for mining and other industries, income dependency by sector, and regional industrial activities. Baseline information was also compiled about small and medium sized local businesses, local business activity trends, new incorporations, tourism and hospitality industry trends, and residential construction. Interviews were used to identify economic development challenges and initiatives in the region.

There are no methods or standards for characterizing economic activity existing conditions. Baseline data will be compiled and reported in text and summary tables.

5.2.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects from Project development and operations on local, regional, and provincial economic activity will be examined and quantified, where possible. This will include an exploration of the impact of various market dynamics (e.g. competitive pressures) on sub-groups (e.g. labour, competing firms) within the population, where appropriate, and the effects will be linked to other VC (e.g. housing demand) where necessary. With a mobile work force, there is also the potential for additional costs/and adverse effects to be borne by the local/BC government without potential recovery from tax revenue. The impact of mobile workers will also be considered.

Population and demographic modeling and economic modeling will be completed to support analysis and assessment of socio-economic effects. The Statistics Canada Input-Output model will be used to support the economic assessment.

Changes in economic activity indicators presented above will be estimated qualitatively and quantitatively where possible for comparison to baseline conditions. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

5.2.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

5.2.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

5.2.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

5.2.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.0 SOCIAL EFFECTS ASSESSMENT

The Application will include an assessment of social VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section 3.0 Assessment Methodology of this AIR and reported using the organizational structure demonstrated in the section 4.0 Environmental Effects Assessment.

The following VCs have been identified for assessment under the social pillar:

- Education, Skills, and Training;
- Community Infrastructure and Services;
- Community Wellbeing;
- Commercial Land Use;
- Non-commercial Land Use / Recreation;
- Public Safety; and
- Visual Quality.

The following table summarizes the social VCs, subcomponents and their respective assessment endpoints and measurement indicators.

Table 14: Social VCs, Subcomponents, Assessment Endpoints and Indicators

Valued Component	Assessment Endpoints and Indicators
Education, Skills and training	Access to education and training opportunities required to facilitate employment with the Project.
Community infrastructure and services	Housing demand and supply, as well as the associated relative availability and affordability of housing The demand for, and supply of, community services and infrastructure. The breadth of community services also includes emergency services, policing services, health care and social and family services.
Community wellbeing	Education, labour force activity, income, and housing that feed into the federal Community Wellbeing Index. Depending on the nature and magnitude of effects identified in other VCs, other factors to be considered could include visual quality, perception of safety, backcountry recreational access, coping behaviours and ability to access services, local food system quality and reliance (grown and locally harvested in area (berries, fish, birds, mammals)) where such data is available.
Commercial land use	Commercial land and resource use opportunities and land use consistency with land use designations and plan objectives and policies.
Non-commercial land use / recreation	Land use, extent of access, and quality of recreational and tourism experiences. Surface water and groundwater flows will be assessed as part of the land use and quality of recreational and tourism experiences indicators.
Public safety	Increased traffic, increased population, project-related mobile workers, and increased geohazards. Traffic volume may be used as an indicator of public safety.

Valued Component	Assessment Endpoints and Indicators
Visual quality	Changes to the visual character of Project site relative to the surrounding landscape in consideration of guidance on Visual Quality Objectives and private land use constraints. The visual quality will be assessed through the visible extent of the Project from receptor sites.

6.1 Education, Skills, and Training

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Indicators for the education, skills, and training VC include access to education and training opportunities required to facilitate employment with the Project.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

6.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on education, skills, and training.

Socio-economic baseline data was compiled primarily from Statistics Canada and BC Stats. Additional sources describing southeastern British Columbia and its communities, economy, infrastructure and services were also consulted. Examples of the latter are the community profiles prepared by the Columbia Basin Rural Development Institute, as well as annual reports, Official Community Plans and other

documents issued by the Regional District of East Kootenay and municipal governments. Studies undertaken for specific purposes, such as affordable housing needs for Elkford, Sparwood and Crowsnest Pass were also used, where applicable.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

Baseline education, skills, and training information was compiled based on educational attainment statistics, workforce training associations, educational institutions, and employment services.

There are no methods or standards for characterizing education, skills, and training conditions. Baseline data will be compiled and reported in text and summary tables.

6.1.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

The Project interacts with education, skills, and training through direct employment and contracting of supplies and services mainly during construction and operations. To the degree that Project-related demands exceed the capacity of education providers to meet this demand, the Project could contribute to the reduced availability of education and training opportunities in the region.

The assessment will include a description of barriers/facilitators that allow the local potential workforce to take advantage of education, skills and training (e.g., training flexibility, childcare, transportation, subsidies). The focus will be on barriers/facilitators that are identified through the interviews conducted for the assessment and relevant studies/reports done on the topic in the region.

Changes in education, skills, and training indicators presented above will be placed within the context of baseline conditions and community planning goals. Results will be carried forward for assessment of the other pathway receptor VCs, where applicable.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.1.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.1.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.2 Community Infrastructure and Services

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Indicators for the community infrastructure and services VC include:

- housing demand and supply, as well as the associated relative availability and affordability of housing; and

- the demand for, and supply of, community services and infrastructure (including community surface water and groundwater use). The breadth of community services also includes emergency services, policing services, health care and social and family services.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.2.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion. The temporal boundaries include construction, operations, closure, and post-closure.

6.2.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on community infrastructure and services.

Socio-economic baseline data was compiled primarily from Statistics Canada and BC Stats. Additional sources describing southeastern British Columbia and its communities, economy, infrastructure and services were also consulted. Examples of the latter are the community profiles prepared by the Columbia Basin Rural Development Institute, as well as annual reports, Official Community Plans and other documents issued by the Regional District of East Kootenay and municipal governments. Studies undertaken for specific purposes, such as affordable housing needs assessments for Elkford, Sparwood and Crowsnest Pass were also used, where applicable.

Additional baseline research and verification is collected through semi-structured interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

To support the assessment of effects on infrastructure and services, baseline information was compiled based on populations statistics, demographics, highway and road infrastructure, highway traffic loads, ground transportation services, air transportation, rail transportation, housing characteristics (including quality, suitability, pricing, availability, affordability, and trends), community infrastructure, land

availability, and community facilities and services. The baseline characterization program also compiled information on existing community plans and new planning initiatives.

There are no methods or standards for characterizing community infrastructure and services conditions. Baseline data will be compiled and reported in text and summary tables.

6.2.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

The Project interacts with community infrastructure and services primarily through direct employment and contracting of supplies and services mainly during construction and operations. Potential Project-related adverse effects include increased requirements for housing and community services and infrastructure that exceed service provider capacity levels.

Changes in community infrastructure and services indicators presented above will be estimated qualitatively and quantitatively where possible for comparison to baseline conditions and community planning goals. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.2.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.2.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.2.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.2.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.3 Community Wellbeing

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Well-being is a broad, multi-dimensional construct which can encompass many aspects of life including: work, housing, family life, income and social status, social and physical environments, health and health services, security and culture. Many of these factors are identified and assessed in other VCs.

As a receptor VC, impacts identified in other sections will be considered in this section if these impacts can reasonably be expected to have a moderate or substantial effect on community wellbeing.

Community wellbeing is part of the mandate for both Health Canada and BC Ministry of Health.

Key indicators for community wellbeing are expected to include education, labour force activity, income, and housing that feed into the federal Community Wellbeing Index. Depending on the nature and

magnitude of effects identified in other VCs, other factors to be considered could include visual quality, perception of safety, backcountry recreational access, coping behaviours and ability to access services, local food system quality and reliance (grown and locally harvested in area (berries, fish, birds, mammals)) where such data are available.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.3.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

6.3.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on community wellbeing.

Socio-economic baseline data was compiled primarily from Statistics Canada and BC Stats. Additional sources describing southeastern British Columbia and its communities, economy, infrastructure and services were also consulted including information from the Provincial Health Services Authority (e.g., local health area stats, BC Community Health Atlas). Examples of the latter are the community profiles prepared by the Columbia Basin Rural Development Institute, as well as annual reports, Official Community Plans and other documents issued by the Regional District of East Kootenay and municipal governments. Studies undertaken for specific purposes, such as affordable housing needs assessments for Elkford, Sparwood and Crowsnest Pass were also used.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

To support the effects assessment on community wellbeing, information was compiled from literature and interviews on:

- Family and community cohesion (including composite indicators of social conditions, perceptions of social conditions by region);
- Health care (including health care infrastructure and services, measures of general health, health services utilization rates, and addition services); and
- Education and social services (including schools and student performance, adult education and training, housing supports, and social services).

There are no methods or standards for characterizing community wellbeing conditions. Baseline data will be compiled and reported in text and summary tables.

6.3.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

The Project interacts with community wellbeing through direct employment and contracting of supplies and services mainly during construction and operations. Potential Project-related adverse effects could include negative behaviours to which increased income could contribute for some individuals (e.g. alcohol and substance abuse); potential increased nuisance levels from noise, vibration, traffic, dust, smells/odours, and non-contaminant tainting; increased recreational activity potentially increasing pressure on use of recreational facilities; and, potential adverse social effects from shift schedules and the proportion of the population working on shift schedules, and increased housing pressure.

Changes in community wellbeing from the Project will be estimated qualitatively and quantitatively where possible for the indicators presented above and compared to baseline conditions.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.3.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.3.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.3.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.3.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.4 Commercial Land Use

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Indicators for effects on commercial land use include commercial land and resource use opportunities and land use consistency with land use designations and plan objectives and policies.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.4.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

6.4.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on commercial land use.

Land use baseline data were compiled primarily from data provided by the BC Ministry of Energy Mines and Petroleum Resources, BC Ministry of Environment, and BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. For example, the Ministry of Energy, Mines and Petroleum Resources, Mineral Titles Office administers the laws and manages the recording system pertaining to the acquisition and maintenance of mineral, placer and coal rights in the province.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass.

Baseline commercial land use information was compiled for all industrial activities in rural and urban areas the region. Rural commercial land use information was compiled for mining, pipelines and powerlines, minerals, placer minerals, oil and gas, forestry, agriculture, water use, and guiding. Urban commercial land uses were compiled for each of the communities.

There are no methods or standards for characterizing commercial land use conditions. Baseline data will be compiled and reported in text and summary tables.

6.4.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

The Project interacts with commercial land use through contracting of supplies and services during construction, operations, and closure. Potential adverse effects from Project procurement, development and operations are increased commercial land use rates for the region requiring changes to planning and application of objectives and policies.

Changes in commercial land use indicators presented above will be estimated qualitatively and quantitatively where possible for comparison to baseline conditions and community planning goals. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.4.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.4.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.4.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;

- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.4.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.5 Non-commercial Land Use / Recreation

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Indicators for the non-commercial land use and recreation VC include land use, surface water and groundwater use, extent of access, and quality of recreational and tourism experiences. Surface water and groundwater flows will be assessed as part of the land use and quality of recreational and tourism experiences indicators.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.5.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

6.5.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on non-commercial land use and recreation.

Land use and surface water and groundwater use baseline data were compiled primarily from data provided by the Ministry of Energy, Mines and Petroleum Resources, BC Ministry of Environment, and BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRO), the Interior Health Authority, and stakeholder engagement. For example, the Ministry of Energy, Mines and Petroleum Resources, Mineral Titles Office administers the laws and manages the recording system pertaining to the acquisition and maintenance of mineral, placer and coal rights in the province. Additional sources describing land use and tenure in southeastern British Columbia were also consulted and will be documented.

Additional baseline research and verification is collected through interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass. Groups or users include:

- Local and regional land use planners;
- Hunters and/or hunters' association;
- Anglers and/or anglers' association;
- Trappers and/or trappers' association;
- ATV users and/or ATV association;
- Snowmobile users and/or snowmobilers' association;
- Municipal/regional recreational planners;
- Guides/outfitters and/or guides'/outfitters' association; and
- Other backcountry users and their representative groups (e.g. mountain bikers, skiers, paddlers, hikers, climbers, campers).

The baseline non-commercial land use / recreation information was compiled into the areas of access to recreational opportunities, trapping, hunting, fishing, off highway vehicle use, backcountry skiing, alpine skiing, mountain biking and hiking.

There are no methods or standards for characterizing non-commercial land use / recreation conditions. Baseline data will be compiled and reported in text and summary tables.

6.5.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

The Project interacts with non-commercial land use / recreation through direct employment, contracting of supplies and services, and the overall mine footprint and activities during construction, operations, and closure. Potential adverse effects from Project development could include loss of access for recreation or increased recreational activity and pressure on use of recreational facilities including backcountry access for legal and illegal hunting, fishing, and gathering.

Changes in non-commercial land use / recreation indicators presented above will be estimated qualitatively and quantitatively where possible for comparison to baseline conditions and community planning goals. Results will be carried forward for assessment of the other pathway receptor VCs.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.5.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.5.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.5.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and

- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.5.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.6 Public Safety

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Public safety is a receptor VC that will be assessed through changes in traffic, population, project-related mobile workers, and geohazards. Traffic volume may be used as an indicator of public safety.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.6.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The proposed socio-economic boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary (including Fernie, Crowsnest Pass, Coleman, and Blairmore) and the LSA is defined by the Elk Valley Subregion.

The temporal boundaries include construction, operations, closure, and post-closure.

6.6.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data and assess public safety.

Existing traffic and access information will be supplemented with additional traffic surveys on Corbin Road if possible. Additional baseline research will be collected through semi-structured interviews with key individuals in the communities of Cranbrook, Fernie, Sparwood, Elkford and Crowsnest Pass as applicable.

Baseline conditions on public safety was compiled from statistics and interviews including information on police services, RCMP detachments, crime rates, fire protection, and emergency planning and rescue services. In addition, a traffic effects assessment will be included in the Application that will describe existing conditions and will present the timing of the study and likely sources of traffic.

There are no methods or standards for characterizing public safety conditions. Baseline data will be compiled and reported in text and summary tables.

6.6.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Potential adverse effects from the Project open pit, rock storage facilities, access, and transportation activities are an increased risk to public safety from decreased terrain stability and vehicle traffic.

An analysis of public safety risk using the indicators presented above will be completed using increased traffic, increased population, and project-related mobile workers and the results from the analyses of terrain stability relative to Project activities and public use and access.

Expected traffic to and from the Project on Corbin Road will be presented based on the Project design. This traffic will be assessed qualitatively and quantitatively where possible in comparison to background traffic data and in consideration of changing traffic levels from the recent closure of Coal Mountain using conservative assumptions.

The assessment will focus on areas of potential risk and mitigation measures for public safety. Risk to wildlife will also be assessed and be managed through a Wildlife Protection Plan presented as part of the Application.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.6.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.6.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.6.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.6.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

6.7 Visual Quality

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Visual quality is a receptor VC and a pathway to non-commercial land use (e.g., tourism) / recreational use and community wellbeing.

Indicators for visual quality include changes to the visual character of Project site relative to the surrounding landscape in consideration of guidance on Visual Quality Objectives and private land use constraints. The visual quality will be assessed through the visible extent of the Project from receptor sites.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

6.7.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The study areas for visual quality are the same as those defined for small-ranging wildlife species in the terrestrial resource boundaries shown in Figure 5. The LSA is the 1 km buffer boundary around the Project footprint, and the RSA is the 10 km buffer boundary around the Project footprint.

The temporal boundaries include construction, operations, closure, and post-closure.

6.7.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on visual quality.

A visual quality assessment will be completed guided by procedures in the Protocol for Visual Quality Effectiveness Evaluations Procedures and Standards (MFR, 2008). Although the procedures are for forestry, this is an available tool for assessing other types of projects.

There is currently no provincial or federal legislation regulating visual quality. Guidance on Visual Quality objectives is in the Southern Rocky Mountain Management Plan (SRMMP; MSRM, 2003). The visual quality criteria will consider that the Project is on private land and has been affected by logging and linear infrastructure.

Photos of baseline conditions will be presented for the viewpoints determined from government

viewpoints, viewpoints identified through consultation with locals (e.g. Ktunaxa members, residents, recreational groups, public, etc.), and other viewpoints identified by a Qualified Professional based on Google Earth imagery.

6.7.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Potential adverse effects from the Project include temporary and permanent changes to the local landscape in the Michel Creek watershed from open pits, mine rock management facilities, roads and the production plant.

The visual effects assessment includes the following:

- Determination of government viewpoints, viewpoints identified through consultation with locals (e.g. Ktunaxa members, residents, recreational groups, public, etc.), and other viewpoints identified by a Qualified Professional based on Google Earth imagery.
- Viewscape modeling for visualization from chosen viewpoints using 20-metre TRIM contours to generate a digital terrain model, GIS shapefiles of the proposed disturbance, and Vegetation Resource Inventory data.
- Viewpoints will include photos of baseline conditions and visualization of project phases from all viewpoints. Visualizations will include labels for interpreting project infrastructure.
- Field assessment by a Qualified Professional including taking photographs of all viewpoints to confirm existing visual conditions, affect viewing distances, and computer-generated models are accurate and reasonable.

The changes will be assessed in comparison to baseline conditions and objectives as presented above.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

6.7.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

6.7.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6

Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.7.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

6.7.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

7.0 HERITAGE EFFECTS ASSESSMENT

The Application will include an assessment of heritage VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section 3.0 Assessment Methodology of this AIR and reported using the organizational structure demonstrated in section 4.0 Environmental Effects Assessment.

The following VCs have been identified for assessment under the heritage pillar:

- Heritage Resources.

The following table summarizes the heritage VCs, subcomponents and their respective assessment endpoints and measurement indicators.

Table 15: Heritage VCs, Subcomponents, Assessment Endpoints and Indicators

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Heritage resources	Precontact archaeological sites DjPq-38 and DjPq-48	Protection of archaeological resources; Presence and number, type and location of archaeological materials or features of sites.

7.1 Heritage Resources

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Heritage resources is a VC since archaeological and heritage resources are protected in BC under the *Heritage Conservation Act*. Protection of heritage resources is also of high importance for the Ktunaxa Nation Council.

The indicator for heritage resources is protection of archaeological resources. This is measured through the presence and number, type and location of archaeological materials or features of sites.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

7.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local study area boundaries for archaeology are the same as the small ranging species local study boundaries for terrestrial resources shown in Figure 5. This represents the mine footprint with a 1 km buffer.

The temporal boundaries include construction, operations, closure, and post-closure.

7.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to collect baseline data on heritage resources.

The archaeological program completed an Archaeology Overview Assessment as the baseline study. The AOA includes background research on the RSA and fieldwork limited to examination of Project footprint areas.

Archaeological Impact Assessments (AIA) have been completed since 2014 on each exploration area prior to work as required by the *Heritage Conservation Act*. The heritage baseline will incorporate results from the AIAs completed to date.

Reports submitted under the *Heritage Conservation Act* will be appended to the Application where appropriate, if approved by the KNC, including proof of approval or status of review stage by the Archaeology Branch. An archaeological overview will be completed to determine the archaeological potential for the effects assessment for areas scheduled for later disturbance in the mine plan. The archaeological overview report will be appended to the Application.

7.1.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Potential effects from the Project include disturbance of archaeological and heritage sites from land clearing for the open pits, rock storage facilities, roads, and other infrastructure and sourcing aggregate for construction.

A complete AIA will be included in the Application that consists of surface examination and subsurface testing conducted under the authority of a *Heritage Conservation Act* Inspection Permit for the purpose of identifying previously unrecorded archaeological sites. The AIA will include a description of any anticipated project impacts and management measures. Results of the AIA will be compared to the indicators with the objective of protection of heritage resources under the Heritage Conservation Act.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

7.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

7.1.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

7.1.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

7.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

8.0 HEALTH EFFECTS ASSESSMENT

The Application will include an assessment of health VCs identified in the AIR. The assessment will be conducted in accordance with the methodology specified in section 3.0 Assessment Methodology of this AIR and reported using the organizational structure demonstrated in section 4.0 Environmental Effects Assessment.

The following VC has been identified for assessment under the health pillar:

- Human Health.

The following table summarizes the health VCs, subcomponents and their respective assessment endpoints and measurement indicators.

Table 16: Health VCs, Subcomponents, Assessment Endpoints and Indicators

Valued Component	Valued Subcomponent	Assessment Endpoints and Indicators
Human health	Traditional foods and community health	Compliance with drinking water standards, and changes in human exposure to mine-related contaminants of potential concern (COPC) related to changes to air, soil, surface water, groundwater, or sediment quality or changes in plant or animal tissue chemistry (quality). Other human health indicators for contaminant-related effects include hazard quotients (ratio of exposure estimate to tolerable levels of exposure defined by health departments) and estimates of incremental lifetime cancer risks calculated with chemical-specific slope factors published by various health departments that quantify carcinogenic potency.

8.1 Human Health

The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of Valued Components. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AIR.

Subcomponents to assess the human health VC include traditional foods and community health. Indicators of human health include compliance with drinking water standards, and changes in human exposure to mine-related contaminants of potential concern (COPC) related to changes to air, soil, surface water, groundwater, or sediment quality or changes in plant or animal tissue chemistry (quality). Other human health indicators for contaminant-related effects include hazard quotients (ratio of exposure estimate to tolerable levels of exposure defined by health departments) and estimates of incremental lifetime cancer

risks calculated with chemical-specific slope factors published by various health departments that quantify carcinogenic potency.

The section will recognize pathways of effects and include linkages to Part C Ktunaxa Nation Title, Rights and Interests.

8.1.1 Context and Boundaries

The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with section 3.2 Assessment Boundaries of the AIR.

The local socio-economic and health boundaries include the communities where the majority of the labour force will likely be housed and where the socio-economic and health effects have the potential to be noticeable. Regional boundaries then expand to capture broader communities. The biophysical determinants of health should consider the boundaries established for the media with the potential for effects on human health (e.g., air, noise, water).

The proposed socio-economic and health boundaries are shown in Figure 6 which shows the RSA outlining the Regional District of East Kootenay Boundary and the LSA is defined by the Elk Valley Subregion and also extends into Alberta to include the Municipality of Crowsnest Pass. The temporal boundaries include construction, operations, closure, and post-closure.

8.1.2 Existing Conditions

The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AIR.

North Coal is using the following approach to assess and collect background data on human health.

A human health risk assessment will be completed to assess potential contaminant-related effects to human health as a result of the Michel Coal Project. The assessment begins with problem formulation through which the proposed project activities and potential sources and types of contaminants are identified. A Conceptual Site Model (CSM) including COPCs, endpoints, and pathways will be presented. Results from the aquatic health and wildlife health risk assessments will be integrated into the human health risk assessment. Background data and existing literature is reviewed. A list of receptors is developed focusing on the most sensitive groups who have behaviors that result in higher than average exposure to environmental contaminants. The list includes:

- Accommodation centres;
- Camping areas;
- Community services;
- Day care centres;
- Education centres;
- Gardening areas;

- Health care centres;
- Ktunaxa citizens;
- Motorized recreation;
- Non-motorized recreation;
- Parks;
- Recreation areas;
- Senior facilities; and
- Service areas.

Particular attention will be given to Ktunaxa citizens who are sensitive receptors with potential exposure pathways through traditional use of the land including harvest and ingestion of traditionally important plants and animals.

Protection goals, endpoints, exposure pathways and risk characterization strategy are then identified. An exposure assessment is completed that quantifies total exposure, including diet, soil ingestion, dermal absorption and air inhalation', to potential contaminants. These media may include air, water, soil, sediment, and dietary items. The HHRA will include quantitative exposure estimates for fish and berries. To the extent that it is scientifically defensible, risk estimates from these food items will be used to support inferences about health risks from eating other traditional food items. To characterize baseline risks, exposure estimates for each combination of receptor and contaminant are compared to literature-based effects measures (e.g., toxicity reference values), including measures recommended by various health agencies for non-cancer endpoints. Potential for adverse effects is expressed as a hazard quotient (for threshold contaminants), and as incidental lifetime cancer risk (ILCR) for non-threshold contaminants. Risk estimates are coupled with a discussion on level and sources of uncertainty.

The risk assessment will incorporate conservative assumptions, while aiming to screen out unrealistic predictions of harmful effects. The risk assessment will also balance complexity with simplicity in order to allow for a rigorous review while still being transparent and easy to understand.

Applicable legislation protecting human health includes BC *Public Health Act* [SBC 2003] C.23 and the *Drinking Water Protection Act* (SBC. 2001] C. 9.

8.1.3 Potential Effects

The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AIR.

The interaction Matrix in Table 5 provides an overview of the VCs interaction with the project activities as described in this section.

Human health is directly or indirectly linked to all VCs under the Physical Environment Pillar. The Project interacts with human health with potential air emissions and effluent discharges from operations of the open pits and rock storage facilities, and water discharges. Project development has the potential for increased risk of health effects from deterioration in quality of food, air, water, sediment and soil quality, noise, and/or vibrations. Given the potential receptors and exposure pathways, the effects assessment focuses on contaminant sources and pathways and does not include noise and vibration. Human health can be affected via the consumption of traditional foods, and direct and indirect exposure pathways.

For non-threshold potential contaminants of concern or pollutants, it is recognized that health effects can be experienced at any level of exposure; therefore, the Application will include mitigation measures to reduce levels to as low as reasonably achievable.

Prediction of adverse effects will follow the same methods described in section 8.1.2, but where exposure assessment is adjusted to reflect changing site conditions related to the development.

The assessment should include a sensitivity analysis for a deterministic risk assessment which consists, at a minimum, of a qualitative summary of the uncertainties and variability associated with key input variables, and a prediction of how these uncertainties are expected to affect the risk estimates as defined in Health Canada. 2010. *Federal Contaminated Site Risk Assessment in Canada, Part V: Guidance on Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRAChem).* September 2010. Contaminated Sites Division, Safe Environments Directorate.

Climate change will be considered and described qualitatively and quantitatively where possible. Uncertainty and likelihood will be considered in the description of effects and the precautionary principle will be applied.

8.1.4 Mitigation Measures

The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with section 3.5 Mitigation Measures of this AIR. Relevant management plans will be referenced. Linkages to other sections in the Application will be identified.

8.1.5 Residual Effects and their Significance

Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in section 3.6 Characterization of Residual Effects of this AIR.

Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

8.1.6 Cumulative Effects and their Significance

If a residual effect is identified, unless stated otherwise by EAO, the Application will:

- Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AIR, are likely to occur, consistent with section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AIR;
- Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AIR;
- Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AIR; and
- Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with sections 3.7 Likelihood, 3.8 Proponent's Determination of Significance and 3.9 Confidence and Risk of this AIR.

8.1.7 Follow-up Strategy

Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with section 3.11 Follow-up Strategy of this AIR.

9.0 ACCIDENTS AND MALFUNCTIONS

The Application will include the following:

- An inventory of hazardous materials (including proper segregation and secondary containment considerations);
- Identification of potential accidents and malfunctions in any phase of the project, that may be caused by technological malfunctions, human error or exceptional natural events (i.e., flooding, earthquake, forest fire), including as a preliminary list:
    - Unanticipated discharges (spills) of hydrocarbons and other hazardous substances, dangerous goods and/or waste dangerous goods during transportation, transfer, storage, and/or use;
    - Leakage from hazardous substances, dangerous goods and/or dangerous goods storage areas;
    - Failure of containment water ponds;
    - Pit wall failure;
    - Slope failure in coarse coal rejects pile or rock storage facilities;
    - Leakage, breakage, or failure of pipelines;
    - Unanticipated discharge of off-specification effluent from treatment facilities (e.g. from water treatment plant malfunction);
    - Accidental sediment releases to watercourses;
    - Loss of electrical power;
    - Unanticipated explosive events during construction and operation;
    - On-site and/or off-site fires; and
    - On-site or off-site motor vehicle accidents.
- A hazard identification and risk assessment for each type of accident or malfunction including:
    - The overall methodology for assessing the potential risk of an event for minor or major hazardous material spills/releases or loss of containment of dangerous goods (likelihood and consequence);
- The identification of the magnitude of an accident and/or malfunction, including the quantity, mechanism, rate, form and characteristics of the contaminants and other materials that are likely to be released into the environment during the accident and malfunction events and that would potentially result in an adverse environmental effect;
- Definitions for each category of likelihood;
- Definitions for each category of consequence;

- An assessment of the likelihood of the event occurring, based on historical trends (e.g. accidents and malfunctions that have occurred at similar sites) and predictive models, and taking into account the lifespan of different project components, including:
    - an explanation of how those events were identified, potential consequences, the plausible worst-case scenarios for each type of incident (e.g., application of passive but not active mitigation techniques, penalizing weather conditions, etc.), as well as the unmitigated effects of these scenarios. Worst-case scenarios should account for the timing that coincides with: 1) migration periods involving high concentrations of migratory birds; 2) nesting periods for migratory birds; 3) spawning periods for fish; and 4) the presence of sensitive wildlife and/or seasonally-important habitat.
- Identification of proposed measures to reduce the likelihood of the event; the contingency and emergency response procedures and associated response capabilities that would be put in place if such events do occur; and the expected effectiveness of such response measure;
- An inventory list of emergency spill response equipment, including their strategic locations relative to likely accident and malfunction sites and/or to likely pathways to sensitive environmental receptors such as aquatic areas and waters frequented by fish and migratory birds. Environmental sensitivity mapping, including likely pathways, will identify adjacent areas sensitive to accident and malfunction scenarios, including streams and wetland areas frequented by fish and/or by migratory birds;
- Assessment of consequence of the event, in a manner consistent with the direct effects assessment and fate and behavior modelling, including but not limited to, spills/releases of hydrocarbons and ammonium nitrate into waters frequented by fish and/or migratory birds should be considered for all seasons;
- Identification of measures to mitigate the consequences to valued components;
- Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction; and
- Management plans in response to mitigation of, and corrective action related to identified malfunctions and accidents. The management plans should include notification to downstream communities, jurisdictions, and indigenous governments, including US entities if the effects from accidents and malfunctions have the potential to affect transboundary waters and aquatic resources.

10.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The Application will include:

- The environmental factors deemed to have possible consequences on the proposed project, including, but not necessarily limited to, consideration of natural hazards such as:
    - Wildfires;
    - Seismic events;
    - Extreme weather-related events (e.g., short- and long-term drought conditions, major precipitation and/or snowmelt, long-term hot or cold weather);
    - Avalanches;
    - Rock and mudslides; and
    - Effects from climate change (e.g., temperature rise, trend of increasing precipitation or drought, increased storm intensity).
- Climate change effects will be addressed in the water balance modelling and project design and engineering following guidance in the *Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC* (EGBC, 2018).
- A description of any changes or effects on the proposed Project that may be caused by the above-mentioned environmental factors;
- The likelihood and consequence of the changes or effects to relevant VCs;
- Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of the effects of the environment on the proposed Project;
- A conclusion about the potential risk of an effect of the environment on the proposed Project and to relevant VCs;
- Management plans on response to, mitigation of, and corrective actions related to environmental risks to the Project; and
- Assessment of effects of the environment on the project will also consider cumulative effects.

PART C – KTUNAXA NATION TITLE, RIGHTS AND INTERESTS

12.0 KTUNAXA NATION TITLE, RIGHTS AND INTERESTS

12.1 Ktunaxa Nation Background

This section of the Application will:

- Identify and introduce the potentially affected Aboriginal Group, the Ktunaxa Nation represented by the Ktunaxa Nation Council, as identified in the section 11 Order;
- Describe how Proponent worked with the Ktunaxa Nation in preparing Part C; and
- This section of the Application will also provide background information on Ktunaxa Nation, including, but not limited to ethnography and historic background; language; land use and stewardship principles; populations; governance; traditional and preferred future economies; and lands and current reserves.

Subsections include:

12.1.1 Potentially Affected First Nations

- Identify the Ktunaxa Nation Council representing the following Ktunaxa Nation Communities:
  - ʔaq̓ am - St. Mary's Band;
  - akink̓um‡asnuq‡iʔit - Tobacco Plains Band;
  - yaqan nukiy - Lower Kootenay Band; and
  - ʔakisq̓nuk First Nation.
- Provide a map that identifies Indian Reserves and Ktunaxa Nation communities, and traditional territory locations and boundaries with respect to the Project location.

12.1.2 Ktunaxa Nation Title, Rights and Interests Valued Components

- Provide an overview of Ktunaxa Nation Valued Components.

The Ktunaxa Rights VCs and their subcomponents are presented in Table 17.

Table 17: Ktunaxa Rights VCs and Subcomponents

Pillar	Valued Component	Valued Subcomponent
Ktunaxa Valued Components	Water	Ktunaxa use of water and resources; All living things depending on water
	Traditional Knowledge and Language	Ktunaxa Language, Knowledge Transmission
	Economic	Economic rights and mineral resources; Ktunaxa economy (subsistence and commercial) including contracting; Economic disparity

Pillar	Valued Component	Valued Subcomponent
	Social	Ktunaxa determinants of health including housing and community wellness; Confidence in wild foods
	Employment and Education	Employment; Education
	Lands and Resources	Ktunaxa use of lands and resources; All living things (including bison, fur bearers, fish); Cultural ecosystems; Ktunaxa stewardship

12.1.3 ʔamakʔis Ktunaxa - Territory and Ecology

- Describe the ecological conditions in Ktunaxa territory, based on both science and Ktunaxa traditional knowledge and understanding, where available;

12.1.4 Ktunaxa Understanding of the Project and Project Area

This section of the Application will:

- Provide a historical context of the Project area; and
- Describe what types of disturbance the project will entail, based on a Ktunaxa Nation understanding of the proposed project, if available.

12.1.5 Qukin ʔamakʔis Ktunaxa ʔaqaƚq̓anuxwatiƚ and Oral Historical Context

12.1.6 Ktunaxa Ethnographic and Historic Background

12.1.7 Ktunaxa Population

12.1.8 Ktunaxa Governance

12.1.9 Ktunaxa Nation Information Sources

This section of the Application will describe the information considered for understanding Ktunaxa Nation use of the Project area and for determining effects from the Project on Ktunaxa Nations' Aboriginal Interests.

Existing information, publicly available, or made available by the Ktunaxa Nation, will be gathered and reviewed, and may include:

- Historical or ethnographic records/materials;
- Ktunaxa traditional ecological knowledge on seasonal use, occupancy or traditional land use;
- Diet study and the Interests and Use Study;
- Elk Valley Aboriginal Use and Interests study;
- Identifying Ktunaxa Interests in the Elk and Flathead Valley. Results from a series of workshops held in March 2007;
- Ktunaxa Nation Census (most recent available);

- Ktunaxa Nation Land Use Plan;
- Ktunaxa Nation Lands and Resources Policy Manual: Values and Principles, Policy Statements and Stewardship Standards. November 2007;
- Other Ktunaxa Nation planning or policy related documents;
- GIS-related files showing seasonal use / occupancy, areas of intent, traditional district boundaries;
- Site specific data related to subsistence, habitation, cultural or spiritual, environment or navigation; and
- Publicly available information from past or current EA documents related to Ktunaxa Nation (e.g. Baldy Ridge, Revelstoke Unit 6, Crown Mountain (in progress), Kootenay West Mine).

12.2 Ktunaxa Rights Effects Assessment: Water

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5 of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.3 Ktunaxa Rights Effects Assessment: Traditional Knowledge and Language

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation or research activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.4 Ktunaxa Rights Effects Assessment: Economic

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.5 Ktunaxa Rights Effects Assessment: Social

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.6 Ktunaxa Rights Effects Assessment: Education and Employment

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and

- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.7 Ktunaxa Rights Effects Assessment: Lands and Resources

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.8 Ktunaxa Perspectives on Cumulative Effects

- Describe the Ktunaxa Nations' Rights related to the VC and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation or research activities;
- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the VC identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the VC consistent with section 3.5. of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Title and Rights after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to the VC.

12.9 Other Ktunaxa Interests

This section of the Application will:

- Describe the Ktunaxa Nations' Aboriginal Interests and any specific values within the Project LSA and RSA identified through secondary research techniques or provided directly through consultation activities;

- Describe the baseline situation and information used to establish this baseline;
- Describe the potential adverse effects of the Project on the Aboriginal Interests identifying relevant VC information from Part B;
- Describe or summarize the mitigation measures to avoid or reduce potential adverse effects on the Aboriginal Interests consistent with section 3.5 Mitigation Measures of this AIR including identifying mitigation measures relied upon in Part B of the Application; and
- Characterize the residual adverse effects on Ktunaxa Nation's Aboriginal interests after mitigation using the methodology described in sections 3.6 Characterization of Residual Effects, 3.7 Likelihood, and 3.9 Confidence and Risk of this AIR and incorporating the findings of the VC's in Part B of the Application that are relevant to Aboriginal Interests.

12.10 Ktunaxa Perspectives on Residual Cumulative Effects

This section will discuss the residual effects of the proposed Project in the context of other industrial and environmental effects based on a Ktunaxa Nation perspective and may include past, present and anticipated future use of the Project Area by the Ktunaxa Nation.

12.11 Other Matters of Concern

The Application will include:

- A list of other matters of concern raised by Ktunaxa Nation with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been assessed;
- A description (or summary if described elsewhere in the Application) of the mitigation measures to address potential effects on other matters of concern to the Ktunaxa Nation;
- A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in section 3 of this AIR; and
- A description of how these matters of concern have been addressed from the perspective of the Ktunaxa Nation and Proponent.

12.12 Summary of Potential Project Effects, Mitigation and Conclusions

The Application will include:

- A Summary Table (see example below) that identifies Aboriginal Interests or other matters of concern to Ktunaxa Nation that may be impacted by the Project and the measures to avoid, mitigate or otherwise manage the potential effects.

Table 18: Summary Table of the Results of Ktunaxa Nation Interests/Other Matters of Concern

Information Source	Issue – Ktunaxa Interest	Issue – Other Matters of Concern	Analysis of Potential Effect	Proposed Measures to Avoid, Mitigate or Otherwise Manage Effects	Status of Issue *(e.g. resolved, ongoing resolution, referred to agency, etc.)*

12.13 References

12.14 Appendices

PART D – ADDITIONAL PROVINCIALLY AND FEDERALLY RECOGNISED INDIGENOUS GROUPS

13.0 ADDITIONAL INDIGENOUS GROUPS

13.1 Additional Indigenous Groups Interests

The Application will present the necessary supporting background and effects assessment for additional Indigenous Groups as may be required under provincial or federal jurisdiction.

These Groups are anticipated to include:

- Shuswap Indian Band;
- Métis Nation British Columbia;
- Bearspaw First Nation;
- Chiniki First Nation;
- Wesley First Nation;
- Tsuut'ina Nation;
- Kainai First Nation (Blood Tribe);
- Siksika Nation;
- Piikani Nation;
- Métis Nation of Alberta – Region 3.

PART E – CONSULTATION

14.0 CONSULTATION

14.1 Indigenous Consultation

14.1.1 Consultation Results

The Application will include:

- Confirmation that Ktunaxa Nation was consulted on a draft of Part C of the Application, and a summary of any feedback received from the Ktunaxa Nation and how it was considered;
- A summary of past and planned consultation activities. Past consultation activities may include consultation activities since the last Indigenous Consultation Report in which case a reference to that Report will be provided;
- If applicable, a summary of proposed changes to the Indigenous Consultation Plan resulting from the feedback, or experience from consultation to date, including any such changes which have been implemented;
- A summary of the key issues and concerns raised by the Ktunaxa Nation and other Indigenous groups relevant to the environmental assessment, the Proponent's responses to those issues and concerns, and the status of resolution;
- The Issues Tracking Table identified in the Indigenous Consultation Plan;
- Comments received throughout the Pre-Application Phase from Indigenous Groups (may be appended to the Application);
- A summary of publicly available arrangements or agreements reached between the Proponent and any Indigenous peoples; and
- A summary of any comments received from the other Indigenous peoples listed on Schedule C of the section 11 Order, responses to those comments and status of resolution. If required, include applicable comments for assessment in the sections below: Indigenous Interests, Other Matters of Concern and/or Summary Table of the Results of Indigenous Consultation related to Indigenous Interests/Other Matters of Concerns.

14.1.2 Other Matters of Concern to Indigenous Groups

If EAO instructs the Proponent to consult another Indigenous group, the Application will include:

- A list of other matters of concern raised by Indigenous Groups with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been considered in the discussion about Indigenous Interests or in the

statutory requirements under CEAA 2012 where applicable;

- A description (or summary if described elsewhere in the Application) of the mitigation measures to address potential effects on other matters of concern to Indigenous Groups;
- A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in this AIR template; and
- A description of how these matters of concern have been addressed from the perspective of the Indigenous Groups and the Proponent.

The Application will include:

- A Summary Table (see example below) that identifies Indigenous Interests or other matters of concern to Indigenous Groups that may be impacted by the proposed Project, and the measures to avoid, mitigate or otherwise manage the effects; and
- An Appendix, the Indigenous Consultation Report, which contains comments received from Indigenous Groups regarding this section of the Application.

Table 19: Summary Table of the Results of Additional Indigenous Consultation related to Other Indigenous Interests/Other Matters of Concern to Indigenous Groups

Indigenous Group	Consultation Stage / Information Source	Issue – Indigenous Interest	Issue – Other Matters of Concern	Analysis of Potential Effect	Proposed Measures to Avoid, Mitigate or Otherwise Manage Effects	Status of Issue *(e.g. resolved, ongoing resolution, referred to agency, etc.)*

14.2 Public Consultation

The Application will include a report on the results of implementation of the approved Public Consultation Plan including:

- Background information:
  - Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project;
  - Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project; and

- Background information about each potentially affected municipality and/or stakeholder group.

- Public Consultation:
  - A summary of the past and planned consultation activities;
  - A summary of any proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders or individuals, or experience from consultation to date; and
  - A description of the key issues raised by the public that are relevant to the EA, the responses to those issues, and the status of their resolution.

- Summary Table:
  - Identification of concerns raised by the public and the measures to avoid, reduce or mitigate those impacts. This information will be provided in the form of a table.

PART F - MANAGEMENT PLANS AND FOLLOW-UP PROGRAMS

15.0 MANAGEMENT PLANS

The Application will include a list of Management Plans for all phases of the proposed Project. The content will be presented in the Application but the names and content are subject to change pending the findings of the assessment. The preliminary list includes:

- Explosives Management Plan - outlines how the proponent will comply with applicable legislative, regulatory, permit, and other relevant obligations with respect to the manufacture and storage of explosives. For licences under the Explosives Act, the management plan will also include information on the facility location(s), types and quantities of explosive(s), the use of mobile processing units and the infrastructure to store and clean them;
- Environmental Management System – provides the framework for all environmental management on the Project and includes the policies, legal requirements, standards and guidelines, organization, continual improvements and training;
- Air Quality Management Plan – procedures for minimizing and controlling dust following provincial guidance in Developing a Fugitive Dust Management Plan for Industrial Projects (MEMPR and MECCS, 2018);
- Water Management Plan – procedures for controlling, treating, monitoring, and discharging contact, non-contact, seepage, and process waters. The plan will clearly describe how the water in streams underlying the ex-pit rock dumps would be controlled and managed, including a conceptual model that demonstrates all of the water management features on the site (e.g. diversions, water treatment inflow/outflow, dams, surface flow, discharges). Water flow and water management will be clearly illustrated, including: - source and flow of water treatment inflow for each treatment facility; - quantity of treated water vs. untreated water; - water treatment effluent discharge locations; and - associated project and environmental monitoring locations. Details on how the effectiveness of water treatment will be monitored should be included in the overall project monitoring and adaptive management plan. Contingency plans should clearly delineate trigger levels (i.e., thresholds for action) and additional mitigation measures that can be implemented if the trigger levels are exceeded. Selenium management will be addressed in this plan. The plan will include procedures for discharges to surface and groundwater for compliance with effluent discharge permits, including information on emergency response procedures and contingency plans for related accidents and malfunctions. The plan will outline how the proposed surface water management practices will mitigate potential effects related to emerging constituents of potential concern in the Elk Valley (e.g., Ni, U and non-selenate Se species) as a result of changing geochemical conditions;
- Sediment and Erosion Control Plan – procedures for minimizing and controlling erosion for all facilities;
- Mine Rock Management Plan – procedures for ongoing materials characterization, segregation, and storage to minimize short and long-term risks for metal leaching and acid generation;

- Waste Management Plan – procedures for managing solid and putrescible wastes, including strategies to reduce, reuse and recycle wherever possible; and procedures to control and minimize dust and air emissions;
- Mine Emergency Prevention, Preparedness and Response Plan.– procedures of fuel handling; dispensing and storage facilities and related equipment; fuel management and spill control; and transportation, handling, storage, and disposal of hazardous materials and the response and clean up for hazardous materials spills
- Access Management Plan – procedures and mitigation measures to manage transportation and traffic to minimize conflicts with other users in the Michel watershed, protect public safety, minimize effects on wildlife and wildlife habitat, and help align with regional road management plans to manage the cumulative effects of roads in the Elk Valley;
- Traffic Management Plan – measures to be followed for any work on roadways for public and worker safety;
- Biodiversity Management Plan – procedures, mitigation measures, and monitoring programs to minimize effects on biodiversity, minimize introduction of invasive species, and provide any offsets for critical habitat with objectives of net positive impact to biodiversity over the life of the project; integrated with the wildlife management and vegetation management plans. The Wildlife Management Plan, Invasive Weed Management Plan, and any individual species management plans will be embedded in the Biodiversity Management Plan;
- Fish Habitat Management Plan – procedures and mitigation measures to minimize effects on fish and fish habitat including plans for any habitat offsets. Details on tributary management may be included in this plan or may be presented in a separate Tributary Management Plan depending on the results of the effects assessment and the required mitigation and management measures needed. Details will align with the Tributary Management Plan under the Elk Valley Water Quality Plan;
- Progressive Reclamation and Closure Plan – procedures and programs to ensure long-term physical and chemical stability of all facilities and progressively decommission, reclaim and revegetate facilities as they are complete. The plan will include road rehabilitation to align with regional road management plans and manage the cumulative effects of roads in the Elk Valley. The plan will include a conceptual plan for temporary or early permanent closure. Additionally, this Plan will ensure that the reclamation bond estimate includes costs associated with long term monitoring, and maintenance for infrastructure that is to remain on site;
- Indigenous Consultation Plan– procedures and programs for cultural awareness and appreciation, and Indigenous employee support;
- Archaeology and Culture Resource Management Plan - heritage resource protection measures including chance find procedures;
- Public Engagement Plan – policies, procedures, and programs to minimize social effects with details such as codes of conduct, communications program, and grievance mechanism;

A comprehensive description of the contents of each Management Plan, including the identification of any mitigation measures described in previous sections will be included within the plans.

16.0 MONITORING & FOLLOW-UP PROGRAMS

The Application will include:

- A description of the monitoring and follow-up programs the Proponent will implement, including their activities, objectives and reporting;
- Reporting structure as identified within the environmental management plans, monitoring plans and EA Certificate Conditions;
- Monitoring programs to evaluate human health that include detail on how the program will be used to inform human health considerations (e.g., triggers); and
- Adaptive management plans including detail on triggers, actions, responses and how monitoring will inform the adaptive management.

PART G - CONCLUSIONS

16.0 CONCLUSIONS

The Application will:

- Provide the Proponent's conclusions regarding the potential for significant adverse effects on VCs from the Project;
- Request an EA Certificate for the proposed Project; and
- Acknowledge the need, if applicable, to successfully complete a federal EA and subsequent permitting/authorization processes prior to proceeding with Project construction, operation and decommissioning.

16.1 Summary of Residual Effects

The Application will summarize all potential residual effects, including cumulative residual effects, in a table format that depicts the potential effect, project phases, project activity or physical work linked to the effect, proposed mitigation and significance of effect on VCs.

16.2 Summary of Mitigation Measures

The Application will include a table that identifies the proposed measures to mitigate potential impacts to VCs as shown in Table 4. This information provides the foundation for the development of a Table of Conditions for the proposed Project, which would be appended to an EA Certificate, should one be issued.

Table 20: Summary of Proposed Mitigation Measures

No.	VC and Effect	Proposed Mitigation Measure	Timing	Legal Requirement?	Responsible Agency
Environmental					
1.1					
1.2					
Social					
2.1					

16.3 Summary of Transboundary Components

The Application will summarize transboundary effects, if any, and mitigation, and monitoring if there are effects for US stakeholders.

17.0 REFERENCE MATERIAL

The Proponent will provide a list of reference material used in developing the Application.

- BC Conservation Data Centre (BC CDC). (2018). BC Species and Ecosystems Explorer. BC Ministry of Environment. Retrieved October 24, 2018, from http://a100.gov.bc.ca/pub/eswp/ .
- BC Ministry of Energy, Mines and Petroleum Resources (MEMPR) and Ministry of Environment and Climate Change Strategy (MECCS). 2018. Developing a Fugitive Dust Management Plan for Industrial Projects. May 2018. Available at https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/guidance-documents/dust_management_plan_guidance.pdf.
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18.0 APPENDICES

This section will include the appendices referenced in the Application.

Information prepared by professionals and provided under their professional seal will be identified in the Application and the related sealed studies will be included in an Appendix.