

PART B – ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS

4 ASSESSMENT METHODOLOGY

The assessment of potential effects in the Application / EIS will be based on the methods described below. Development of these methods was guided by the “Application Information Requirements Template with Respect to an Application for an Environmental Assessment Certificate pursuant to the *Environmental Assessment Act*, S.B.C. 2002, c. 43” (AIR Template) prepared by the BC EAO 4 October 2010 (BC EAO 2010a), the *BCEAA*, *CEA Act*, and provincial and federal guidance documents and engagements. Figure 4-1 below shows the EA process and Figure 4-2 below shows the framework for assessing potential effects from the proposed Raven Project in the provincial and federal EA process.

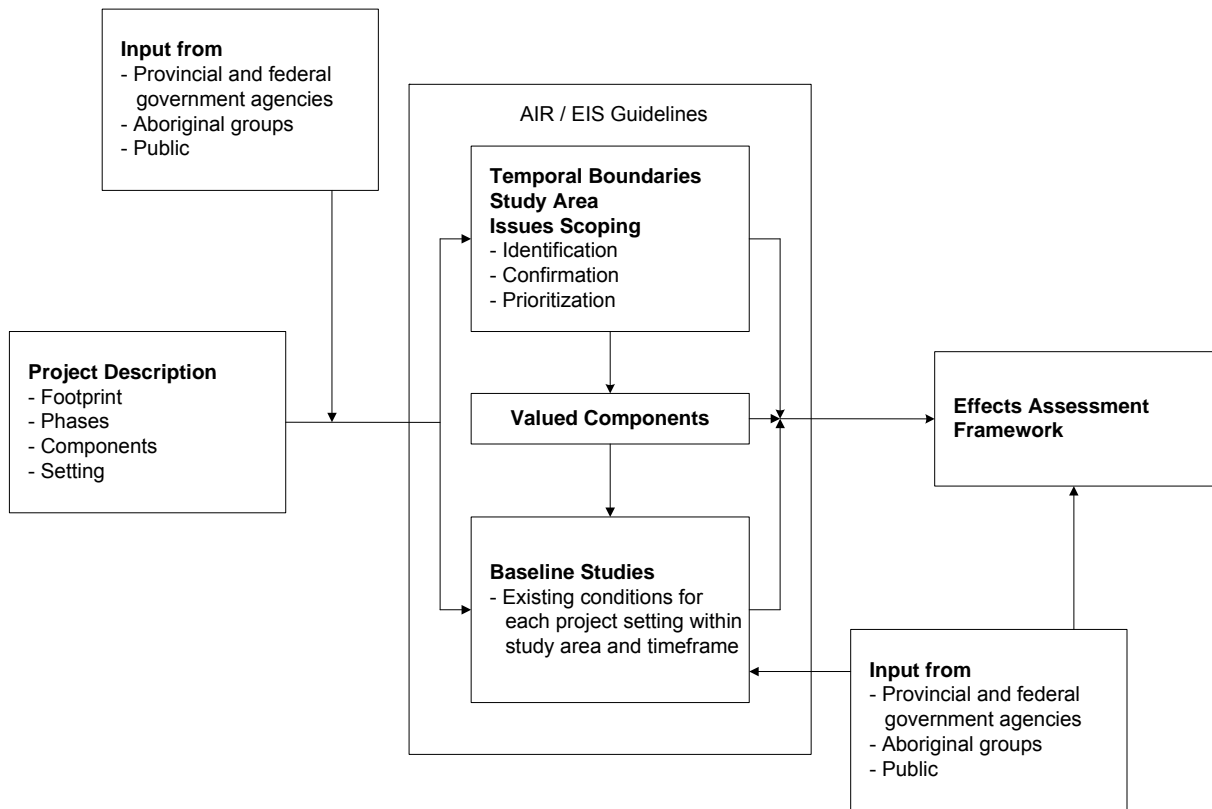
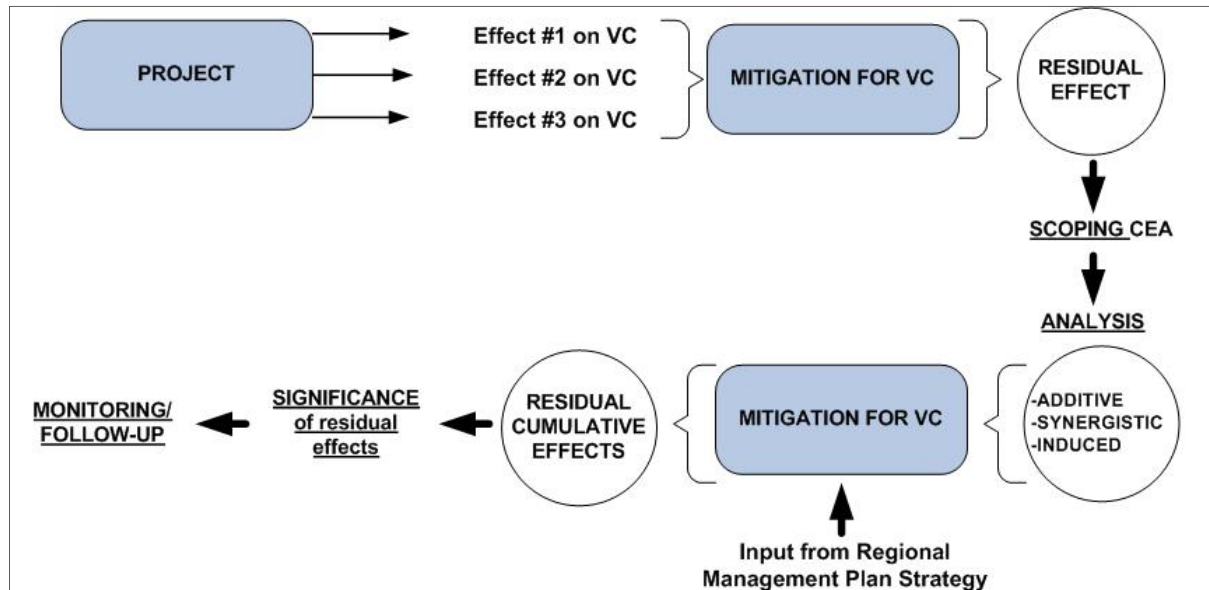


Figure 4-1: Environmental Assessment Process

RAVEN UNDERGROUND COAL PROJECT



Note: CEA - cumulative effects assessment; VC - Valued Component

Source: Agency 2011

Figure 4-2: Framework for Assessing Potential Effects from the Proposed Raven Project

The preliminary list of Valued Components (VCs) to be assessed in the Application / EIS includes, but is not limited to, the following:

- Atmospheric environment VCs:
 - Air quality;
 - Climate change;
 - Noise; and
 - Vibration;
- Groundwater VCs:
 - Hydrogeology; and
 - Groundwater quality;
- Hydrology, surface water quality and sediment quality VCs:
 - Surface hydrology (Cowie Creek and Cougar Smith Creek watersheds); and
 - Freshwater and sediment quality;
- Fisheries and aquatic resources VCs:
 - Rainbow trout / steelhead;

- Cutthroat trout;
 - Coho salmon;
 - Chum salmon; and
 - Pink salmon;
 - Marine environment VCs:
 - Marine water quality;
 - Shellfish;
 - Marine fish;
 - Marine mammals; and
 - Marine birds;
 - Terrestrial environment VCs:
 - Terrain, soils and surficial geology (physiography and topography, soil cover, soil quality, and surficial geology); and
 - Vegetation and plant communities (biodiversity and plant community structure composition, species at risk, and ecological communities at risk);
 - Wildlife and their habitat VCs:
 - Ungulates;
 - Small mammals;
 - Songbirds;
 - Raptors;
 - Carnivores; and
 - Invertebrates;
 - Environmental health VCs:
 - Humans;
 - Mammals (large carnivores / omnivores, ungulates, and furbearers);
 - Birds (raptors, songbirds, waterfowl and shorebirds);
 - Amphibians;
 - Fish; and
 - Invertebrates (terrestrial and aquatic);
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- Economic health VCs:
 - Provincial economy and government revenues;
 - Regional employment;
 - Employment opportunities;
 - Contract and business opportunities;
 - Labour income;
 - Local unemployment rate and trend;
 - Regional government finances; and
 - Employment and economic diversification;
- Social conditions VCs:
 - Social conditions (regional population and demographics, housing, regional services, regional infrastructure, and family and community wellbeing);
 - Transportation;
 - Non-traditional land use (NTLU) (parks and protected areas, mining and exploration activities; renewable resource use, tourism and other recreational uses, and marine uses and tenures); and
 - Visual and aesthetic resources (visual landscape);
- Heritage resources VCs:
 - Archaeological sites; and
 - Historic heritage sites; and
- Human health VCs:
 - Public health;
 - Healthy living; and
 - Worker safety and health.

4.1 Valued Component Scoping and Rationale

The Application / EIS will consider five broad types of effects: environmental; economic; social; heritage; and health. For each of the five types of effects, the Application / EIS will describe the methods used to identify, scope, and rationalize the inclusion of VCs. VCs are components that are considered important by the proponent, the public, Aboriginal groups, scientists, and government agencies involved in the EA process (e.g., fish and fish habitat, listed species, rare ecosystems, air quality, water quality, housing, regional services, provincial economy and government revenues, regional employment and income,

archaeological sites, historic heritage sites, public health, and healthy living). Importance may be determined on the basis of values, including Aboriginal interests, scientific and / or regulatory concern, biodiversity, and sensitivity to proposed Raven Project effects.

Specific rationale for why each VC is included in the EA will be provided in Sections 5 to 9 of the Application / EIS. The assessment of potential effects will be completed on a VC by VC basis grouped into subject areas for each project setting component (environmental, economic, social, heritage, and health). Preliminary VCs and the rationale for inclusion are presented in Part B, Sections 5 to 9 of this AIR / EIS Guidelines.

4.1.1 Spatial Boundaries

The Application / EIS will identify and present the spatial boundaries to be used for the EA and the rationale for selecting the boundaries. Spatial boundaries will be identified using the following criteria:

- Physical extent (terrestrial, freshwater aquatic, marine aquatic, and airshed), to which the impacts of the proposed Raven Project (including the Port Facility) might be manifested;
- Extent of terrestrial, freshwater aquatic, and marine ecosystems and applicable resources potentially affected by the proposed Raven Project;
- Extent of potential social, economic, heritage and health effects, including those of Aboriginal groups, arising from the proposed Raven Project; and
- Considerations resulting from consultation with Aboriginal groups, the public, and government agencies on the scoping of issues to be addressed in the Application / EIS.

Each project setting component section of the Application / EIS (Sections 5 to 9) will include a description and rationale for each study area boundary employed which reflects the range of geographic areas within which specific effects may be experienced. Maps outlining the spatial extent of both a Local Study Area (LSA) and a Regional Study Area (RSA) will be provided for all components of the proposed Raven Project (including mine site, transportation routes and Port facility). Spatial boundaries will be based on applicable guidance documents, reasonable expectations and professional judgement.

If effects are detected or predicted to exceed the spatial boundary established for the LSA or RSA for a VC, the spatial boundary will be expanded to a point where no residual effects can be detected or reasonably predicted.

Where effects are anticipated, baseline data will be used to assess potential effects related to the proposed Raven Project. This may include the expansion of discipline-specific study areas where appropriate.

4.1.2 Temporal Boundaries

Temporal boundaries are time limits for the EA. Temporal boundary selection will be based on a reasonable expectation of the time over which the proposed Raven Project would affect biophysical and human environment receptors.

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described. Specifically, each of the following phases of the proposed Raven Project will be considered:

- Construction phase - 2013;
- Operations phase - 2014 to 2029: includes progressive reclamation (the duration of the operations phase of the proposed Raven Project will be assessed as part of an ongoing feasibility study);
- Decommissioning and closure phase - 2030: includes a closure period during which the facilities would be reclaimed; and
- Post-closure phase - post 2030: includes post-closure monitoring until on-site water quality has stabilized and results indicate no material future adverse effects on local receiving waters. Stabilization of rejects facilities would also be considered in post-closure monitoring.

4.1.3 Traditional, Cultural, Ecological or Community Knowledge

The Application / EIS will incorporate available traditional, cultural, ecological, or community knowledge to the extent possible.

4.2 Selected Valued Component

For each VC identified in the Application / EIS, the Application / EIS document will present the following information.

4.2.1 Introduction

4.2.1.1 Relevant Legislation and Legal Framework

The Application / EIS will describe and provide legislation and the legal framework related to the assessment of the VC.

4.2.1.2 Information Source and Methods

The Application / EIS will describe the source of information and methods used to obtain detailed baseline information on the selected VC (e.g., VC #1).

4.2.2 Detailed Baseline Description

The Application / EIS will provide detailed baseline information.

4.2.3 Potential Effects of the Proposed Project

The Application / EIS will identify, analyze, and describe potential adverse and positive effects resulting from the proposed Raven Project's construction, operations, decommissioning and closure, and post-closure phases. The Application / EIS will describe measures that the proponent would commit to, to mitigate potential adverse effects or to enhance positive effects.

4.2.3.1 Identification and Analysis of Potential Project Effects

Assessment of effects on a VC include consideration of effects from project components (direct effects) and effects from other project-affected VCs (indirect effects) on the selected VC during each proposed Raven Project phase (construction, operations, decommissioning and closure, and post-closure). The Application / EIS will use the following steps to identify potential direct and combined effects (direct impacts combined with indirect impacts) during each proposed Raven Project phase on a selected VC:

- Vetting of each potential direct effect that may occur during each proposed Raven Project phase to determine whether there is an interaction between the project components and the selected VC (e.g., air quality);
- Determination of whether direct project effects on the VC (e.g., air quality) are likely to result in indirect effects on other VCs;
- Determination of whether there is an interaction between residual project effects on biophysical, economic, social, heritage and health project setting components and the VC (e.g., air quality);
- Assessment of potential combined project effects resulting from the interaction of direct and indirect project effects on the VC (e.g., air quality). Vetting of each potential combined project effect during each project phase to determine if it is likely to occur (e.g., impacts on air quality from vegetation clearing (indirect project effect on air quality) in combination to dust generation caused by foundation excavation (direct project effect on air quality) during the construction phase); and
- Potential direct and combined project effects that may not be eliminated through implementation of changes to project design would be carried forward in the assessment.

Results will be described and summary tables will be included for each step described above.

4.2.3.2 Mitigation Measures and Potential Residual Effects

The Application / EIS will describe mitigation measures, including management and compensation plans approved by the proponent, which would be implemented to address potential impacts on the VC. This will include a specific breakdown of the proposed Raven Project design, mitigation or enhancement measures that could and would be done to:

- **Enhance** positive environmental, economic, social, heritage or health effects;
- **Eliminate** the threat / risk to environmental, economic, social, heritage, and health components completely (change to project design (e.g., alternate approaches, different chemical / material used));
- **Prevent / reduce** impacts of the threat / risk to environmental, social, economic, heritage, and health components (e.g., berms, training, pollution prevention equipment / technologies);
- **Respond** to threat / risks to environmental, social, economic, heritage, and health components when it occurs (e.g., emergency response, clean up); and
- If the suggested mitigation is **Unknown** (i.e., untried elsewhere in similar circumstances and the response of the target (organism or physical process) is unknown), this will be identified.

The anticipated success of each breakdown above will be rated as high, medium, or low. Mitigation / enhancement measures for potential project effects by proposed Raven Project phase and relevant mitigation success rating will be summarized in a table format. Assumptions made for the VC will be clearly described.

The Application / EIS will assess potential residual effects for the proposed Raven Project, which include beneficial effects and those adverse environmental effects which cannot be avoided or mitigated through the application of environmental control technologies or other acceptable means, including emergency response and contingency plans.

4.2.3.3 Significance of Potential Residual Effects

The Application / EIS will summarize the significance rating of potential residual project effects assessments for each separate VC and will include results in a table.

4.2.4 Cumulative Effects Assessment

Various human activities, which individually are considered to cause insignificant effects on a VC, may combine within a period of space and time to cause significant changes on that VC. The Agency defines cumulative effects as:

“changes to the environment that are caused by an action in combination with other past, present and future human actions” (Agency 1999a).

Under this definition, “actions” include humans, projects, and activities. Projects are typically some form of commercial or industrial development that is planned, constructed, and operated (e.g., a mine development or resource access road). Activities may either be part of a project or may arise over time because of ongoing human presence in an area. Examples of activities are public traffic, hiking, and hunting (Agency 1999a).

The CEA for the proposed Raven Project will be conducted to assess any cumulative effects that are likely to result from the proposed Raven Project in combination with other projects or activities that have been or would be carried out.

In order to prepare a comprehensive CEA for each VC, the following three steps will be required:

- Each residual effect identified for the VC will be reviewed;
- Potential interactions / overlaps for each residual proposed Raven Project effect carried forward in the CEA will be reviewed and described, including:
 - Residual effects from other historical (closed) projects / activities;
 - Existing (currently active) projects and general land use activities;
 - Reasonably foreseeable future projects occurring within the same timeframe and in the same area; and
- Potential cumulative effects will be assessed, and any necessary mitigation and enhancement measures described.

4.2.4.1 Rationalization for Carrying Forward Project Related Residual Effects into the Cumulative Effects Assessment

The Application / EIS will provide a rationale for each residual effect related to the proposed Raven Project carried forward into the CEA.

The Application / EIS will follow the methodology presented below to select and describe past, present and / or future projects / activities that may interact with the VC within the proposed Raven Project’s LSA and RSA as per the AIR Template.

The selection of other projects and human activities to be considered in the CEA would be initially identified by reviewing available information for the following:

- Historical (closed) projects / activities within the CEA study areas;
- Existing (currently active) projects within the CEA study areas;
- General land use activities within the CEA study areas; and
- Reasonably foreseeable future projects (i.e., planned and approved projects) occurring within the CEA study areas.

Biophysical and economic / social study areas will be identified for the CEA. The biophysical Cumulative Effects Study Area (CESA) is focused and would not include most of the projects identified in the economic and social CEAs. The CEA for the proposed Raven Project will include, but not necessarily be limited to, consideration of the following projects and activities:

- Historic and current mining and exploration activities (e.g., Quinsam Coal project, Baynes Sound Mine (1875 to 1877), Tsable River Mine (1940s to 1966), Bear coal deposit (exploration activities));
- Small gravel pits and rock quarries scattered throughout the proposed Raven Project area operated by timber companies and the BC MOTI in support of road building (O.R. Cullingham Resource Consultants Ltd. (ORCRC) 2007);
- Logging;
- Hunting;
- Trapping;
- Fishing;
- Recreation / tourism use;
- Air traffic (Canadian Forces Comox Base, Comox Airport (YQQ));
- Transportation and access (Hwys 19 and 4);
- Groundwater resource use;
- Surface water resource use;
- Baynes Sound aquaculture;
- Port Alberni waterfront marine environment in the vicinity of the offloading facility; and
- Existing shipping activities from the Port Alberni Port Facility down Alberni Inlet / Trevor Channel through the Maa-nulth Domestic Fishing Area, Tseshaht hahuuthli and other First Nations' asserted territories.

A Project Inclusion List and associated map will summarize those projects or human activities identified as overlapping either spatially or temporally with the proposed Raven Project that may cause changes to the biophysical, social or economic environment in combination with the proposed Raven Project. Maps showing overlapping zones of influence for pertinent environmental attributes, such as water quality and wildlife, will be provided.

For each of the residual effects identified above which are carried forward into the CEA, the Application / EIS will describe interactions between other projects, human activities and reasonably foreseeable projects.

The Application / EIS will carry forward activities identified above as having the potential to interact with residual project effects on the VC and assess if there is a spatial and temporal overlap. The Application / EIS will describe the potential cumulative effect on the VC.

The Application / EIS will provide a discussion regarding the level of certainty and any limitations for each CEA.

4.2.4.2 Mitigation Measures and Potential Residual Cumulative Effects

The Application / EIS will describe mitigation and / or enhancement measures proposed for management of identified potential cumulative effects on the VC. The Application / EIS will make commitments to carrying out of regional monitoring and effect management as necessary. Where possible and in consultation with provincial agencies, the proposed mitigation and / or enhancement measures will consider regional management plan strategies. The Application / EIS will clearly explain, where necessary, the probability of mitigation success for any potential cumulative effects.

4.2.4.3 Significance of Potential Residual Cumulative Effects

The Application / EIS will assess potential residual cumulative effects on the VC, which include beneficial effects and those adverse environmental effects which could not be avoided or mitigated through the application of environmental control technologies or other acceptable means, including emergency response and contingency plans. The Application / EIS will describe the findings of potential residual CEAs for the VC and summarize the results in a table.

4.2.5 Proposed Significance Rating of Potential Residual Project Effects or Potential Residual Cumulative Effects

The Application / EIS will refer to and consider the Agency guide titled “Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects (Reference Guide for Responsible Authorities)” (Agency 1999b), in deciding whether the proposed Raven Project is likely to cause significant environmental effects under the *CEA Act*.

Significance determination will be done on potential residual effects related to the proposed Raven Project if they are not likely to combine with other past, present and / or future projects / activities to result in potential cumulative effects. Otherwise, significance determination will be done after the CEA for potential residual cumulative effects on the VC.

Determining the significance of residual effects is usually considered the most important task when conducting an EA. The determination of significance is often more complex for cumulative effects than it is for individual subject areas because of the broader nature of what is being examined. For cumulative effects, the approach requires determining the extent of further effects that could be sustained by a VC before the VC undergoes changes in a condition or state that could not be reversed with mitigation / management.

The Application / EIS will summarize the potential residual cumulative effects identified for the VC and stage of development (construction, operations, closure / decommissioning, or post-closure). The significance of any residual cumulative effects will be discussed. Available CEA information from each VC section per subject area will be compiled into a CEA that meets federal (*CEA Act*) requirements. This information will be incorporated into the federal CEA section, Section 22.13 (in Part E - Requirements for Federal Environmental Assessment) of the Application / EIS.

In order to determine the significance of the potential residual effect or cumulative effect for the proposed Raven Project, the Application / EIS will consider existing environmental standards, guidelines and objectives, such as the BC water quality guidelines (BC MOE 2006), as well as the carrying capacity, tolerance level, or assimilative capacity of the natural system(s), where possible. In the absence of defined environmental standards, guidelines, and objectives for the VC, the Application / EIS will refer to the criteria discussed in the “A Reference Guide for the *Canadian Environmental Assessment Act*” (Agency 1994) to determine the adversity, likelihood, and significance of environmental effects.

The framework consists of three general steps:

- Step 1: deciding whether the environmental effects are adverse;
- Step 2: deciding whether the adverse environmental effects are significant; and
- Step 3: deciding whether the significant adverse environmental effects are likely.

The Application / EIS will assess whether any potential residual effect or cumulative effect related to the proposed Raven Project would be significant by analyzing the following factors:

- **Magnitude** - Magnitude describes the nature and extent of the environmental effect. The magnitude of an effect is quantified in terms of the amount of change in a parameter or variable from an appropriate threshold value, which may be represented by a guideline or baseline conditions;
- **Geographic extent** - Geographic extents are similar to the spatial boundaries of the assessment (LSA, RSA);
- **Duration** - Duration is defined as a measure of the length of time that the potential effects could last. It is closely related to the project phase or activity that could cause the effect;
- **Frequency** - Frequency is associated with duration and defines the number of occurrences that could be expected during each phase of the proposed Raven Project;
- **Reversibility** - Reversibility is the ability of a physical parameter, biological or social community to return to conditions that existed prior to an adverse environmental effect. The prediction of reversibility can be difficult because environmental effects

may, or may not, be reversible. Despite this, it is important to ascertain reversibility because it has an important influence on the significance of an effect;

- **Ecological context (biophysical environment only)** - Ecological context is a measure of the relative importance of the affected ecological component to the ecosystem, or the sensitivity of the ecosystem to disturbance. It indicates the degree to which an effect on the component would affect the ecosystem;
- **Level of confidence** - Using the previously described rating criteria, the significance of adverse environmental effects will be evaluated based on a review of project-specific data, relevant literature, and professional opinion. To this, the level of confident in the prediction will be added; and
- **Certainty** - To arrive at a high level of confidence for a significance rating, rigorous scientific and / or statistical methods (i.e., a quantitative approach) will be employed where feasible. Where such methods are not feasible, professional judgment will be employed (i.e., a qualitative approach). Rating the certainty of the significance rating is an additional step that may be used to justify or substantiate the level of confidence in the evaluation.

For potential residual effects and / or cumulative effects related to the proposed Raven Project, probability of occurrence, effect on ecosystem functioning, and effect on sustainability (capacity of renewable resources to meet future needs), would be evaluated in addition to the eight items listed above.

- **Probability of occurrence** - The probability of effects is the likelihood that the effect would occur. Three categories will be considered:
 - **Low:** the effect on the VC is well understood and there is a low probability of effect on the VC as predicted;
 - **High:** the effect on the VC is well understood and there is a high probability of effect on the VC as predicted; and
 - **Unknown:** the effect on the VC is not well understood, and based on potential risk to the VC, effects would be monitored and adaptive management measures taken as appropriate.

Each potential residual effect or cumulative effect related to the proposed Raven Project determined to have an effect on the environment, economic health, social condition, heritage, or health will be evaluated based on these nine measures. Other metrics that will be considered in the assessment include direction, and cumulative or synergistic consequences.

4.2.5.1 Quantitative Versus Qualitative Assessment

For each VC, one or more measurable or qualitative parameters will be selected to evaluate potential effects. Measurable parameters are indicators used to determine the level or

amount of change to a VC (e.g., predicted sediment in water discharged from the mine is a quantifiable parameter; the potential infusion of cash from employment into a community is another). Qualitative parameters are used as subjective assessments of the state of a VC as a result of proposed Raven Project effects; perception of aesthetic effects on viewsapes or the quality of a wilderness experience are examples.

Since the proposed Raven Project has not yet been developed, much of the assessment would be based on known effects from similar projects and on quantitative or qualitative modelling of potential effects. The potential degree of change in these parameters is used to classify effects.

4.2.5.2 Evaluation of Effects Using Established Thresholds

An assessment of the significance of project-specific or cumulative environmental effects (CEE) will require the identification of ecological thresholds, management objectives or community / societal standards against which the level of an effect could be evaluated (where possible, quantitative thresholds would be used to evaluate significance as described above). Established standards, such as Canadian Council of Ministers of the Environment (CCME) water quality guidelines, will be employed where they exist; other metrics include government regulations, scientific literature, land use plans, and resource management agency goals.

4.2.5.3 Evaluation of Effects without Using Established Thresholds

Thresholds or regional objectives will not be available for some VCs. Where established thresholds are not available, professional judgement will be used to provide a qualitative classification based on a weight of evidence approach. The approach is based on the magnitude of expected change in the VC as a result of the proposed Raven Project. Four categories are established:

- Not significant (negligible);
- Not significant (minor);
- Not significant (moderate); and
- Significant.

Ratings will be established based on experience with similar projects, modified as appropriate by current community and regulatory perceptions of significance of a particular effect as determined through engagement throughout the assessment process.

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

- Have a medium magnitude at a sub-regional spatial extent and be chronic (permanent) in duration;

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

Significance for VCs will be based on magnitude, spatial extent, and duration. If effects on VCs are rated as significant, the frequency, reversibility, ecological context, direction and certainty will be used to fully assess significance.

4.2.6 Monitoring / Follow-Up

Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

4.2.7 Conclusion

Based on the analysis presented, the Application / EIS will provide a conclusion for each VC with respect to potential residual effect or cumulative effect related to the proposed Raven Project and their significance.

4.2.8 Limitations

The Application / EIS will describe any limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others).

4.3 Summary of Assessment of Potential Effects

The Application / EIS will provide a summary of any potential proposed Raven Project residual effect or cumulative effect and their significance for each project setting component using Tables 4.3-1 and 4.3-2 respectively.

Table 4.3-1: Summary of Potential Residual Environmental Effects Analysis

Valued Components (Project Phase)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)
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Note: 1. Additional tables to be prepared by the proponent for potential environmental, economic, social, heritage and health effects.
 2. C - construction phase, O - operations phase, CI - closure phase, and D - decommissioning phase (other phases could be added as needed).

Table 4.3-2: Summary of Potential Residual Cumulative Environmental Effects Analysis

Valued Components (Project Phase)	Potential Cumulative Effect	Key Mitigation Measures	Potential Residual Cumulative Effect	Significance Analysis of Cumulative Effects (Summary Statement)
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- Note:**
1. Additional tables to be prepared by the proponent for potential environmental, economic, social, heritage and health effects.
 2. C - construction phase, O - operations phase, CI - closure phase, and D - decommissioning phase (other phases could be added as needed).

5 ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS

The Application / EIS will provide a summary of environmental background information for all subject areas considered (Section 5.1). The following biophysical environment subject areas will be described in the Application / EIS: atmospheric environment; groundwater; hydrology, surface water quality and sediment quality; fisheries and aquatic resources; marine environment; terrestrial environment; wildlife and their habitat; and environmental health.

In general, the Application / EIS will report on the baseline characteristics of each relevant subject area in sufficient detail to permit the identification, assessment, and determination of the significance of potentially adverse effects and characterization of the beneficial effects of the proposed Raven Project. For each subject area, the assessment will be completed on the basis of identified VCs as detailed in Section 4 preceding.

For each subject area (Sections 5.2 to 5.9, below), and for each VC, the format presented in Section 4 will be followed. An example is presented in the following text box:

5.2	<u>Subject Area 1</u>
5.2.1	Valued Component Scoping and Rationale
5.2.1.1	Spatial Boundaries
5.2.1.2	Temporal Boundaries
5.2.2	Selected Valued Component (e.g. VC #1)
5.2.2.1	Detailed Baseline for VC #1
	Information Source and Methods
	Relevant Legislation and Legal Framework
	Cultural Ecological or Community Knowledge
	Detailed Baseline Description
5.2.2.2	Potential Effects of the Proposed Project and Proposed Mitigation
	Identification and Analysis of Potential Project Effects
	Mitigation Measures
5.2.2.3	Potential Residual Effects
	Potential Residual Effects after Mitigation
5.2.2.4	Cumulative Effects Assessment
	Rationalization for Carrying Forward Project Related Residual Effects into the Cumulative Effects Assessment
	Interaction between VC #1 and other Past, Present or Future Projects / Activities
	Mitigation Measures
5.2.2.5	Proposed Significance Rating of Potential Residual Project Effects or Potential Residual Cumulative Effects
5.2.2.6	Monitoring / Follow-up
5.2.2.6	Conclusion
5.2.2.7	Limitations
5.2.3	Valued Component #2
	<i>[The analysis above will be repeated for all VCs for each subject area.]</i>
5.3	Summary of Assessment of Potential Effects

5.1 Environmental Background

This section of the Application / EIS will provide a general description of the existing biophysical environment, including surrounding areas within the zone of potential influences of the proposed Raven Project. The Application / EIS will summarize information previously collected for the proposed Raven Project area and present current baseline information. A number of studies were completed for the proposed Raven Project by Hillsborough Resources Limited (Hillsborough) in 1996 in connection with a proposed bulk sample at the site. The studies focused on resource definition but a number of biophysical environmental investigations were completed as well. Biophysical studies were completed by Agra Earth & Environmental (AEE; now AMEC Environment & Infrastructure (AMEC)), Nanaimo office. The AEE report referenced a number of other studies previously completed. In addition to that list, a number of other studies have been completed before and since. Consolidated historic and current databases will be presented where relevant. Historic and current baseline datasets will be carefully reviewed for compatibility.

The proponent will incorporate TK and traditional land use (TLU) information, where available, into the design of each baseline study. The nature and sensitivity of the area within and surrounding the proposed Raven Project based on the results of baseline studies will be described. The VCs that are considered likely to be affected would be included in the description. The relationship of the VCs to the broader regional setting and its ecosystems and economy will also be considered. Relevant reports and documents will be appropriately referenced.

5.2 Atmospheric Environment

5.2.1 Valued Component Scoping and Rationale

Preliminary atmospheric environment VCs and rationale for selection are described in Table 5.2-1. The selected VCs for atmospheric environment are those VCs with identified interaction with the proposed Raven Project. Where available, supporting information, which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The preliminary list and rationale provided will be updated to integrate results from consultation that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, and biodiversity and sensitivity to proposed Raven Project effects.

Table 5.2-1: Atmospheric Environment Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Air quality	Proposed Raven Project related emissions of criteria air contaminants including particulate matter (PM _{2.5} and PM ₁₀) and nitrogen oxides, sulphur dioxide, volatile organic compounds, and dustfall	VC assessed in recent EA process; extensive scientific literature; professional judgement based on EA of other mining projects	K'ómoks First Nation has expressed concerns with respect to air quality and fugitive dust	BC MOE, EC, HC, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Residents in the proposed Raven Project area; local Aboriginal groups, site employees, hunters, loggers, and tourists	National and Provincial Ambient Air Quality Objectives, Canada-Wide Standards for Particle Matter and Ozone
Climate	Proposed Project related emissions of particulate matter	VC assessed in recent EA process, GHCN2 Beta: The Global Historical Climatology Network, Canadian Climate Normals	Aboriginal groups' historical knowledge of microclimate changes	BC MOE, EC, HC	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Residents in the proposed Raven Project area; local Aboriginal groups, site employees, hunters, loggers, and tourists	<i>Clean Air Act of Canada;</i> Canada - British Columbia Agreement in Principle on Climate Change; The Kyoto Protocol of the United Nations Framework Convention on

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
							Climate Change
Noise	Proposed Project related noise	VC assessed in recent EA process; professional judgement based on EA of other mining projects	K'ómoks First Nation has expressed concerns with respect to potential noise effects	BC MOE, EC, HC, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Residents in the proposed Raven Project area; local Aboriginal groups, site employees, hunters, loggers, and tourists	Maximum permissible sound levels pertaining to industrial operations in proposed Raven Project area (i.e., Alberta ERCB, Irish EPA, IFC)
Vibration	Proposed Project related vibration	VC assessed in recent EA process; professional judgement based on EA of other mining projects	K'ómoks First Nation has expressed concerns with respect to potential vibration effects	BC MOE, EC, HC, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Residents in the proposed Raven Project area; local Aboriginal groups, site employees, hunters, loggers, and tourists	DIN Standard 4150

Note: BC EAO - British Columbia Environmental Assessment Office; BC ILMB - BC Integrated Land Management Bureau; BC MOE - British Columbia Ministry of Environment; BC MFLNRO – British Columbia Ministry of Forests, Lands and Natural Resource Operations; DIN - Deutsches Institut für Normung (German Institute for Standardization); EA - Environmental Assessment; EC - Environment Canada; ERCB - Energy Resource Conservation Board; GHCN - Global Historical Climatology Network; HC-Health Canada; IFC - International Financial Corporation; Irish EPA - Irish Environmental Protection Agency; PM_{2.5} - fine particulate matter no greater than 2.5 micrometres in aerodynamic diameter; PM₁₀ - fine particulate matter no greater than 10 micrometres in aerodynamic diameter; VC - Valued Component

5.2.1.1 Air Quality Spatial Boundaries

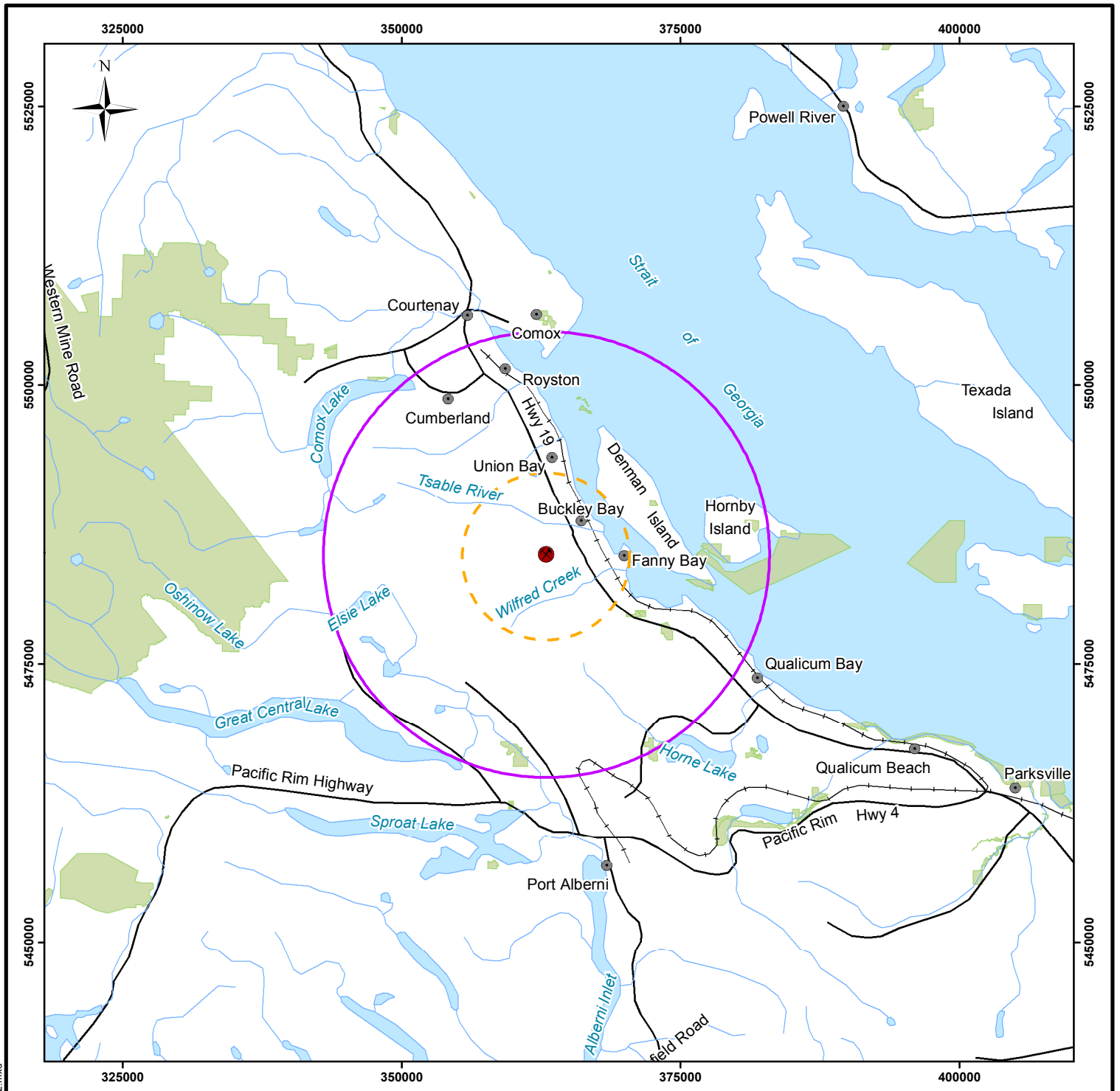
The LSA is intended to cover the area that, by the operation of the proposed Raven Project at the designated sites, may cause exceedance of air quality objectives. The LSA will be defined by a 3-km radius centred on the proposed Raven Project potential emission sources. A 3-km radius was chosen as the probable extent of pollutant dispersion required to decrease pollutant concentration to acceptable levels. This is based on principles of transportation and dilution of pollutants in the atmospheric air, characteristics of anticipated emissions, and experience from similar projects. The proposed Raven Project will include two LSAs. One LSA will accommodate emission sources from the proposed Comox Valley mining / processing facility, and the other LSA will accommodate emission sources from the Port Alberni coal transfer facility. Each LSA will incorporate the transportation routes within the property border lines, the area topography, and constructed objects which may affect the dispersion characteristics of air pollutants.

The Comox Valley RSA is an estimate of the area of the Buckley Bay airshed for which the baseline air quality has been estimated. This is a rounded area with a 20-km radius from the center point at the mine. This is a conservative approach designed to ensure that humans, flora and fauna are protected from air contaminants.

Climate data for the RSA has been collected for over a 30-year period by EC at the nearby YQQ meteorological station. Figure 5.2-1 shows the study areas for air quality.

The Port Alberni RSA Port Facility is defined by a circular area of 10 km diameter with the centre point located at the proposed coal terminal (Figure 5.2-2). The proposed RSA includes most of the residences potentially affected by the proposed Project, a section of the shipping route, all regional emission sources, as well as regional flora and fauna. It is expected that the emissions from the Port Alberni Port Facility will be at much lower rate than emissions from the mine / processing facility.

The above proposed study areas will be verified and eventually updated if warranted based on the dispersion modelling results.

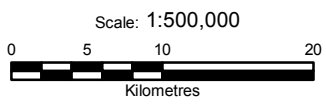




Legend

- Raven Coal Project
- Populated Place
- Road
- +— Rail line
- Watercourse
- Waterbody
- Park or Protected Area
- Air Quality LSA
- Air Quality RSA

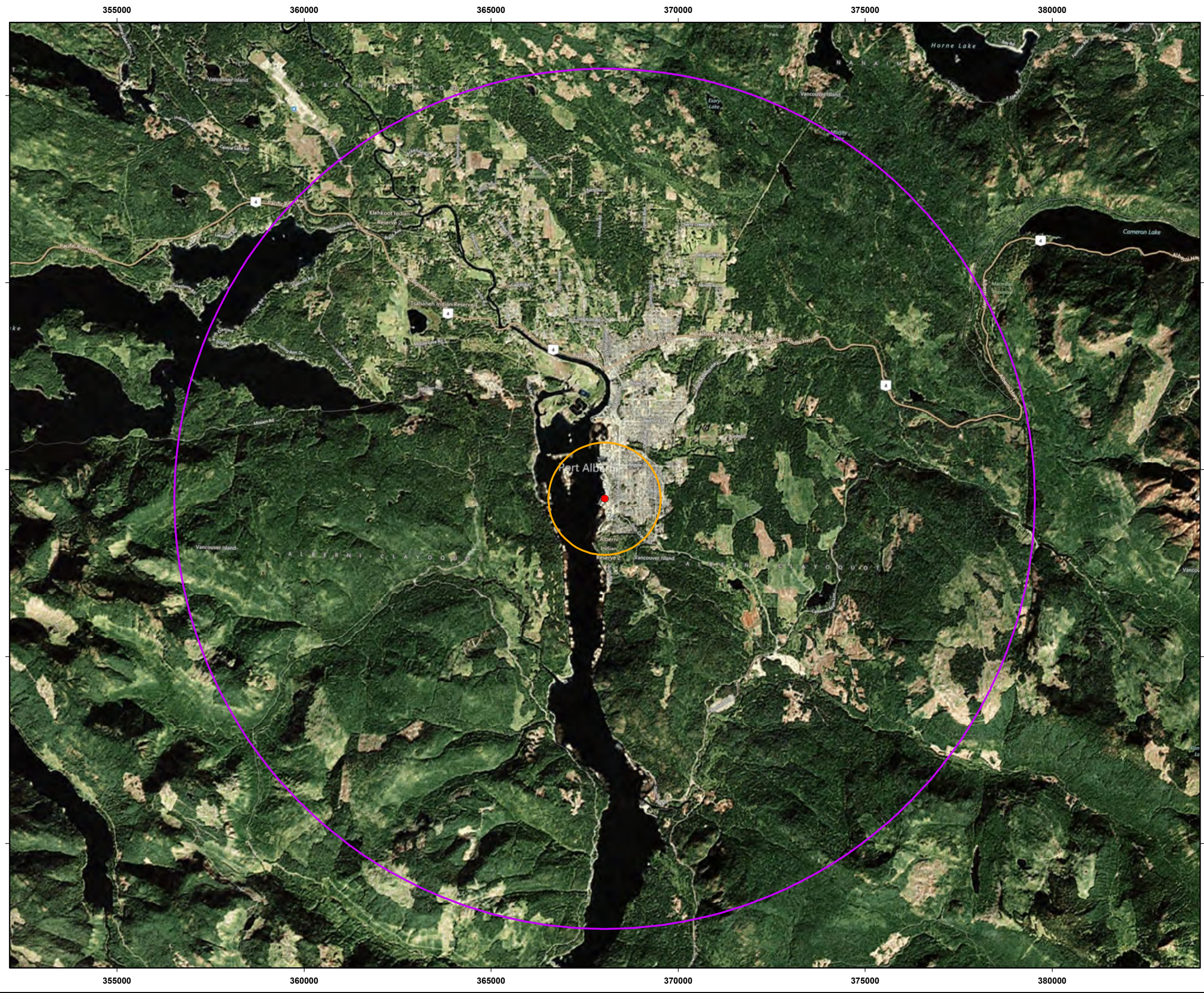
Reference

Base Data: 1:2,000,000 scale
from the Land and Resource Data Warehouse



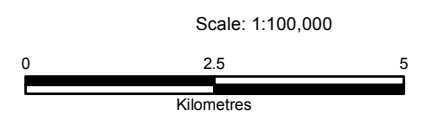
CLIENT:		 Compliance Coal Corporation <small>the Comox Joint Venture</small>
PROJECT: Raven Underground Coal Project		
Air Quality Spatial Boundaries - Mine Site		
DATE: February 22, 2010	ANALYST: EO	Figure 5.2-1
JOB No: VE51897	QA/QC: BO	PDF FILE: 04-50-001_AQ_study_area.pdf
GIS FILE: 04-50-001		
PROJECTION: UTM Zone 10	DATUM: NAD83	



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- Legend**
- Port Location
 - Air Quality LSA
 - Air Quality RSA

Key Map



CLIENT:		 Compliance Coal Corporation
PROJECT: Raven Underground Coal Project		
Air Quality and Noise Spatial Boundaries - Port Facilities		
DATE: August 2010	ANALYST: MY	Figure 5.2-2
JOB No: VE51897	QA/QC: RP	PDF FILE: 4-50-002_study_area_port_alberni.pdf
GIS FILE: 4-50-002		
PROJECTION: UTM Zone 10	DATUM: NAD83	

5.2.1.2 Air Quality Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.2.1.3 Climate Change Spatial Boundaries

Weather is basically the way the atmosphere is behaving in terms of temperature, humidity, precipitation, cloudiness, wind, and atmospheric pressure over a short period of time and small geographical extent. Climate, however, is the description of the long-term pattern of weather over a larger area. Therefore, the proposed Raven Project study area for climate will include the Buckley Bay airshed area and extend over Vancouver Island to include the Port Alberni airshed.

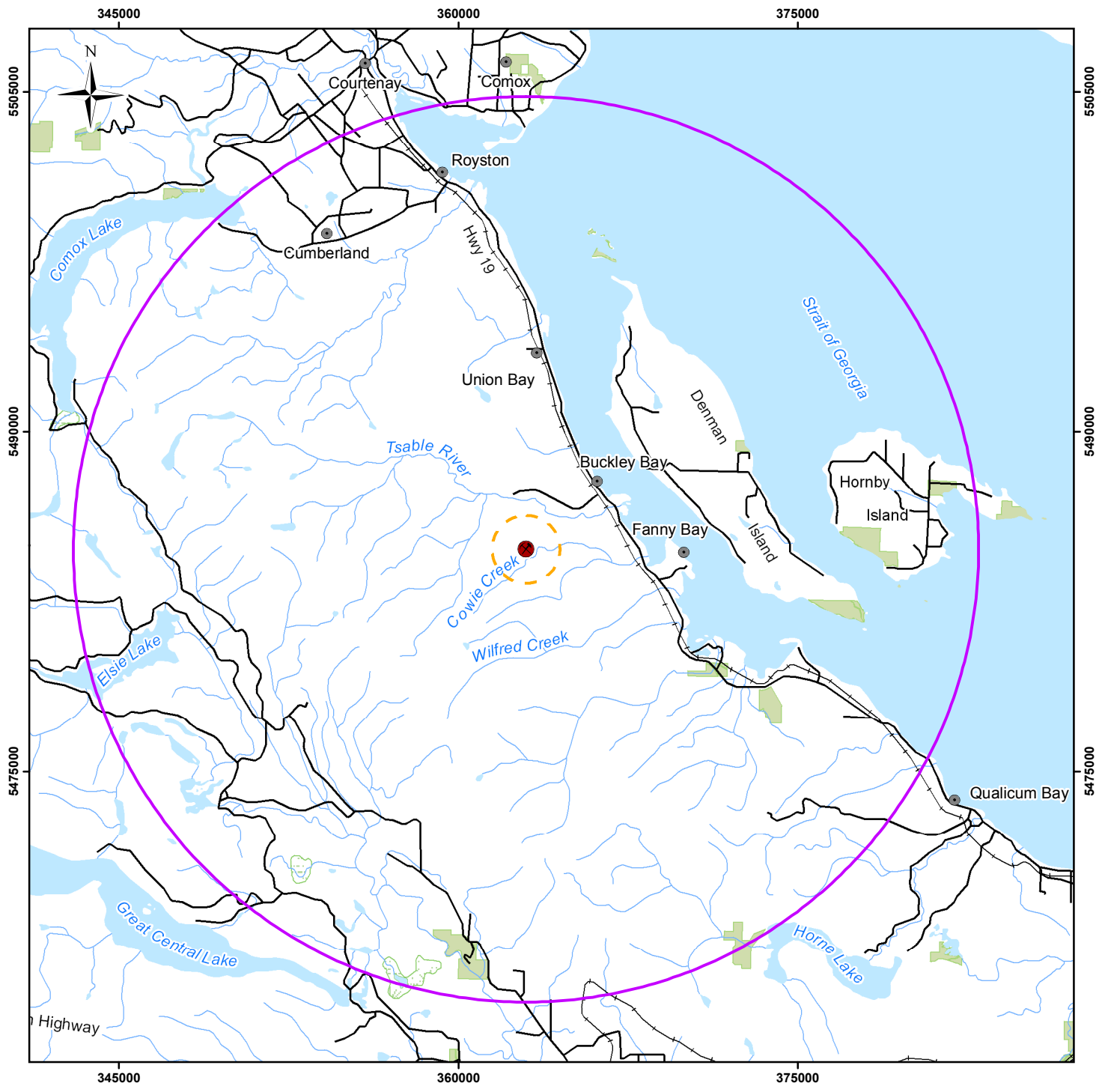
5.2.1.4 Climate Change Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.2.1.5 Noise Spatial Boundaries

The LSA consists of an approximately circular area within a 1.5-km distance from the proposed Raven Project's permanent noise sources at the Comox Valley and Port Alberni areas, which refers to permissible sound levels (PSLs) adopted for the proposed Raven Project. The exact shape of the LSA will depend on results of noise modelling and will be presented as noise contours.

The RSA is centred on and extends over a circular area with a radius of 5 km for each of the proposed Raven Project mine, surface facilities, coal stock piles and reject piles, and the Port Facility and coal terminal. A distance of approximately 5 km is the maximum extent required for attenuating (to the background levels in the surrounding environment) the unmitigated high level blasting noise which could be expected during the construction phase of the proposed Raven Project. This is based on the effect of noise attenuation in air, professional judgement, and experience. The extent of the study areas will be verified through modelling. The study area for noise associated with the mine site is shown on Figure 5.2-3; the study area for noise for the proposed Port Alberni Port Facility is shown on Figure 5.2-4.

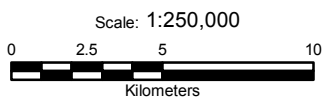


Legend

- Raven Coal Project
- Noise LSA
- Noise RSA
- Populated Place
- Road
- +— Railroad
- Watercourse
- Waterbody
- Swamp or Marsh
- Park or Protected Area

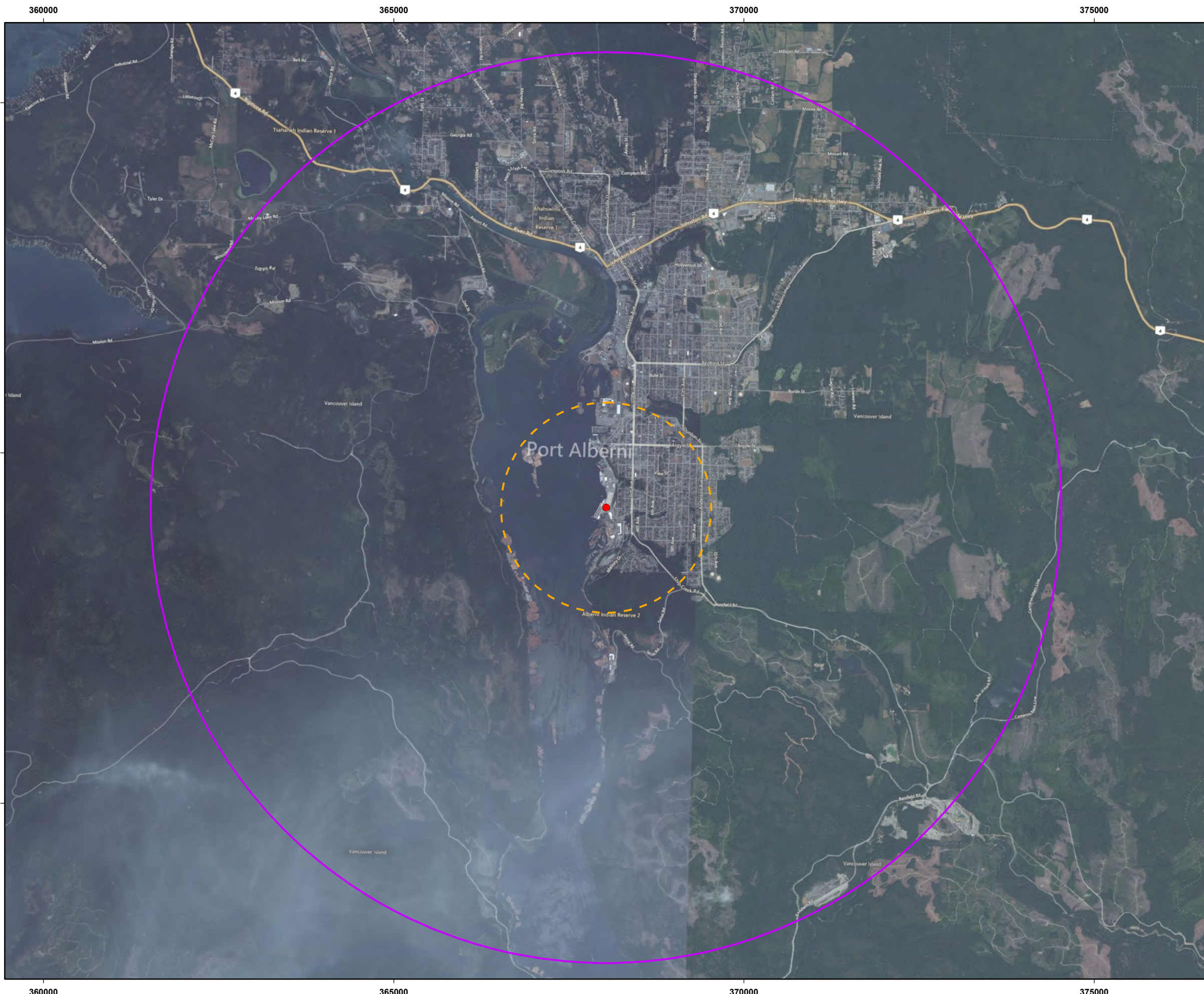
Reference

Base Data: 1:250,000 scale from the NRCAN Geogratis NTDB



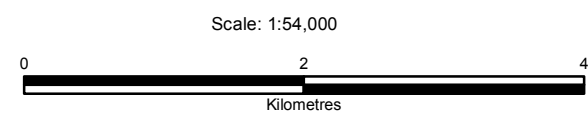
CLIENT: Compliance Coal Corporation <small>100% Comox Joint Venture</small>		
PROJECT: Raven Underground Coal Project		
<h2 style="margin: 0;">Noise Spatial Boundaries - Mine Site</h2>		
DATE: February 22, 2010	ANALYST: MY	<h3 style="margin: 0;">Figure 5.2-3</h3>
JOB No: VE51897	QA/QC: BO	
GIS FILE: 12-50-001		
PROJECTION: UTM Zone 10	DATUM: NAD83	



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- Legend**
- Port Location
 - Noise LSA
 - Noise RSA

Key Map



CLIENT:  Compliance Coal Corporation		
PROJECT: Raven Underground Coal Project		
Noise Spatial Boundaries - Port Alberni		
DATE: August 2010	ANALYST: MY	Figure 5.2-4
JOB No: VE51897	QA/QC: RP	
GIS FILE: 12-50-003		
PROJECTION: UTM Zone 10	DATUM: NAD83	

5.2.1.6 Noise Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.2.1.7 Vibration Spatial Boundaries

Spatial boundaries will be the same as for the assessment of potential noise effects. See Section 5.2.1.5.

5.2.1.8 Vibration Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.2.2 Air Quality

5.2.2.1 Detailed Air Quality Baseline

Baseline meteorological data for the proposed Raven Project will be collected to support air quality monitoring and will describe the climate of the area in terms of:

- Wind: direction, velocity, temporal and spatial variability;
- Precipitation: volume, frequency, temporal and spatial variability of rain; and volume, depth profiles, frequency, temporal and spatial variability of snow;
- Temperature: averages, extremes, temporal and spatial variability;
- Humidity: averages, extremes, temporal and spatial variability;
- Solar radiation: total, net, averages, extremes, and temporal variability;
- Evaporation: total, net, averages, extremes, temporal and spatial variability; and
- Extreme weather events (to be determined).

Much of the above data will be required at a high level of detail to ensure the development of robust and scientifically defensible air quality modelling. Monitoring station data for the LSA will be obtained from the existing Buckley Bay station located on the Raven property. The station is operated by the University of British Columbia (UBC) within the Canadian Carbon Program network, and has been recording basic weather parameters since 2000.

Monitoring station data will be reviewed in the context of the abundance, distribution, proximity and physical descriptions of potential obstacles to climate measurements (e.g., mountains, valleys, forests, objects created by humans). Climate normal data for regional stations published by EC every decade will be used; the most current update will also be obtained. For long-distance dispersion modelling, upper atmosphere data will be obtained from the EC advanced weather station at YQQ.

The Application / EIS will include a desktop study to estimate most likely baseline air quality concentrations and an analysis of baseline air quality including a review and adaptation of data gathered at monitoring stations established within the Canadian Air and Precipitation Monitoring Network (CAPMoN), National Air Pollution Surveillance (NAPS) Network, and other relevant studies specific to Vancouver Island (e.g., Campbell River permittee monitoring network, information on existing local air quality from the Air Quality Council of Port Alberni). A justification and explanation for using this approach will be included.

Vancouver Island baseline air quality studies include a one-year intensive measurement program conducted by EC, BC MOE, and the Cowichan Regional District on Vancouver Island's east coast. This program measures the chemistry of rainfall over the southern areas of Vancouver Island and is conducted by Royal Roads University through a partnership with EC. A study of air quality and transboundary transport of pollutants completed by EC, Pacific and Yukon Region, at the Christopher Point Border air quality station is also available. In the future, background air quality data would also be available from a newly installed (early 2010) EC / BC MOE monitoring station on the West Coast of Vancouver Island (Amphitrite Point south of Ucluelet).

The Application / EIS will include a description of the relevant legislation and legal framework as well as cultural and ecological or community knowledge in support of the detailed air quality baseline description.

5.2.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section will present identification and analysis of potential effects related to the proposed Raven Project on local air quality through each proposed Raven Project phase. Emission rates for area and point sources and spatial distribution of ground level concentrations will be assessed for criteria air contaminants (CAC), including, but not limited to:

- **Total suspended particulates (TSP):** Air concentrations of TSP (dust), and the potential for project activities to increase TSP concentrations;
- **Fine particulate matter (PM):** Air concentrations of fine PM no greater than 2.5 micrometres (μm) in aerodynamic diameter ($\text{PM}_{2.5}$) and PM no greater than 10 μm in aerodynamic diameter (PM_{10}), and the potential for project activities to increase concentrations of fine PM;

- **Nitrogen oxides (NO_x):** Air concentrations of NO_x, and the potential for proposed project activities to increase concentrations;
- **Sulphur oxides (SO_x):** Air concentrations of SO_x, and the potential for proposed project activities to increase concentrations;
- **Ozone (O₃):** Air concentrations of O₃, and the potential for proposed project activities to increase concentrations;
- **Methane / carbon dioxide (CH₄/CO₂):** Project-related greenhouse gas (GHG) emissions of CH₄ (including coal seam methane) and CO₂, and the potential for proposed project activities to impact climate change; and
- **Other:** Air concentrations of other potential air quality constituents (e.g., metallic elements of suspended particulates, diesel emissions, nitrous oxide (N₂O), other hydrocarbons and Volatile Organic Compounds (VOCs)) specific to the proposed Raven Project, and the potential for proposed project activities to increase air concentrations.

Each of the above will require background on existing baseline concentrations determined in a desktop study.

Predictions of ambient air quality resulting from the operation of the proposed Raven Project will be achieved using an air quality dispersion model. The selection and use of that model will be based on the "Guidelines for Air Quality Dispersion Modelling in British Columbia" (BC MOE 2008). The AERMOD View dispersion model is proposed, subject to discussion with BC MOE. The results of the dispersion modelling will be added to the measured or expected background levels of the relevant air contaminants. That total will be compared to relevant air guidelines or objectives for the appropriate time averaging periods to determine the significance, if any, of the proposed Raven Project on air quality.

The final decision on which air quality dispersion model to utilize for the air quality assessment will be made in consultation with BC MOE. This will include the meteorological data requirements and the use of MM5 data in any air dispersion modelling exercise. A conceptual and detailed Model Plan will be submitted and approved by BC MOE prior to commencement of work as per the "Guidelines for Air Quality Dispersion Modelling in British Columbia" (BC MOE 2008).

The proponent will evaluate changes to ambient concentrations of Criteria CACs at the mine site and in Port Alberni resulting from proposed mine operations and linked to emissions from anticipated truck and marine traffic associated with the proposed Raven Project. Depending on the outcome of the assessment, an ambient air monitoring program will be proposed for the mine site and for Port Alberni to cover contaminants of concern.

The most current data on baseline GHG emissions which are on record for Canada and BC will be included in the assessment of proposed Raven Project-related GHG emissions to

show changes in the provincial and Canadian inventories. In this way, the baseline data will be linked with the potential effects assessment. GHG emission calculations will include each proposed Raven Project phase, including transportation of coal to the proposed Port Facility at Port Alberni, coal hauling to the port, handling of coal at the port facility, and marine transportation from Port Alberni Port Facility through Alberni Inlet and Trevor Channel to the Cape Beale Pilotage Station. GHG emissions for transport to and use of coal at overseas destinations will not be included.

Implications of GHG emissions from the proposed Raven Project, and the implications of climate change on the proposed Raven Project design considered in the climate and air quality analysis will be addressed.

Assessment of potential effects related to the proposed Raven Project on air quality will be described for point, area, and mobile sources. This will include potential fugitive emissions from stockpiles and settling ponds, as well as vent raises and an incinerator (if included).

Mobile and stationary equipment will be quantified in the Application / EIS. The Application / EIS will also include a discussion of potential human receptors and the distance to the nearest human settlement.

Air quality analysis will include:

- Effects on biological receptors (e.g., vegetation, wildlife);
- A discussion of measures considered to minimize the release of air contaminants, such as coal dust, exhaust gases, GHG, and other air contaminants including fugitive PM; this would include measures associated with coal transport (trucking, Port Facility and ship emissions);
- A description of Best Management Practices (BMPs) to reduce emissions of PM and precursors to PM;
- Consideration of ambient air quality and meteorological monitoring requirements during the construction and operations phases; and
- The proposed Raven Project's incremental contribution to total national and provincial GHG emissions on an annual basis where information is available (including an estimate of annual emissions from the operation of combustion equipment and methane release from coal mining).

Potential fugitive dust effects will be assessed for the proposed Raven Project as part of the air quality assessment. Potential impacts to vegetation, including ecosystems, will be assessed in the vegetation assessment and addressed as part of the Air Quality Management Plan. Health effects from dusts are generally related to both the physical aspects (i.e., irritation and inflammation of the respiratory tract) and the chemical aspects (i.e., toxicity), which varies depending on the elemental composition of the airborne

particulate. Concentrations of dusts in air will be compared to all available and appropriate risk-based thresholds that are considered protective of health to identify dusts that could be a potential health concern. If dusts are identified as a potential health concern, then further risk-based analysis will be implemented. Quantitative estimates of risk will be calculated by considering the inherent hazardous potential of the dust, and then potential for any individual to actually be exposed to the dust.

Reference will be made to “Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners” (Agency 2003b) in compiling the Application / EIS.

The air quality next to the stretch of roads used for access to the proposed Raven Project site situated outside the LSA and RSA will be conservatively inferred by air quality predictions where the boundaries of these study areas intersect the roads.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.2.3 Climate Change

Climate is a description of the long-term pattern of weather over a large area. Climate is usually described in terms of long-term (more than 30 years) meteorological parameters which are continuously monitored. Climate change refers to changes in long-term trends weather parameters such as temperature or precipitation.

5.2.3.1 Detailed Climate Change Baseline

Existing climate descriptions for North America, BC, and Vancouver Island will be obtained, analyzed for relevance and quality, summarized, and included in the Application / EIS. Long-term meteorological data collected over a minimum 30-year period at the nearest EC weather stations (known as Canadian Climate Normals) will be analyzed to determine if there have been changes in weather parameters over the period of record. Long-term climate data for the Buckley Bay and Port Alberni airsheds have been collected by EC at the YQQ and Port Alberni meteorological stations.

5.2.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

The proposed Raven Project will contribute to the GHG inventory for Vancouver Island, BC, and Canada. Based on diesel fuel consumption by the proposed Raven Project diesel powered equipment, the emission rate of GHG (CH₄/CO₂ and N₂O) will be calculated and analyzed with reference to provincial and Canadian inventories and Canada's international obligations. Because the proposed Raven Project is relatively small, no climate change predictive models such as Atmosphere-Ocean General Circulation Model (AOGCM) will be used to predict impacts on the global temperature. Extreme events observed in the past, such as cyclical anomalies (e.g., El Niño) will be considered for climate description.

Effects of GHG emissions by the proposed Raven Project sources will be examined with reference to GHG inventory for Vancouver Island, the Province of BC, and Canada. Reference will be made to Canadian obligations under the ratified Kyoto Protocol.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described; relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.2.4 Noise

The Application / EIS will include an assessment of the potential impact of the proposed Raven Project on the environment, including changes in ambient noise levels during construction and operations, continuous versus acute exposure, and the effect of changes in noise levels on humans and wildlife. A description of background noise levels at the mine site and port facility will be included in the Application / EIS. The worst case scenario will be analyzed for the most critical section of the transportation ROW.

5.2.4.1 Detailed Noise Baseline

A noise survey will be conducted at the proposed Raven Project site, the proposed Port Facility and in nearby communities. Terrain features acting as potential noise barriers and reflectors may require inclusion in the noise assessment using a noise mapping computer model. Continuous 24-hour monitoring of sound parameters will be executed in accordance with the following two guidelines for environmental noise survey: (1) American National

Standard Institute (ANSI) 1994: Procedures for Outdoor Measurement of Sound Pressure Level; (2) International Organization for Standardization (ISO) / Draft International Standard (DIS) 1996-1 & 1996-2.2 Acoustics – Description, Assessment and Measurement of Environmental Noise (ISO/DIS 1996-1:2003; ISO/DIS 1996-2:2005). The System 824 Sound Level Metre / Real Time Analyser will be the instrument used in the survey.

During surveys, on-site weather data will be recorded using a hand-held Kestrel Weather Station. Exceptional sound events will be noted and described in terms of time and likely source by the instrument operator (present on-site at all times during the survey period). The location of the monitoring point will be selected in accordance with relevant guidelines for environmental noise surveys.

BC does not have ambient noise standards, usually expressed in a sound pressure unit of decibel A-scale (dBA), applicable to the area of the proposed Raven Project. CVRD has noise abatement guidelines for roads and both Comox and Qualicum Airports have noise abatement regulations for aircrafts, but none of these guidelines specify specific acceptable noise levels. Relevant noise standards existing in other jurisdictions (provincial and municipal) will be adopted for the proposed Raven Project (e.g., “BC Noise Control Best Practices Guideline” (BC Oil and Gas Commission 2009) and “Noise Directive 038” (Alberta Energy Resource Conservation Board (ERCB) (2009)).

The baseline sound survey data will be analyzed for daytime and night time noise levels and other sound parameters and added to levels for assessment of cumulative environmental noise levels specific to the proposed Raven Project. Quality Assurance / Quality Control (QA / QC), statistical analysis, data validation, removal of outliers, and error / accuracy analysis will be included.

5.2.4.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will describe the nature and extent of potential increases in ambient noise levels resulting from activities related to the proposed Raven Project during each proposed project phase. Potential receptors, including on-site personnel, residents and businesses in the vicinity of the off-site facilities, and wildlife, will be identified and included in the assessment of potential noise effects related to the proposed Raven Project. The worst case scenario will be analyzed for the most critical section of the transportation ROW. It can be expected that ambient noise associated with the proposed Raven Project will reach the baseline level at the boundary of a 3-km buffer. However, if this is not the case, Alberni Inlet and Trevor Channel will be included in the noise RSA.

The SPM9613 sound mapping model will be used for prediction of noise levels. The model requires input data that includes atmospheric conditions, modelled equipment sound power levels at octave frequency spectrum, noise source directivity, barriers inclusion if present, reflecting surfaces data, observer (noise receiver) locations, ground cover, and hardness. Model findings will be used to make a comparison with PSLs specific to the proposed Raven

Project for daytime and night time objectives. Each significant data source present during the operations phase will be included as inputs into the model, including crushers, processing plants, ventilation fans, and secondary power generation (if present). Design and location of noise sources will be considered and specific noise predictions at the proposed Raven Project area will be made. The model output will include noise contours, sound spectrum data, statistical descriptors of environmental sound, and sound pressure levels in a two-dimensional ground-level setting. Location of hills, forest and ground hardness contours will be shown. Discussion of results uncertainty will be included. The impact assessment of predicted noise levels on humans and wildlife will be discussed based on existing literature.

The Application / EIS will identify potential effects from increased noise levels from surface blasting (construction phase only), crushing, equipment operation, and coal transport on the environment. Impact of trucking noise along the critical sections of the transportation ROW and occurring on public roadways in the Port Alberni area will be predicted with a highway noise model. The assessment of noise effects will include the construction and operations phases of the proposed Raven Project, point and mobile sources of noise, and tonal and impulsive noise. Assessment will be based on the ISO / DIS 1996-1 & 1996-2.2 Acoustics – Description, Assessment and Measurement of Environmental Noise. Any identified residual effects of the proposed Raven Project will be discussed followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described, and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Proposed mitigation measures will be identified and relevant management plans will be referenced. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.2.5 Vibration

5.2.5.1 Detailed Vibration Change Baseline

Baseline data collection for vibration conditions is not required, as there are no existing sources of ground-borne vibration (e.g., blasting) within the LSA and RSA.

5.2.5.2 Potential Effects of the Proposed Project and Proposed Mitigation

Potential vibration effects related to the proposed Raven Project will be considered using empirical equations for ground vibration assessment for construction blasting and

compactors (if needed) and heavy equipment movement. It is anticipated that operational blasting will be required very infrequently, as the coal could easily be removed with a continuous miner (i.e., without blasting). The infrequent operational blasting is not anticipated to cause surface vibration. Comparison with the recommended permissible vibration defined by Standard DIN 4150 (German Institute for Standardization (Deutsches Institut für Normung) 2001) will be completed and assessed. Potential residual effects from the proposed Raven Project will be discussed.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described, and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.3 Groundwater

5.3.1 Valued Component Scoping and Rationale

The selected VCs for groundwater are hydrogeology and groundwater quality which are those VCs with identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The preliminary rationale provided below will be updated to integrate results from consultation that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, and biodiversity and sensitivity to proposed Raven Project effects. The preliminary rationale for selecting groundwater VCs is described below in Table 5.3-1.

Table 5.3-1: Groundwater Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Hydrogeology (flow, recharge / discharge, surface (marine and / or fresh) water - groundwater interaction)	Potential proposed Raven Project-related effects to surface streams due to underground mine works dewatering	VC assessed in recent EA process; professional judgement based on EA of other mining projects	K'ómoks First Nation has expressed concerns with respect to potential project effects on local hydrogeology	BC MOE, DFO, EC, VIHA, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Potential fisheries and wildlife impacts; concern regarding effects of mine dewatering on municipal and private groundwater drinking wells	<i>Water Act, Fisheries Act, Drinking Water Protection Act</i>
Groundwater quality	Seepage from underground mine walls exposure to air at depth, underground works build through fresh groundwater and saline deep groundwater zones	VC assessed in recent EA process; professional judgement based on EA of other mining projects	K'ómoks First Nation has expressed concerns with respect to potential proposed Raven Project effects on local water quality	BC MOE, DFO, EC, VIHA, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Potential impact with respect to fisheries and wildlife; concern with respect to municipal and private drinking water (well) quality	<i>Water Act, Fisheries Act, BCWQG, CEQG, BC CSR, Drinking Water Protection Act</i>

Note: BC CSR - *British Columbia Contaminated Sites Regulation*; BC MOE - British Columbia Ministry of Environment; BCMFLNRO – British Columbia Ministry of Forests, Lands and Natural Resource Operations; BCWQG - British Columbia Water Quality Guidelines; CEQG - Canadian Environmental Quality Guidelines; DFO - Fisheries and Oceans Canada; EA - Environmental Assessment; EC - Environment Canada; VC - Valued Component; VIHA - Vancouver Island Health Authority

5.3.1.1 Hydrogeology Spatial Boundaries

The hydrogeology study area (HSA) was determined by potential project effects on groundwater, including regional aquifers and is shown on Figure 5.3-1. For the purpose of this section, the LSA and the RSA were combined as the HSA. The HSA will be expanded if modelling indicates potential impacts beyond this boundary.

5.3.1.2 Hydrogeology Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.3.1.3 Groundwater Quality Spatial Boundaries

The study area for groundwater quality is the same as for hydrogeology (Figure 5.3-1).

5.3.1.4 Groundwater Quality Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

360000

370000



Legend

- Hydrogeology Study Area
- Proposed Access Road
- Potential Location of Site Facilities

5490000

5490000

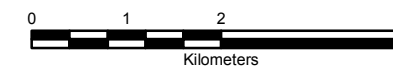
5480000

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Scale: 1:80,000



Reference

Basemap: ESRI World Topographic Map
Model Boundary: Itasca Denver, Inc.

CLIENT:  Compliance Coal Corporation

PROJECT: Raven Underground Coal Project

Hydrogeology and Groundwater Quality Spatial Boundary

DATE: April 19, 2011 ANALYST: EO **Figure 5.3-1**

JOB No: VE51897 QA/QC: LR PDF FILE: 07-50-11_hydrogeo_study

GIS FILE: 07-50-11

PROJECTION: UTM Zone 10 DATUM: NAD83



5.3.2 Hydrogeology

5.3.2.1 Detailed Hydrogeology Baseline

The hydrogeology baseline characterization will consist of a review and analysis of available geology and hydrogeological information. This will include: regional published reports and maps (including existing BC MOE aquifer maps); published reports of hydrogeological studies of coal deposits in other regions with similar geology; a search and analysis of local (on-site and nearby) water well stratigraphy and production information; and relevant data collected during the proposed Raven Project's resource exploration activities. A list of current and predicted future groundwater users in the immediate area and region, including Aboriginal users, would be provided, and potential groundwater conflicts will be identified.

The site hydrogeology characterization also includes wells installed in drillholes at selected locations and data logging piezometers to record groundwater pressures in different units over time. The Application / EIS will provide a rationale for the locations and depths of installed wells and piezometers, the method of piezometer sealing, and the length of screen on wells and piezometers. The well screens are situated at specific depths to allow hydraulic testing of the units. The equipment was installed to characterize both permeability and storage properties of the main hydrogeologic units. A visual assessment of the land will be undertaken to determine where natural seeps may already be occurring, and may be likely to be exacerbated by mining.

The investigation program will be developed to characterize the main hydrostratigraphic layers across the Raven property, including sandstone, siltstone / mudstone, and coal units. The assessment of these units will be conducted through the installation of the following:

- Two vertically nested vibrating wire piezometers (VWP) with data loggers installed in single drillholes in different units;
- Two large diameter wells installed near the VWPs;
- One large diameter well screened in the overburden sandstone; and
- Three monitoring wells screened in coal units.

The VWPs will be installed at strategic depths to allow the characterization of several different units as well as the long term (several months) observation of groundwater pressures.

Testing will include the following:

- The monitoring wells screened in the coal and sandstone units will be purged and sampled and the recovery measured for hydraulic conductivity calculations; and

- The large diameter wells screened over several units will be pumped and sampled, the recovery measured, and the response of the groundwater pressures in the VWPs recorded.

Additional test work will include water quality surveys within the stream beds of Cowie and Cougar Smith Creeks during low flow periods to determine the interaction between deep groundwater and surface water.

The data obtained from the hydraulic testing, groundwater elevation measurements, and long-term groundwater pressure monitoring will provide support for numerical model development required for both engineering studies and the EA. Results of the information review and field investigations will allow for:

- Characterization of aquifers and aquitards, including aerial extent, thickness and continuity, hydraulic properties, and the degree of aquifer confinement;
- Identification of natural discharges (spring, seeps, streams);
- Identification of groundwater recharge zones; and
- The relationship and connectivity of groundwater aquifers in the HSA to aquifers in surrounding areas.

The drawdown / recovery and VWP data will be analyzed utilizing appropriate conceptual models to calculate unit permeability and storage. The VWP data collected between October 2009 and February 2010 will be correlated with site precipitation and streamflow data to assess the interconnection between the surface water and groundwater systems.

The analyses of the field testing program, the regional geology and relevant published information will form the basis for the construction of models for an impact assessment analysis. A groundwater model will be developed as a component of the Application / EIS. The model will be clearly described in the report, including uncertainties and assumptions, and model verification will be conducted to support the model outcomes.

5.3.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will identify potential effects on groundwater levels and the quantity available for stream base flow. Effect conclusions will be based on predicted mine water discharge volumes due to seepage from underground mine workings and the effect this would have on local and regional groundwater flow. The assessment will consider:

- Water handling procedures;
- Water balance predictions;
- Contingencies for potential inflows that are higher than expected;
- Potential effects of mine-related groundwater pumping;

- Potential effects of underground mining (i.e., rock fracturing, joint dilation or bedding plane separation) resulting in potential changes to strata permeability and storage capacity, groundwater flow directions, groundwater chemistry, groundwater levels, and groundwater-surface water interactions;
- Potential effects on groundwater recharge (surficial and bedrock aquifers);
- Potential effects on local drinking water wells and drinking water quality; and
- The potential effect of mine collapse, potential surface subsidence, and resulting impacts to groundwater flow regime and groundwater-surface water interactions.

Potential proposed Raven Project effects on hydrogeology will also be incorporated into other relevant sections of the Application / EIS (e.g., fisheries and aquatic resources, hydrology, etc.). All parameter estimates (e.g., water balance), reported in the Application / EIS will include sources of information (either estimates or empirical) and assumptions built into the data.

Proposed mitigation measures will be identified and relevant management plans will be referenced as appropriate. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described, and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.23 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.3.3 Groundwater Quality

5.3.3.1 Detailed Groundwater Quality Baseline

The existing baseline data set for groundwater quality, including physical parameters of waterbodies with the potential to be affected by the mine development, will be included in the Application / EIS.

Groundwater samples were collected from different geological units and from stream bed deposits to characterize the baseline water quality. The Application / EIS will include:

- Groundwater monitoring and sampling site locations, and justification for the selection and spacing of these sites;

- Groundwater sample data, including the frequency, timing and duration of sampling;
- Description of groundwater-surface water and groundwater-sea water interactions; and
- Water quality objectives for groundwater, including a rationale for the selection of the stated objectives
- Monitoring is currently scheduled to assess the potential for the presence of hydrostatic pressure variation. A water quality survey will be conducted during low flow periods along Cougar Smith and Cowie Creeks to determine the groundwater contributions to creek baseflow. Samples will be collected from in the streambed deposits. Assuming wells close to Cowie Creek are groundwater under the direct influence (GUDI) wells a survey will be conducted to identify the potential drinking water sources on Cowie Creek.

Groundwater samples will be collected from the sandstone and coal units to characterize the quality of the water. Field parameters (pH, conductivity, temperature, total dissolved solids (TDS), and salt content) will be monitored while purging the wells and the samples recovered once the parameters are stabilized.

Laboratory analysis will include physical parameters, major ions, nutrients, total metals and dissolved metals. Appropriate analytical techniques will be used. Table 5.3-2 provides a list of the parameters to be analyzed.

Polycyclic aromatic hydrocarbons (PAH) will be analyzed on post pumping samples.

- The proponent will review the baseline monitoring and survey results with VIHA, BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO) and BC MOE to inform the groundwater monitoring program(s) that will be developed as part of the Environmental Management Plan (EMP).

Table 5.3-2: Groundwater Assay Parameter List

Physical Parameters	Dissolved Metals
pH @ 25°C	Aluminum
Conductivity @ 25°C	Antimony
Total suspended solids	Arsenic
Total dissolved solids	Barium
T-Alkalinity as CaCO ₃	Beryllium
T-Hardness as CaCO ₃	Boron
Turbidity	Cadmium
Anions	Calcium
Chloride	Chromium
Fluoride	Cobalt
Sulphate	Copper
	Iron
Nutrients	Lead
Ammonia - Nitrogen	Magnesium
Nitrate - Nitrogen	Manganese
Nitrite - Nitrogen	Mercury
TKN - Nitrogen	Molybdenum
Phosphorus (ortho-phosphate)	Lithium
Phosphorus (Total)	Nickel
	Potassium
Organics	Selenium
Carbon (Total Organic)	Silicon
	Silver
	Sodium
	Thallium
	Tin
	Titanium
	Uranium
	Vanadium
	Zinc

Note: CaCO₃ - calcium carbonate; °C - degrees Celcius

5.3.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will identify potential effects on groundwater quality, including groundwater in the HSA with an identified potential to be used for drinking water.

Effect conclusions will be based on the predicted water quality of mine water seepage, including both operational and post-closure conditions. The assessment will consider

potential effects on water quality in relation to metals, nutrients, major ions, and physical parameters. Both dissolved and total metals will be modelled as appropriate to the type of effects. Groundwater quality will be assessed against appropriate risk-based guidelines. The Application / EIS will compare background and predicted water quality to applicable guidelines.

The influence on geochemistry will be assessed from potential sources such as rock exposed in underground mine workings, potential subsidence and materials temporarily stored on surface (i.e., processed coal, reject materials, topsoil, and till). This will include information from assessments of ML/ARD potential. The Application / EIS will integrate results of the ML/ARD prediction work, water quality, hydrology, and water balance information to develop water quality predictions that will be used as a basis for impact assessment, to determine materials handling procedures and to assess and develop ML/ARD mitigation / management requirements for the proposed Raven Project. Geochemical modelling will be presented in a clear and transparent manner and the methods, assumptions and rationale used to estimate water quality will be thoroughly explained. The lag time to ML/ARD onset will be assessed for all potentially ARD generating materials; this information will be utilized in the assessment of potential effects to groundwater quality. Contingency plans will be provided where there are significant uncertainties or risks associated with the predicted water quality.

Potential effects of the proposed Raven Project on groundwater quality will also be incorporated into other relevant sections of the Application / EIS (e.g., fisheries and aquatic resources, hydrology, etc.). All parameter estimates reported in the Application / EIS will include sources of information (either estimates or empirical) and assumptions built into the data. Water quality predictions will be made for major mine components (e.g., coal rejects, stockpiles, underground workings including the gob), site surface water discharges, groundwater seepages and relevant receiving environment locations. Water quality predictions will be conducted for key flow conditions and relevant time-steps in the mine life (i.e., temporal boundaries will include operations, closure, post-closure, workings flooded and discharging, etc.). Water quality predictions and effects assessment will include pH, alkalinity, sulphate, cations, major and trace metal / metalloids, nitrogen species etc., and include comparison to all relevant water quality guidelines and objectives. Contingency plans will be provided where there are significant uncertainties or risks associated with the predicted water quality.

The Application / EIS will describe proposed measures available to manage the impacts identified above. The management strategy for any ML/ARD will be assessed in predictive water quality modelling. Concepts for operational and post-closure monitoring and maintenance plans will be provided, including prevention and management strategies for temporary closure or early-permanent closure scenarios. The Application / EIS will also include a discussion and significance assessment of each identified residual effect following mitigation.

Potential effects will be based on the predicted water quality of each waste stream (potential seepage from topsoil and till storage areas, ponds and dams, general site, washed coal and raw piles, truck wash and oil-water separator, external sedimentary pond, diversion ditches and catchment ditches, and mine water) and containment ponds throughout the proposed Raven Project area. The Application / EIS will include an assessment of the data on groundwater quantity necessary to evaluate potential effects associated with mine development and operations, including providing water balance calculations.

Any identified residual effects of the proposed Raven Project will be discussed followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures would be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance.

5.4 Hydrology, Surface Water Quality and Sediment Quality

5.4.1 Valued Component Scoping and Rationale

The selected VCs for hydrology, surface water quality and sediment quality are those VCs with identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The preliminary rationale provided below will be updated to integrate results from consultation and Working Groups that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, and biodiversity and sensitivity to proposed Raven Project effects. The rationale for selecting hydrology, surface water quality and sediment quality VCs is described below in Table 5.4-1.

Table 5.4-1: Surface Hydrology and Water Quality Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Surface Hydrology (Cowie Creek and Cougar Smith Creek watersheds)	Potential proposed Raven Project-related effects in Cowie Creek and Cougar Smith Creek watersheds	Identified by proponent, underground mine dewatering activities and surface water diversion may affect surface hydrology, underground mining may cause change to surface hydrology due to potential subsidence	K'ómoks First Nation has expressed concerns with respect to potential proposed Raven Project effects on local hydrology	BC MOE, DFO, EC, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000); Nile Creek to Trent River Water Allocation Plan (BC MOE 1995)	Surface hydrology is valued by general public, NGOs and industry; potential impact with respect to fisheries and wildlife	<i>Water Act, Fisheries Act</i>
Freshwater and Sediment Quality	Potential proposed Raven Project-related effects in Cowie Creek and Cougar Smith Creek watersheds	Identified by the proponent and AMEC; streams provide fish habitat	Local Aboriginal groups have expressed concern with respect to potential proposed Raven Project – related effects on surface water quality	BC MOE, DFO, EC, BC MFLNRO, VIHA	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Surface water quality is valued by general public, NGOs and industry; potential impact with respect to fisheries and wildlife	<i>Water Act, Fisheries Act, Drinking Water Protection Act</i> BCWQG, CEQG, BC CSR

Note: BC CSR - British Columbia *Contaminated Sites Regulation*; BCWQG - British Columbia Water Quality Guidelines; BCMFLNRO – British Columbia Ministry of Forests, Lands and natural Resource Operations; BC MOE - British Columbia Ministry of Environment; CEQG - Canadian Environmental Quality Guidelines; DFO - Fisheries and Oceans Canada; EC - Environment Canada; NGO - Non-Government Organization; VIHA – Vancouver Island Health Authority

5.4.1.1 Water Balance Spatial Boundaries

The aquatic LSA and RSA is the Cowie Creek watershed, and are common to hydrology, surface water and sediment quality. The rationale for the hydrology LSA and RSA is based on watershed boundaries; the proposed Raven Project is confined to Cowie Creek and some of its tributaries. The aquatics LSA and RSA are shown in Figure 5.4-1.

5.4.1.2 Water Balance Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each project phase will be described.

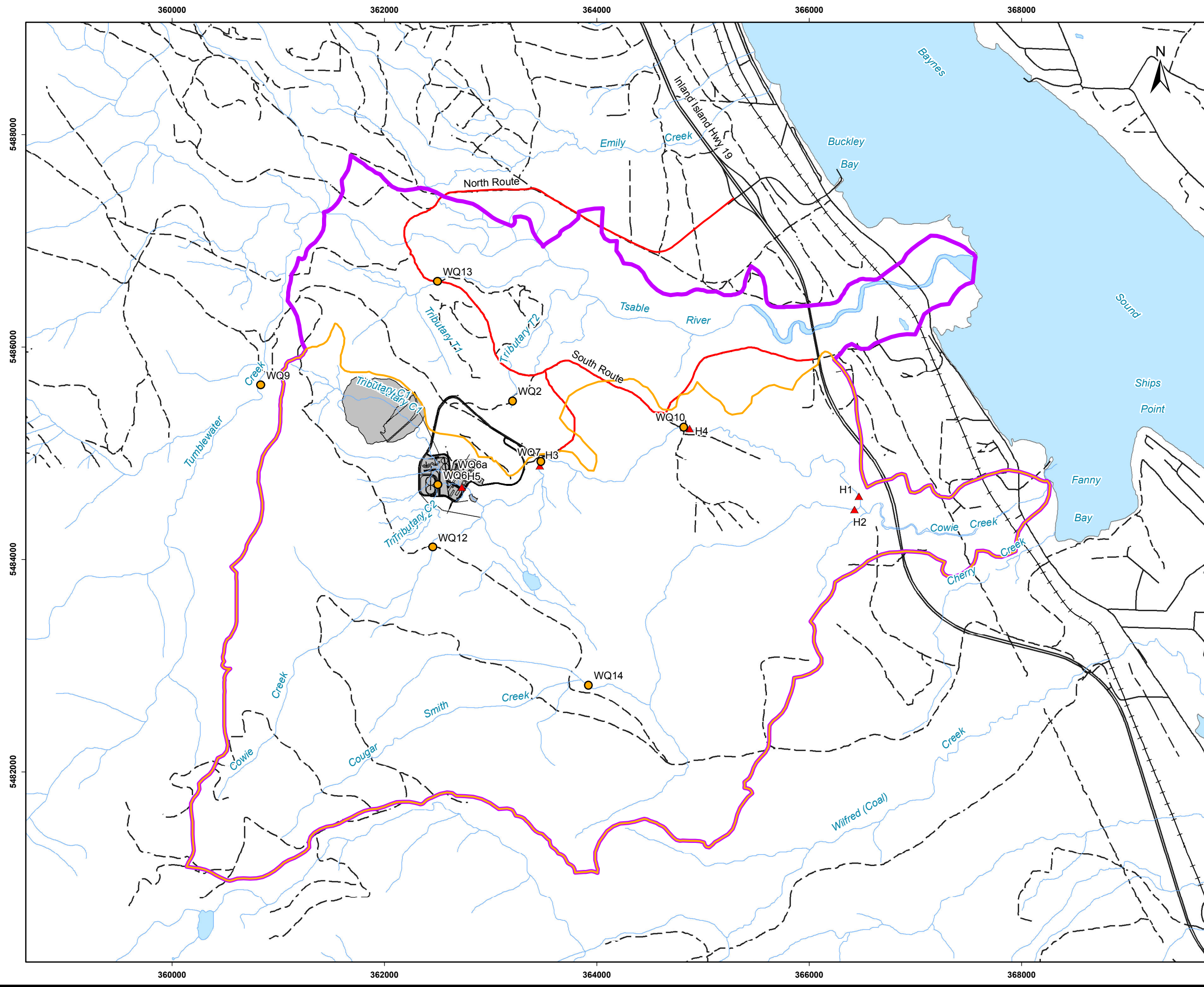
5.4.1.3 Surface Water Quality and Sediment Quality Spatial Boundaries

The LSA and RSA for surface water quality and sediment quality is the same as for hydrology (Figure 5.4-1). The rationale is based on watershed boundaries; the proposed Raven Project is confined to Cowie Creek and some of its tributaries. Cougar Smith Creek is included for water quality as an adjacent, generally similar watershed that could serve as a reference stream. The Application / EIS will review biophysical and physico-chemical properties of the study area and reference sites, and provide a justification for the selection of reference sites.

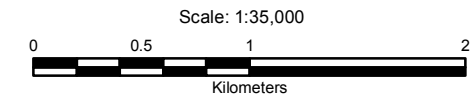
5.4.1.4 Surface Water Quality and Sediment Quality Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each project phase will be described.

Y:\GIS\Projects\VE\VE51907_Raven_Coal\Maping\10_50-009_v4.mxd





- Legend**
- ▲ Hydrometric Station
 - Water Quality Monitoring Station
 - Proposed Access Road
 - Paved Road
 - - Gravel/Rough Road
 - + Railroad
 - Watercourse2
 - Waterbody
 - Aquatics Local Study Area
 - Aquatics Regional Study Area
 - Potential Location of Site Facilities



Reference
Tributaries T1, T2, C1 are local names used for reference and are not gazetted names

Reference
LIDAR (5m) used to define Cowie and Cougar Smith Creek Watercourses
TRIM used in other watersheds
LSA/RSA: Cowie, Cougar Smith Creek watersheds, and two first order tributaries to the Tsable River
Basedata: TRIM

CLIENT:		 Compliance Coal Corporation
PROJECT:		
Raven Underground Coal Project		
Aquatic Spatial Boundaries		
DATE:	ANALYST:	Figure
June, 2012	EO	
JOB No:	QA/QC:	PDF FILE:
VE52179	NF	10-50-009_v4_aquatic_study_area.pdf
GIS FILE:		
10-50-009_v4.mxd		
PROJECTION:	DATUM:	
UTM Zone 10	NAD83	

5.4.2 Surface Hydrology

5.4.2.1 Detailed Surface Hydrology Baseline

The Application / EIS will include a description of watersheds affected by the mine, power lines, roads, and existing water use. Surface hydrology will be described along with water quality and quantity, including potential reference areas for environmental effects monitoring. The assessment will include a description of:

- Methods used;
- Existing water use;
- Watersheds affected by the mine, roads and infrastructure including local wetlands, ponds and lakes;
- Flow data from regional hydrometric stations;
- Site flow monitoring data;
- Mean monthly and annual flows;
- Minimum daily and monthly flows;
- 10-year and 20-year seven-day low flow;
- Maximum monthly flows;
- Peak instantaneous flows;
- Flood events (e.g., 1 in 200 year flood event);
- Climate change considerations;
- Ice cover conditions;
- Baseline studies; and
- Effect of groundwater flows on surface water bodies (regional and local).

Where potential impacts on fish values and proposed fish habitat mitigation and compensation measures are presented and discussed, the information listed above will be used as part for the basis for analysis of potential effects from the proposed Raven Project.

The hydrological program will include the following:

- Establishing continuous water level recorders on Cowie Creek above its junction with Cougar Smith Creek;
- Measuring stream discharges at least quarterly, including freshet and summer low flows on Cowie and Cougar Smith Creeks at the water level recorder stations;

- Downloading continuous water level recorders and check data whenever streams are gauged;
- Surveying reaches of Cowie Creek from above the proposed Raven Project facilities to its confluence with Cougar Smith Creek to determine baseline wetted width, water depth, spot flows, percentage of runs, riffles, pools, etc.; and
- Monitoring water run-off and infiltration of material from fine and coarse rejects piles at the mine into the shallow groundwater system.

Analyses required include flood and low flow calculations for Cowie and Cougar Smith Creeks and determination of the effects of de facto water withdrawal from Cowie Creek by the proposed Raven Project development on flows, particularly low summer flows. It is understood that Cowie Creek flows are subsurface for a portion of the summer and thus potential effects from the proposed Raven Project may be limited to reduction of flows in Cowie Creek below the Cougar Smith Creek junction. Analysis of the site-specific meteorological precipitation data, together with available EC data would be required to provide a measure of data representation, (i.e., how typical was the measurement period compared to climate normals which span a 30-year period). Analyses will also consider the potential impact of climate change scenarios, in the form of sensitivity analyses of the key hydrological parameters, such as precipitation and evaporation.

5.4.2.2 Water Balance

A water balance will be prepared that incorporates each proposed Raven Project component through each proposed Raven Project phase and under a range of climatic conditions. Reported parameter estimates (e.g., precipitation, evaporation, stream flows, groundwater flows, soil permeability, and hydraulic roughness) will include information sources (either estimates or empirical), and make reference to measurement standards or collection protocols which were used, as well as assumptions built into the data. Consideration of extreme events and years, both wet and dry, will be included. The Application / EIS will include all water balance calculations within a comprehensive water balance or budget for the Raven Project.

5.4.2.3 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will identify potential effects on surface water quantity and flow. Effect conclusions will be based on predicted water volumes in and from waste streams and containment ponds throughout the proposed Raven Project area, including: mine water; seepage; surface runoff and collection ponds; Process Plant and water treatment facility discharges; settling ponds; and the sewage treatment facility (septic fields). The assessment will consider the potential effects on water quantity and catchment areas in relation to:

- Water withdrawals and discharge related to the proposed Raven Project, including points of withdrawal and discharge;
- Quantity of runoff, groundwater and seepage from underground and other mine workings. This will include: a description of predicted mine inflows and hydrogeology; water handling procedures; water balance predictions and contingencies for potential inflows that are higher than expected; and the effects of discharges on the hydrology of the area;
- Consideration of flood and drought conditions (wet and dry);
- Climate change scenarios, considered in the form of sensitivity analysis of key hydrological parameters such as precipitation and evaporation, will be applied to water balance;
- Receiving water quantity, including changes in timing, volume and deviation of peak and minimum flows resulting from the proposed Raven Project (e.g., dewatering of underground works); and
- ML/ARD and seepage potential associated with movement of material and use for foundations, dykes and dams.

The release of mine water will be managed to match the flow range observed in the creeks and to avoid unnatural effects on physical habitats. Potential effects on natural stream morphology and sediment transport will be assessed if changes are evidenced from changes to the hydrological flow regime.

Potential effects of the proposed Raven Project on water quantity will also be incorporated into other sections of the Application / EIS (e.g., surface water and sediment quality, fisheries and aquatic resources, etc.). All parameter estimates (e.g., water balance), reported in the Application / EIS will include sources of information (either estimates or empirical) and assumptions built into the data.

The Application / EIS will assess the possible effects of the proposed Raven Project on existing water licences in the area to ensure that drinking water systems are evaluated with regard to the effects of the mine or any ancillary facilities such as the roads.

The Application / EIS will describe proposed measures available to manage the impacts identified above, including measures to contain and treat contaminated water. Relevant management plans will be referenced as appropriate. Any identified residual effects of the proposed Raven Project will be discussed followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures would be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described and their significance will be determined. Reference to

relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.4.3 Surface Water and Sediment Quality

The Application / EIS will include an analysis of water quality and sediment quality. The water quality monitoring program will be comprised of two components. Water and sediment quality samples will be collected from relevant water quality monitoring stations established during previous studies and augmented with new sites reflecting current mine plans. The location of fine sediment deposition downstream of the proposed mine will be determined and a sampling program will be developed. If fine sediment cannot be found in the stream / river systems, fine sediment samples will be taken in the marine / estuary environment. Chemistry and toxicity testing will be conducted on stream sediments.

Additional samples will be collected for background total suspended solids (TSS) in conjunction with hydrology, fisheries, and aquatic resource studies along the proposed access road and power line ROW.

This information will be used as part of the basis for analysis of potential impacts on fish values and proposed fish habitat mitigation and compensation measures.

5.4.3.1 Detailed Surface Water and Sediment Quality Baseline

Water Quality

Water quality samples will be collected monthly commencing April 2009 at six of the historic (1996) sites and at two new sites. Collectively, these sites will provide water quality data above, within and below the proposed Raven Project. Water quality samples will also be collected from two control sites on separate drainages. Each water quality sampling site will be shown on appropriate maps. During the summer low flows (August) and fall high flows (late October-early November), water quality samples will be collected on Cowie and Cougar Smith Creeks for a reduced set of parameters on a weekly basis (for five weeks, per BC MOE guidelines). Low and high flow samples are collected at the same locations as monthly samples.

Field quality control will include one duplicate sample, field blanks and travel blanks. Temperature, pH and conductivity data are collected in the field, with other parameters assessed in the laboratory (see below).

RAVEN UNDERGROUND COAL PROJECT

Table 5.4-2 lists the proposed analyses for monthly sampling and Table 5.4-3 lists the proposed analyses for weekly sampling. Analytical methods and detection limits for each tested parameter will be detailed in the Application / EIS.

Table 5.4-2: Monthly Sampling Parameter List

Physical Parameters	Total and Dissolved Metals
pH @ 25°C	Aluminium
Conductivity @ 25°C	Antimony
Total suspended solids	Arsenic
Total dissolved solids	Barium
Turbidity	Beryllium
T-Alkalinity as CaCO ₃	Boron
T-Hardness as CaCO ₃	Cadmium
Total and fecal coliform*	Calcium
Anions	Chromium
Chloride	Cobalt
Fluoride	Copper
Sulphate	Iron
	Lead
	Magnesium
Nutrients	Manganese
Ammonia - Nitrogen	Mercury
Nitrate - Nitrogen	Molybdenum
Nitrite - Nitrogen	Lithium
Phosphorus (ortho-phosphate)	Nickel
Phosphorus (Total)	Potassium
	Selenium
	Silicon
Organics	Silver
Carbon (Total Organic)	Sodium
	Strontium
	Thallium
	Tin
	Titanium
	Uranium
	Vanadium
	Zinc

Note: *sampling for fecal coliform commenced in April 2011 at all surface water sampling sites
CaCO₃ - calcium carbonate; °C - degrees Celcius

Table 5.4-3: Weekly Sampling Parameter List

Physical Parameters	Nutrients
pH @ 25°C	Ammonia - Nitrogen
Conductivity @ 25°C	Nitrate - Nitrogen
Total suspended solids	Nitrite - Nitrogen
	Phosphorus (ortho-phosphate)
	Total Phosphorus
	Sulphate
	Chloride
	Total and dissolved metals

Note: CaCO₃ - calcium carbonate; °C - degrees Celcius

Samples will be analyzed for PAHs once during the summer at each site. Petrographic analysis will be performed on selected geochemical samples.

Sediment Quality

Sediment quality samples will be collected at the water quality stations once during the summer (August 2009). Five duplicates for each site will be analysed to assess variability. Table 5.4-4 lists the proposed parameter list for sediments. PAHs and particle size will be analyzed from one replicate at each site.

Table 5.4-4: Sediment Parameter List

Total Metals	
Aluminium	Mercury
Antimony	Molybdenum
Arsenic	Nickel
Barium	Potassium
Beryllium	Selenium
Boron	Silicon
Cadmium	Silver
Calcium	Sodium
Chromium	Strontium
Cobalt	Thallium
Copper	Tin
Iron	Titanium
Lead	Uranium
Magnesium	Vanadium
Manganese	Zinc

5.4.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will identify potential effects on surface water (and sediment) quality. Assessment of potential effects on drinking water will be included, if applicable. Any surface water discharge from the mine will need to meet water quality objectives set by BC MOE. Effect conclusions will be based on the predicted water quality of waste streams and containment ponds throughout the proposed Raven Project area, including: mine water; seepage; surface runoff and collection ponds; Process Plant and any water treatment facility discharges; settling ponds; and the sewage treatment facility (septic fields). If any potential effects on surface water or sediment quality are identified, potential effects on the marine environment will be assessed. Contingency plans will be provided where there are significant uncertainties or risks associated with predicted water quality.

The assessment will consider potential effects on water quality in relation to:

- Quality (particularly metals, nutrients and major ions) of runoff, groundwater and seepage influenced by geochemistry (including ML/ARD) from potential sources such as mine rock exposed on underground mine walls, subsidence and materials temporarily stored (i.e., processed coal, fine and coarse rejects, topsoil and till, and tailings);
- Receiving water quality, including:
 - A description of predicted effluent within the delineation plume to the limits of predicted changes caused by the proposed Raven Project;
 - A description of the predicted effects of releases of any effluents, surface runoff and seepages that may be directed to land, with particular attention to effect linkages on vegetation, soil and wildlife and effects on aquatic organisms;
 - Siltation and water chemistry (e.g., runoff along mine site roads, the access road, and drainage ditches);
 - Contaminant loading and dispersion including surface runoff and airborne contaminants;
 - Waste rock chemistry and toxicity, runoff characteristics, and the implications for wildlife and downstream water quality; and
 - Water quality along the selected access road and power ROW.

The Application / EIS will integrate results of the ML/ARD prediction work, water quality, hydrology, and water balance information to develop water quality predictions that will be used as a basis for impact assessment, to determine materials handling procedures and to assess and develop ML/ARD mitigation / management requirements for the proposed Raven Project. The potential for bacteria associated with coal reject piles will be

considered. Concepts for operational and post-closure monitoring and maintenance plans will be provided, including prevention and management strategies for temporary closure or early-permanent closure scenarios. Geochemical modelling will be presented in a clear and transparent manner and the methods, assumptions and rationale used to estimate water quality will be thoroughly explained. The lag time to ML/ARD onset will be assessed for all potentially ARD generating materials and this information will be utilised in the assessment of potential effects to surface water quality.

Potential effects of the proposed Raven Project on surface water and sediment quality will also be incorporated into other relevant sections of the Application / EIS (e.g., vegetation, wildlife, fisheries and aquatic resources, etc.). All parameter estimates reported in the Application / EIS will include sources of information (either estimates or empirical) and assumptions built into the data.

Trace metals, including selenium, will be included in the modelling of water discharged by the mine. It is not anticipated that selenium will be an issue for the proposed Raven Project. If, however, potential selenium issues are identified, risks will be assessed as appropriate. Both dissolved and total metals will be modelled as appropriate to the type of effects (e.g., seepage is presented as a dissolved phase, but if discharged, sediment ponds will be presented as total metal concentrations). Water quality predictions will be made for major mine components (e.g., coal rejects, stockpiles, underground workings including the gob), site surface water discharges, groundwater seepages and relevant receiving environment locations. Water quality predictions will be conducted for key flow conditions and relevant time-steps in the mine life (i.e., temporal boundaries would include operations, closure, post-closure, workings flooded and discharging, etc.). Water quality predictions and effects assessment will include pH, alkalinity, sulphate, cations, major and trace metal / metalloids, nitrogen species etc., and include comparison to all relevant water quality guidelines and objectives. Contingency plans will be provided where there are significant uncertainties or risks associated with the predicted water quality.

The effects of effluent discharge on water quality will be modelled as part of the surface water quality assessments. Potential effects of effluent discharge on the marine environment will be considered. If the predictive modelling demonstrates impacts on receiving waters, the Application / EIS will address how these exceedances would be mitigated during all phases of the mine life. Potential effects on the marine environment will also be assessed.

TSS will be monitored during the construction phase. Water quality will be assessed against BC MOE protection of freshwater aquatic life guidelines, which have lower limits than drinking water standards. Where no aquatic life guideline exists, appropriate environmental quality guidelines will be determined. The proponent will work with BC MOE to develop water quality objectives on the basis of background data collated in the Application / EIS. If any water is released to the environment, water quality will be assessed.

Proposed mitigation measures will be identified and relevant management plans will be referenced as appropriate. Any identified residual effects of the proposed Raven Project will be discussed, followed by assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Section 10 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.5 Freshwater Fisheries and Aquatic Resources

This section of the Application / EIS will describe scope, approach, methods, and analysis used to describe fisheries and aquatic resources within the proposed Raven Project's area of potential influence. The Application / EIS will include a description of the aquatic habitat, periphyton and benthic invertebrate communities, and fish species composition, relative abundance, distribution, habitat use, life history characteristics, seasonal movements, and fish tissue metal burdens in the Cowie Creek watershed.

5.5.1 Valued Component Scoping and Rationale

The selected VCs for fisheries and aquatic resources are those VCs with identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The preliminary rationale for selecting fish species as VCs is described in Table 5.5-1. The preliminary rationale will be updated to integrate results from consultation and Working Groups that reflect Aboriginal, scientific and / or regulatory concerns, conservation status, biodiversity, and sensitivity to the potential effects of the proposed Raven Project.

5.5.1.1 Freshwater Fisheries and Aquatic Resources Spatial Boundaries

The LSA for fisheries and aquatic resources is the entire Cowie Creek watershed, including Cougar Smith Creek, a 2nd order tributary of Cowie Creek. All surface infrastructure of the proposed Raven Project would be located within the Cowie Creek watershed boundaries and potential effects to fish and aquatic resources are therefore limited to Cowie Creek. If potential effects of the proposed Raven Project are identified beyond the LSA, the boundaries will be expanded as necessary. Cougar Smith Creek is included in the LSA, even though no components of the proposed Raven Project would be located within its

subwatershed catchment. It is included solely because of the potential for fish from Cowie Creek to move into Cougar Smith Creek; no direct effects to fish, fish habitat, or other aquatic resources in Cougar Smith Creek would occur from the proposed Raven Project. Such movements would be restricted to the lower 2 km of Cougar Smith Creek to the impassable falls. This LSA is consistent with the LSA used for the other surface water disciplines (Figure 5.4-1).

The RSA for fisheries and aquatic resources includes the Cowie Creek watershed and Tsable River mainstem and two unnamed Tsable River tributaries. This RSA has been selected because the Cowie Creek watershed is the area within which any potential indirect impacts from the proposed Raven Project and potential cumulative effects with other past, present, or reasonably foreseeable future projects are most likely to occur. The Tsable River and two of its tributaries are included in the RSA because the river contains populations of all five Pacific salmon and steelhead, and because of the potential for indirect effects to fish and aquatic resources in the river from underground mining. Potential indirect effects to fish and aquatic resources include changes in surface water quality, changes in groundwater quantity and quality, changes in stream flows, and changes in physical habitat due to subsidence. Past, present, and reasonably foreseeable projects with potential residual effects that could interact with residual effects from the proposed Raven Project within this RSA include logging, associated road construction and maintenance, historical mining activities and the old and new Inland Island Hwy.

Table 5.5-1: Freshwater Fisheries and Aquatic Resources Valued Components

Valued Component		Rationale						
Common name	Scientific name	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations
Rainbow trout / steelhead	<i>Oncorhynchus mykiss</i>	Potential changes in habitat and stream flow in Cowie Creek may affect spawning and recruitment; effluent discharge at closure may affect fish health	Anadromous populations present in Cowie Creek (FISS 2010).	Local Aboriginal groups; K'ómoks First Nation has directly expressed concerns with respect to Cowie Creek	DFO, BC MOE	Freshwater fisheries program plan; Greater Georgia Basin Steelhead Recovery Plan	Important sport, commercial, and cultural fish species.	Federal <i>Fisheries Act</i> ; BC <i>Fish Protection Act</i>
Cutthroat trout	<i>Oncorhynchus clarkii clarkii</i>	Potential changes in habitat and stream flow in Cowie Creek may affect spawning and recruitment; effluent discharge at closure may affect fish health	Resident and anadromous populations present in Cowie Creek (FISS 2010) species of special concern (blue-listed) in BC	Local Aboriginal groups; K'ómoks First Nation has directly expressed concerns with respect to Cowie Creek	DFO BC MOE	Freshwater fisheries program plan; Strategic plan for the conservation and management of cutthroat trout in BC	Important sport fish species	Federal <i>Fisheries Act</i> ; BC <i>Fish Protection Act</i>
Coho salmon	<i>Oncorhynchus kisutch</i>	Potential changes in habitat and stream flow in Cowie Creek may affect spawning and recruitment; effluent discharge	Anadromous populations present in Cowie Creek (FISS 2010).	Local Aboriginal groups; K'ómoks First Nation has directly expressed concerns with respect to Cowie Creek	DFO	Pacific Region Integrated Fisheries Management Plan (South Coast); Wild Salmon Policy	Important sport, commercial and cultural fish species.	Federal <i>Fisheries Act</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component			Rationale					
Common name	Scientific name	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations
Chum salmon	<i>Oncorhynchus keta</i>	at closure may affect fish health Potential changes in habitat and stream flow in Cowie Creek may affect spawning and recruitment; effluent discharge at closure may affect fish health	Anadromous populations present in Cowie Creek (FISS 2010).	Local Aboriginal groups; K'ómoks First Nation has directly expressed concerns with respect to Cowie Creek	DFO	Pacific Region Integrated Fisheries Management Plan (South Coast); Wild Salmon Policy	Important sport, commercial and cultural fish species.	Federal <i>Fisheries Act</i>
Pink salmon	<i>Oncorhynchus gorbuscha</i>	Potential changes in habitat and stream flow in Cowie Creek may affect spawning and recruitment; effluent discharge at closure may affect fish health	Anadromous populations present in Cowie Creek (FISS 2010).	Local Aboriginal groups; K'ómoks First Nation has directly expressed concerns with respect to Cowie Creek	DFO	Pacific Region Integrated Fisheries Management Plan (South Coast); Wild Salmon Policy	Important sport, commercial and cultural fish species.	Federal <i>Fisheries Act</i>

Note: Agency - Canadian Environmental Assessment Agency; BC - British Columbia; BC MOE - British Columbia Ministry of Environment; DFO - Fisheries and Oceans Canada; FISS - Fisheries Information Summary System

5.5.1.2 Freshwater Fisheries and Aquatic Resources Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each project phase will be described.

5.5.2 Freshwater Fisheries and Aquatic Resources

5.5.2.1 Detailed Freshwater Fisheries and Aquatic Baseline

A review of the results of previous fisheries investigations along with information from online resources provided a basis for a new field program to supplement the description of fisheries resources in the Cowie Creek watershed including fish habitat, fish populations, and movements (see AMEC (2009) for details of previous studies).

The fisheries baseline section will present a synopsis of available documents presenting results from historic and current field work conducted to describe the aquatic habitat, periphyton and benthic invertebrate communities, and resident and anadromous fish communities. This will include descriptions of fish species composition, relative abundance, and distribution, by reach, as well as descriptions of habitat use, life history characteristics, seasonal movements, and metal burdens, by species, in the Cowie Creek watershed. Baseline metal burden concentrations will be described for resident cutthroat trout and rainbow trout populations in the watershed. The baseline will also summarise available data from external sources regarding the enumeration and distribution of spawning anadromous salmonids.

Baseline information will be used as part of the basis for impact analysis in the Application / EIS. This will be done where potential impacts on fish, fish habitat, and lower trophic communities and proposed fish habitat mitigation and compensation measures are presented and discussed.

The requirements for baseline information will be more limited for the Tsable River and its tributaries. Existing studies and data characterizing fisheries and aquatic resources will be compiled from various sources, including, but not limited to, information gathered by local, provincial and federal agencies, academic institutions, and information from scientific literature. Adult coho salmon enumeration will also be conducted for the Tsable River as described in further detail below.

The following provides an outline of the types of sampling and analysis that are proposed to collect and present baseline data needed to assess the potential impacts of the proposed Raven Project on fisheries and aquatic resources.

Habitat Assessment

Fish habitat will be assessed in the proposed Raven Project study area using two provincially standardized methods: the BC Resources Inventory Standards Committee (RISC) 1:20,000 reconnaissance (RISC 2001b) and a modified Fish Habitat Assessment Procedure (FHAP) (Johnston and Slaney 1996).

The 1:20,000 reconnaissance assessments will be used during an initial spring survey to identify reach breaks, watershed features and drainages, and document habitat at a reach scale. Spring habitat assessments will be focused on Cowie Creek above and below the barrier to anadromous fish.

A FHAP will be used to map habitat at the mesohabitat level (e.g., pool, riffle, glide, cascade). The FHAP will be conducted in specific reaches of Cowie Creek as determined by the outcome of the reconnaissance level mapping and the development of the mine plan. It is anticipated these areas include Cowie Creek above and below the anadromous barrier and in the unnamed Cowie Creek tributary where the mine facilities may be located. These assessments will describe the composition of habitat.

Temperature loggers will be set in Cowie Creek, select tributaries, and in Cougar Smith Creek upstream and downstream of tributary confluences to continuously record water temperatures. Approximately seven loggers will be installed and downloaded at three month intervals during water quality sampling.

The single lentic system in the Cowie Creek watershed will be surveyed based on the RISC 1:20,000 reconnaissance level method. Habitat, fish utilization, water quality profiles, substrate and inlet / outlet streams will be considered as part of the survey.

Stream flow assessments will be conducted in Cowie Creek using methods described in the BC Instream Flow Guidelines (Lewis et al. 2004). It is proposed that three visits under high, medium, and low flow levels be used to collect data and calibrate a hydraulic model. The timing of data collection will, where possible, be simultaneous with specific fish activity (e.g., spawning (spring) and rearing (summer)). Transects will be established at the mesohabitat level (e.g., riffles, runs, pools) of Cowie Creek and depth, water velocity, substrate composition, and cover will be measured at regular intervals across the stream.

Fisheries Resources

Seasonal sampling of sites in the LSA will be undertaken during spring and summer to assess fish distribution, habitat use and abundance in Cowie Creek, above and below the anadromous barrier. Spring sampling will also enable the assessment of spawning locations, distribution of spawning fish and size-at-maturity. Minnow trapping and backpack electrofishing will be the two primary fish collection methods used during the spring. Sampling would follow RISC standard protocols.

In summer, relative abundance and density of fish will be measured in Cowie Creek upstream and downstream of the anadromous barrier and in Cougar Smith Creek. Densities of fish in discrete habitat types, in each reach, will be determined by conducting multi-pass depletion estimates using a backpack electrofisher. Fish captured will be identified by species and measured for length and weight. Sexual maturity (where possible) and any deformities will be recorded. Captured fish will be fin-clipped and subsequent recapture of marked fish will be used to provide insight into fish movements within the Cowie Creek watershed.

To understand the importance of habitat and the seasonal use of habitat in the immediate vicinity of the mine facilities, sampling of fish in the spring, summer, and winter will be conducted in the unnamed tributary of Cowie Creek (Tributary C1). This sampling will include minnow trapping and / or backpack electrofishing to determine fish species presence / absence, extent of upstream distribution, habitat use and sexual maturity. Habitat will be assessed based on a modified FHAP. Additional sites will be sampled in headwater areas of Cowie Creek to determine the relative importance of habitat in this tributary to the resident fish populations of the watershed.

The single lentic system in the Cowie Creek watershed will be investigated for the presence of fish. Minnow traps will be the primary sampling method although short-set gillnets and shoreline electrofishing may also be used. Any fish captured will be enumerated, identified by species, and measured.

Fall and winter runs of coho salmon and chum salmon are known to be present in Cowie Creek below the anadromous barrier while fall and winter runs of coho salmon, chum salmon, pink salmon, Chinook salmon and steelhead are known to be present in the Tsable River (BC Fisheries Information Summary System; DFO nuSEDS V2 database). Existing available information from literature, government and other sources will be identified and included in the description of baseline conditions presented in the Application / EIS Guidelines. This will include, but not be limited to historical enumeration and distribution of salmon spawning runs in Cowie Creek and the Tsable River from historical annual escapement records (DFO nuSEDS V2 database) and published information pertaining to the life history and freshwater habitat requirements for these salmon species. In addition, the proponent will conduct adult coho salmon enumeration in Cowie Creek and the Tsable River. This work will be initiated in 2012 and be conducted using methods acceptable to DFO. The data resulting from the 2012 coho salmon enumeration work will be submitted immediately upon completion as part of the environmental assessment process. The requirements for potential further adult coho salmon enumeration beyond 2012 will be determined through subsequent discussions with DFO.

Benthic Invertebrates

Benthic invertebrates will be collected from Cowie and Cougar Smith Creeks. Benthic invertebrates will be semi-quantitatively collected from sites using EC's Canadian Aquatic

Biomonitoring Network (CABIN) protocol, a method recognized and supported by provincial and federal regulatory agencies. Dependent on summer stream flows and suitability of sites, samples will be taken at multiple sites on Cowie and Cougar Smith Creeks. The number of samples collected per site will be based on the CABIN protocol (EC 2010).

Benthic invertebrate samples will be identified to the taxonomic group consistent with CABIN methods and compared to the Georgia Basin reference condition model. Community metrics including dominance structure, mean densities, taxonomic diversity, and similarity indices will be calculated.

Periphyton & Chlorophyll a

Periphyton samples will be conducted at all of the same stream locations as benthic invertebrates. Samples will be collected by scraping attached periphyton from rocks within a 25 centimetres squared (cm²) quadrat consistent with provincially approved methods. Replicate samples for periphyton analysis will be collected: five per site, based on provincial guidelines; and three samples for periphyton analysis to allow for statistical analysis.

Periphyton samples will be identified to a taxonomic level depending on the occurrence and dominance in the sample, and densities will be reported. Samples will be analyzed for concentrations of chlorophyll a, a pigment whose concentration in water is indicative of productivity and trophic status.

Fish Tissue Sampling

Fish will be collected for determining natural background metal burden concentrations from the Cowie Creek watershed, including samples from the Cowie Creek mainstem and Cougar Smith Creek. Sampling will be conducted at approximately three sites with seven replicate samples collected for each species sampled at each site. Length, weight and age data will be collected for all sampled fish. The final trout species, sampling locations and the number of lethal samples will be determined with input from regulatory agencies. Sample size determination will consider the population impacts of lethal sampling. Sampling will be conducted simultaneously with other programs. The baseline study will be the reference point for determining the temporal trends for metal burdens in fish tissue. This will also form the basis for the assessment of the risk to human health due to consumption of potentially contaminated fish.

A combination of historical data and data specific to the proposed Raven Project will be presented in the baseline information with the purpose of clearly and transparently describing the fisheries and aquatic resources in the study areas. Comparisons, where appropriate, will be made to literature and other studies in adjacent watersheds. Baseline data will be used during the impact assessment to assess potential effects, identify mitigation measures, and to assess the level of significance of any residual effects.

Aquatic habitat will be mapped and documented, including barriers and features, cover, gradient, water depth and channel information. Composition of mesohabitats in reaches where an FHAP was conducted will also be calculated.

Hydraulic habitat data will be used to build a model to indicate how habitat conditions in Cowie Creek change with discharge. The data will also provide a means of assessing how flow changes may alter habitat quantity and quality and if, and to what extent, any changes to flows in Cowie Creek may affect fish.

Fish distribution, relative abundance, species composition, density and estimated population will be analyzed. Life history characteristics for cutthroat trout will be calculated, including length-at-age and size-at-maturity. Fish movement will also be reported. Fish muscle and whole body tissue metal concentrations will be reported.

5.5.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will assess all potential effects on fish and fish habitat during each phase of the proposed Raven Project. The assessment will individually address each of the species VCs identified. Potential effects that will be assessed include:

- Direct effects due to the mine footprint;
- Subsidence effects of mining activities on water flow patterns and changes in water quantity and quality to habitats at and downstream of potential areas of alteration (including potential creation or exacerbation of fish barriers);
- Mine dewatering activities;
- Flow changes from water management, surface water diversions, and groundwater pattern alterations;
- Changes in fish harvesting patterns due to changes in access and human presence; and
- Changes in water quality due to mine effluent, surface water run-off, and / or air-borne contamination.

The Application / EIS will include identification of potential linkages between the proposed Raven Project to fisheries, fish habitat, and aquatic resources, identification of necessary mitigation measures, assessment of mitigation measures effectiveness to reduce or eliminate effects, and assessment of residual effects to fisheries, fish habitat, and aquatic resources that may remain after mitigation. Effectiveness of mitigation measures will be based on past uses, an understanding of the unique site conditions and biological characteristics of the system, and the complexity of the mitigations application. The significance of any residual effects to individual fish, populations of resident fish, and to fish habitat in the Cowie Creek watershed will be assessed using professional judgement, any quantitative models available and relevant (e.g., instream flow model), and the published

literature. For quantitative models, assumptions will be described, and any uncertainty associated with assumptions and predictions will be detailed. The analysis of potential effects will consider:

- Productive capacity of fish habitat during each phase of the proposed Raven Project;
- Seasonality of fish utilization and fish-bearing status of potentially affected streams;
- Watercourses that may experience changes in fisheries because of road crossings and power line ROWs;
- Habitat loss or alteration, including aquatic vegetation and sensitive areas such as spawning grounds, nursery areas, winter refuges and migration corridors;
- Natural barriers to fish migrations;
- Changes in stream flow;
- Changes in groundwater seepage quantity and quality;
- Any rare and / or sensitive species and habitat and Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or SARA-listed species;
- Species of cultural, spiritual, or traditional use (TU) importance to Aboriginal groups;
- Traditional ecological knowledge, when and where available;
- Changes to the thermal regime of the aquatic environment;
- Changes to fish harvesting;
- Acoustic effects from blasting on fish and fish habitat in local aquatic systems;
- Entrainment and impingement effects from water withdrawals;
- Direct (chronic and acute toxicity) and indirect (changes in periphyton and benthic invertebrates) effects to fish due to changes in water chemistry (e.g., suspended solids, nutrients, major ions and metals) from runoff, discharges, or air-borne deposition from the proposed Raven Project; and
- Mitigation and / or compensation requirements based on DFO (1991) “Policy for the Management of Fish Habitat” and the related principle of No-Net-Loss (NNL) of the productive capacity of fish habitat.

Proposed mitigation measures will be identified and relevant management plans will be referenced as appropriate. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described

and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Any harmful alterations, disruption, or destruction (HADD) of fish habitat caused by the mine will be quantified. A conceptual compensation plan will be developed that meets DFO's guiding principle of NNL of productive capacity of fish habitat. Conceptual compensation alternatives will be developed that are consistent with regional fisheries management objectives and DFO's preference hierarchy. The conceptual compensation plan will be included in the Application / EIS.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.6 Marine Environment

This section of the Application / EIS will describe scope, approach, methods, and analysis used to describe the marine environment within the proposed Raven Project's area of potential influence.

5.6.1 Valued Component Scoping and Rationale

The selected VCs for marine environment are those VCs with identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The rationale for selecting marine VCs is described below in Table 5.6-1. Species considered for the selection of VCs and focus species will include but not be limited to any species of Aboriginal or public interest, scientific and / or regulatory concerns, conservation status, biodiversity, and sensitivity to proposed Raven Project effects.

Table 5.6-1: Marine Environment Valued Components

Valued Component		Rationale						
Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines	
Marine water quality	n/a	Potential effluent or coal dust discharge into Cowie Creek watershed or along the Alberni I.-Trevor C. Shipping corridor may have an influence on marine surface water quality, marine biota and/or habitat	Identified by AMEC, the proponent, the Agency, DFO	The Cowichan, K'ómoks First Nations and Tseshaht First Nation have expressed concerns with respect to potential Project effects on local water quality	DFO, EC, BC MOE, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Marine surface water quality is valued by general public, NGOs, PRNPR and industry (incl. eco-tourism and shellfish aquaculture)	<i>Fisheries Act, Ocean Act, BCWQG, CEQG,</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component		Rationale						
	Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Shellfish	Pacific oyster (<i>Crassostrea gigas</i>) / Manila clam (<i>Venerupis philippinarum</i>)	Potential changes in water quality may have an influence on the marine nearshore environment, shellfish habitat, and shellfish species of commercial value or of conservation concern	Identified by the Agency, DFO, K'ómoks, Maa-nulth and Tseshaht First Nations	Known to be a significant traditional food source for First Nations; K'ómoks, Maa-nulth, and Tseshaht First Nations also have interests in shellfish aquaculture	DFO, EC, BC MOE	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Baynes Sound Coastal Plan for Shellfish Aquaculture	General public and the Shellfish Industry	<i>Fisheries Act</i> , SARA,

RAVEN UNDERGROUND COAL PROJECT

Valued Component		Rationale						
	Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Marine fish	Plainfin midshipman (<i>Porichthys notatus</i>)	Potential changes in water quality associated with coal transport	Intertidal and mid-water species; Identified by the public	Unknown	DFO	Pacific Region Integrated Fisheries Management Plan	General public, sport and commercial fishing industry, eco-tourism industry	<i>Fisheries Act</i>
	Pacific Herring (<i>Clupea pallasii</i>)	(e.g., coal dust, accidental chemical spills or discharge) or associated with port upgrade activities may have an influence on marine fish, their behaviour, and fish habitat.	Ecologically and commercially important; Identified by AMEC, the Public, and First Nations	known to be a significant traditional fisheries and food source for First Nations; The Cowichan and Tseshaht First Nation have expressed concern with respect to potential project effects on herring				<i>Fisheries Act</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component		Rationale						
Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines	
	Rockfish (various species)	Represent of demersal fish species; Ecologically and commercially important; Identified by AMEC	Unknown				<i>Fisheries Act, SARA</i>	
Marine mammals	Humpback whale (<i>Megaptera novaeangliae</i>) and Killer whale (<i>Orcinus orca</i>)	Potential disturbance from the presence of vessels and associated engine noise may alter the behaviour and distribution of marine mammals; Potential strike by vessels and exposure to hydrocarbons and other chemicals associated with	Species of conservation concern; Provincially and federally listed; Identified by DFO, Parks Canada and Maa-nulth First Nations	Conservation of marine mammals remains a priority for First Nations; The Maa-nulth and Tseshah First Nation have expressed concern with respect to potential Project effects on marine mammals along the shipping corridor	DFO, EC, BC MOE	Vancouver Island Summary Land Use Plan (BC ILMB 2000), PRNPR Management Plan	General public, NGOs, PRNPR, and eco-tourism industry	<i>Fisheries Act, Marine Mammal Regulations, SARA</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component		Rationale						
	Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Marine birds	Marbled murrelet (<i>Brachyramphus marmoratus</i>)	<p>spills and vessels' discharge may affect marine mammal health, growth and survival</p> <p>Potential changes in water quality may have an influence on the marine environment, and marine birds' foraging habitat;</p> <p>Accidental spills or discharge of hydrocarbons or other chemical may have potential lethal and sub-lethal effects on marine birds due to ingestion and or plumage</p>	<p>Species of conservation concern; Provincially and federally listed; Identified by Parks Canada and Maa-nulth First Nations</p>	<p>Conservation of marine birds remains a priority; Identified by the Maa-nulth, Tseshaht and Hupacasath First Nations</p>	<p>BC MOE, EC, BC MFLNRO</p>	<p>Vancouver Island Summary Land Use Plan (BC ILMB 2000); Somass Estuary Management Plan</p>	<p>General public, NGOs, PRNPR, and eco-tourism industry</p>	<p><i>Migratory Bird Convention Act, BC Wildlife Act, SARA</i></p>

RAVEN UNDERGROUND COAL PROJECT

Valued Component		Rationale						
Species of Focus	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines	
	fouling; Potential disturbance from the presence of vessels may alter the behaviour and distribution of marine birds with adverse consequences on foraging.							

Note: Agency - Canadian Environmental Assessment Agency; BC MOE - British Columbia Ministry of Environment; BC MFLNRO – British Columbia Ministry of Forests, Lands and Natural Resource Operations; BCWQG - British Columbia Water Quality Guidelines; CEQG - Canadian Environmental Quality Guidelines; C. - Channel; DFO - Fisheries and Oceans Canada; EC - Environment Canada, I. - Inlet; n/a - not applicable; NGO - Non-Governmental Organization; PRNPR - Pacific Rim National Park Reserve; SARA - *Species at Risk Act*

5.6.1.1 Marine Spatial Boundaries

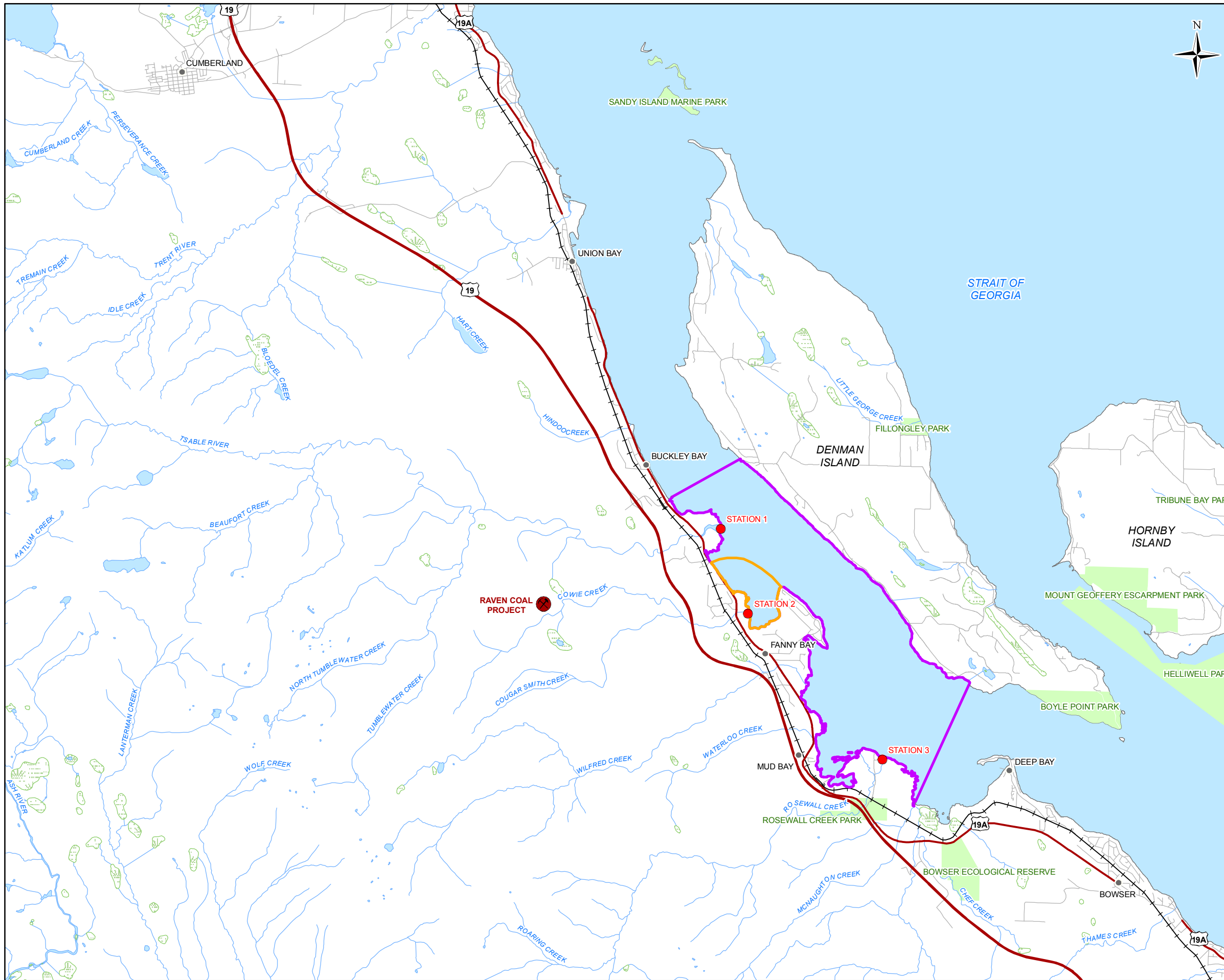
The proposed Raven Project could potentially affect two separate marine areas: 1) Baynes Sound, located between the northeast side of Vancouver Island and Denman Island; and 2) Alberni Inlet / Trevor Channel, located on the west coast of Vancouver Island. The Application / EIS will include an assessment of potential project effects on the marine aquatic resources for each of these two areas.

The marine LSA for studies in Baynes Sound is defined as the nearshore marine waters of Fanny Bay into which Cowie Creek flows (Figure 5.6-1). The LSA includes the nearshore waters of Fanny Bay where project-specific environmental effects would be predicted to occur and could be measured with a reasonable degree of accuracy as a result of potential project effects of Cowie Creek. The marine RSA in Baynes Sound is defined as the nearshore marine waters extending from just north of the Tsable River southward to the southern edge of Deep Bay (Figure 5.6-1). If groundwater modelling (combined flow and quality) predicts the potential for upwelling of contaminated groundwater in Baynes Sound, the marine RSA boundary will be expanded to include those potential effects.

The spatial boundary for marine studies in Alberni Inlet / Trevor Channel includes two areas: a port study area; and a marine study area (Figure 5.6-2). The port study area will include the proposed Port Alberni Port Facility footprint area plus a 200 m buffer. The port study area boundary is based on the potential extent of unmitigated effects from the proposed Raven Project associated with the proposed upgrades to the Port Alberni Port Facility. The marine study area boundary for marine studies includes Alberni Inlet and Trevor Channel shipping corridor to the Cape Beale Pilotage Point (Figure 5.6-2). The Application / EIS will examine the potential effects of possible increased vessel traffic due to coal transport within the marine study area.

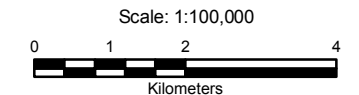
5.6.1.2 Marine Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.





Legend

- Populated Place
- Water Quality Study Area
- ⊗ Raven Coal Project
- Road
- Highway
- + Railway
- Stream
- River & Lake
- ▭ Swamp or Marsh
- ▭ Parks & Protected Area
- ▭ Marine LSA
- ▭ Marine RSA

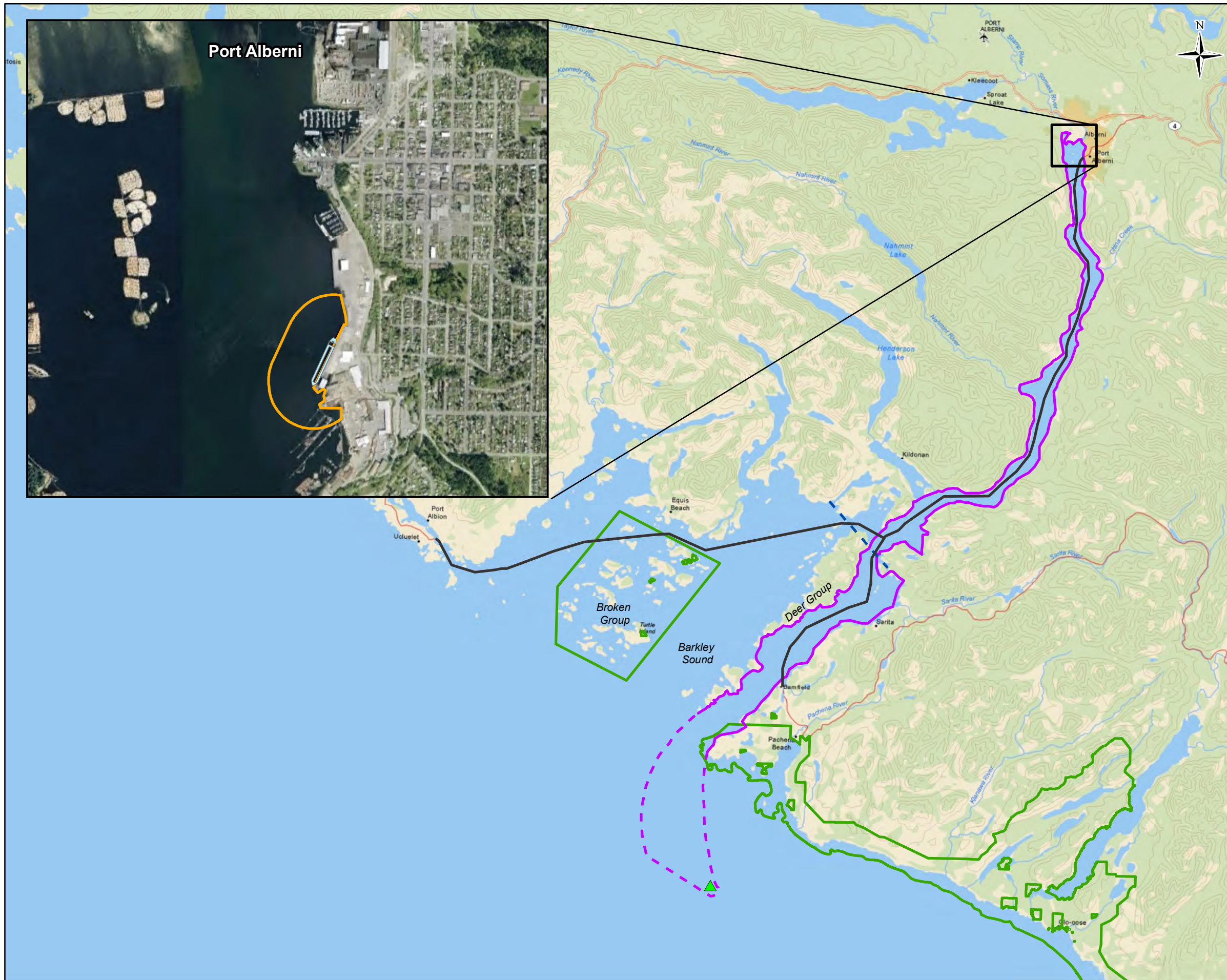


Reference

Basedata:
 Road: Geobase 1:20,000
 Water: Watershed Atlas 1:50,000

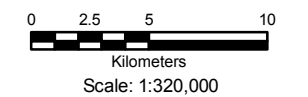
CLIENT:  Compliance Coal Corporation <small>100% Conoco Joint Venture</small>		
PROJECT: Raven Underground Coal Project		
Marine Spatial Boundaries, Baynes Sound, BC		
DATE: July 19, 2010	ANALYST: EO	Figure 5.6-1
JOB No: VE51897	QA/QC: SB	
GIS FILE: 20-50-001.mxd		PDF FILE: 20-50-001_marine_wq_study_area.pdf
PROJECTION: UTM Zone 10	DATUM: NAD83	

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Legend

- ▲ Cape Beale Pilotage Point
- Ferry Route
- - Port Alberni Port Authority Boundary
- ▭ Pacific Rim National Park Reserve of Canada
- ▭ Port Study Area
- ▭ Marine Study Area



Reference

ESRI Community Base Map

CLIENT:	 Compliance Coal Corporation	
PROJECT:	Raven Underground Coal Project Marine Spatial Boundaries, Port Alberni, Alberni Inlet – Trevor Channel, BC	
DATE:	ANALYST:	Figure 5.6-2
January 2011	MY	
JOB No:	QA/QC:	PDF FILE:
VE51897	SB	18-50-020_port_alberni.pdf
GIS FILE:		
18-50-020		
PROJECTION:	DATUM:	
UTM Zone 10	NAD83	

5.6.2 Detailed Marine Baseline

Baynes Sound

The proposed Raven Project will be designed to preclude potential effects to the marine environment of Baynes Sound. Background information on marine resources will be collected through a combination of existing information and a marine sampling program. Existing studies and data characterizing marine resources will be compiled from various sources, including, but not limited, to studies conducted by local, provincial, and federal agencies, academic institutions, and information from peer-reviewed scientific literature. Additional data will be collected as part of a baseline monitoring program to characterize existing water, sediment and shellfish tissue quality conditions, including water quality, sediment chemistry and quality, and potential bioaccumulation of contaminants in shellfish will be collected.

Water quality, sediment quality, and shellfish tissue quality will be characterized at three sites within the LSA and RSA, including a site influenced by historical mining activities (Tsable Creek estuary), a site downstream of the proposed Raven Project (Fanny Bay estuary), and a reference site of similar bathymetry, bottom and exposure where no historical mining has occurred (Deep Bay). Water and sediment quality will be monitored at three subtidal monitoring stations at each site (for a total of three replicates per site). Shellfish tissue quality will be characterized at both intertidal and subtidal monitoring stations at each site (for a total of three intertidal and three subtidal replicates per site).

Water quality monitoring will consist of physico-chemical profiling (temperature, salinity, specific conductance, turbidity, dissolved oxygen) of the whole water column, and characterization of inorganics (metals) and organics (PAHs) concentrations of water using standard oceanographic sampling techniques and semipermeable monitoring devices (SPMDs). Appropriate analytical techniques for marine waters will be used. Sediment quality (total organic carbon (TOC), grain size, metals, and PAHs) of the upper 10 centimetre (cm) sediment layer will be sampled at each subtidal monitoring stations using a van Veen grab. Shellfish tissue will be sampled to determine natural background metal and PAH burden concentrations. Shellfish species selected for tissue sampling include the Pacific oyster (*Crassostrea gigas*) and the Manila clam (*Venerupis philippinarum*). These species were chosen because: 1) they are sessile organisms and thus representative of local conditions; 2) they are recreationally harvested and commercially farmed in Baynes Sound; 3) the Pacific oyster is a filter-feeder, which is found both intertidally and subtidally, lying on the sediment surface or, in the case of farmed oysters, hanging in the water column. Possible contamination pathways are through feeding (filtering of phytoplankton and debris) and direct uptake from water; and 4) the Manila clam is a filter-feeder found intertidally, which burrows through direct uptake from sediments.

Water sampling (water column profiling and metal concentrations) will occur bi-monthly. Sampling of PAH concentrations in water using SPMDs will occur as a single 60-day event

during the period of lowest flow (summer) when dilution would be the lowest. Sediment sampling will occur twice a year during the period of lowest flow (summer) and during the period of highest runoffs (winter). Shellfish sampling will occur bimonthly. Water and sediment samples will be collected following sampling methodologies outlined in the “British Columbia Field Sampling Manual” (BC Ministry of Water, Land and Air Protection (BC MWLAP) 2003). Shellfish monitoring will be based on sampling recommendations outlines in the “Standard Guide for Conducting In-situ Field Bioassays with Marine, Estuarine and Freshwater Bivalves” (Salazar and Salazar 2000).

Alberni Inlet and Trevor Channel

The assessment will include consideration of potential effects from the proposed Raven Project associated with: the proposed upgrades to the Port Alberni Port Facility; loading of coal at the port; and possible increased vessel traffic associated with coal transport along the existing marine shipping route. The work will consider any available information from anticipated PAPA simulation modelling of the shipping corridor from Cape Beale to Port Alberni. The assessment will also consider past, current and foreseeable activities that may interact with the proposed Raven Project.

Within the port study area, background information on marine resources will be collected through a review of existing information and a marine sampling program. Existing studies and data characterizing marine resources will be compiled from various sources, including, but not limited to, studies conducted by local, provincial and federal agencies, academic institutions, and information from scientific literature. Additional data will be collected as part of a baseline monitoring program including:

- An underwater video survey that will be completed at the port to characterize existing habitat which may be impacted by the proposed port upgrades. Video transects will include an area covering the footprint of the area proposed for dredging plus a 30-m buffer; and
- A sediment quality survey (sediment coring, physical and chemical analyses) will be completed to characterize existing chemical levels and physical properties of the sediments within the footprint of the proposed dredge area and to determine an appropriate disposal method and disposal site prior to dredging.

Within the marine study area, background information on marine resources will be collected through a review of existing information. Existing studies and data characterizing marine resources will be compiled from various sources, including, but not limited to, studies conducted by local, provincial and federal agencies, academic institutions, and information from scientific literature. Specifically, the following marine studies will be undertaken:

- Mapping and characterization of sensitive nearshore habitats, including eelgrass and kelp beds, spawning grounds, nursery areas and marine bird colonies;

- Characterization of the behaviour and movement patterns of marine mammals along the marine study area;
- Mapping and characterization of marine bird colonies and behavior along the marine study area;
- A marine mammal collision study to assess the potential for collisions between project-associated vessels and marine mammals; and
- A bow-wake modelling study to estimate bow wakes produced by Panamax-sized vessels under typical operation conditions that will allow the identification of potential effects of shipping traffic to sensitive marine resources in the study area.

5.6.2.1 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will assess potential direct and indirect effects of the proposed Raven Project on marine aquatic resources and marine habitats. The assessment will individually address each of the VCs that are identified. The assessment will give consideration to, and demonstrate linkages between, predicted physical and biological changes resulting from the proposed Raven Project.

Baynes Sound

The following potential effects of the proposed Raven Project on marine resources will be assessed, such as:

- Potential effects on surface or groundwater quality within the Cowie Creek watershed and thus increased loading rates of contaminants to the marine environment;
- Potential effects to the timing or amount of freshwater discharge to the marine environment; or
- Potential changes to the timing, amounts, or particle characteristics of sediment transported to the marine environment.

Alberni Inlet and Trevor Channel

Within the port study area:

- Potential effects on water quality and marine resources of the proposed Port Facility upgrade activities (pile driving, dolphin placement and dredging) will be assessed and applicable management measures will be provided;
- Potential effects of increased noise (in air and underwater) and light during Port Facility upgrades on marine resources (including marine fish, marine birds, and marine mammals) will be assessed;

- Potential effects associated with storm water will be assessed and applicable management measures will be provided; and
- Air quality modeling will be used to assess potential water quality effects to marine nearshore waters as a result of potential fugitive dust from coal loading at the Port Alberni Port Facility. Applicable management measures will be provided.

Within the marine study area:

- The potential effects of increased underwater noise as a result of vessel traffic related to the proposed Raven Project on marine resources (including marine fish, marine birds, and marine mammals) will be assessed;
- The potential for the loss or alteration of marine habitats, including eelgrass / kelp beds and sensitive habitats such as spawning grounds, nursery areas, and bird colonies along the shipping corridor will be assessed;
- The probability of increased vessel collisions with marine mammals along the Alberni Inlet / Trevor Channel shipping corridor will be assessed;
- The potential effects of increased vessel traffic along the shipping corridor on marine birds will be addressed;
- The potential proposed Raven Project effects on commercial, recreational and subsistence fisheries will be addressed;
- The potential of project effects to any species that are rare, vulnerable, endangered, threatened, or of “special concern” as listed under provincial Blue- and Red-lists, SARA, COSEWIC, as well as any species of international significance will be assessed; and
- The potential of project effects to species of cultural, spiritual or traditional use importance to First Nations and Aboriginal groups will be assessed.

The Application / EIS will include an assessment of potential effects on marine aquatic resources and marine habitats from various construction and post-construction activities (e.g., mine construction, mining operation, upgrades to the proposed Port Alberni Port Facility, and coal transportation along well established and well used shipping lanes). The potential for ship wake effects will be evaluated, and if required, shipping protocols will be recommended to prevent wake and any associated effects. If potential effects are identified, these will be assessed.

Appropriate mitigation measures and management strategies will be based on the results of baseline data collection and an assessment of the potential effects of the proposed Raven Project. Mitigation options will be identified for direct effects to species of concern as well as

for habitat effects. Important habitats will be identified for the marine aquatic resource VCs and mitigation or protection measures will be detailed in the Application / EIS.

Any identified residual effects of the proposed Raven Project will be discussed followed by assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.7 Terrestrial Environment

This section of the Application / EIS will describe scope, approach, methods, and analysis used to describe terrestrial environment resources within the proposed Raven Project's area of potential influence.

5.7.1 Valued Components and Scoping Rationale

The selected VCs for terrestrial environment are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The rationale for selecting terrestrial VCs is described below in Table 5.7-1. The preliminary rationale will be updated to integrate results from consultation and the Working Group that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, and biodiversity and sensitivity to proposed Raven Project effects.

Table 5.7-1: Terrestrial Environment Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Terrain, Soils and Surficial Geology							
Physiography and topography	Above ground proposed Raven Project facilities; changing physical topography of site	VC assessed in recent EA process, surface facilities, subsidence, reclamation	To be discussed with local Aboriginal groups	BC MOE, EC, Agency, DFO, NRCan, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	BC <i>Mines Act</i>
Soil cover	Removal of soil cover during construction and operations phases; change from baseline conditions	VC assessed in recent EA process, issue at reclamation	To be discussed with local Aboriginal groups	BC MOE, EC, Agency, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	BC <i>Mines Act</i> , specifically soil salvage and reclamation
Soil quality	Removal and storage of reclamation material; changes in soil quality with time; baseline soil metal analysis to measure change at reclamation	VC assessed in recent EA process, issue at reclamation; supports other discipline (environmental health) interactions	To be discussed with local Aboriginal groups	BC MOE, EC, Agency, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	BC <i>Mines Act</i> ; BC <i>CSR</i> and <i>CEQG</i> would be applied
Surficial geology	Above ground proposed Raven Project facilities; conversion of	VC assessed in recent EA process, surface facilities,	To be discussed with local Aboriginal groups	BC MOE, EC, Agency, DFO,	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	BC <i>Mines Act</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
	baseline surficial geology to post mine materials	subsidence, reclamation		NRCan, BC MFLNRO			
Vegetation and Plant Communities							
Biodiversity and plant community structure composition	Site clearing for above ground project facilities; above ground project facilities siting and potential reduction of habitat	VC assessed in recent EA process, surface facilities, subsidence, issues at reclamation	To be discussed with local Aboriginal groups	BC MOE, EC, Agency, MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	<i>BCEAA, CEA Act</i>
Species at risk	Site clearing for above ground proposed Raven Project facilities; above ground proposed Raven Project facilities siting and potential effect on species at risk	VC assessed in recent EA process, surface facilities	To be discussed with local Aboriginal groups	BC MOE, EC, Agency	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	<i>SARA</i>
Ecological communities at risk	Site clearing for above ground proposed Raven Project facilities; proposed Raven Project facilities siting and potential effect on	VC assessed in recent EA process, surface facilities	To be discussed with local Aboriginal groups	BC MOE, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	Not applicable

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
Interaction with proposed Raven Project activities ecological communities at risk	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines	

Note: Agency - Canadian Environmental Assessment Agency; BC - British Columbia; BC CSR - *British Columbia Contaminated Sites Regulation*; BCEAA - British Columbia *Environmental Assessment Act*; BC MFLNRO- British Columbia Ministry of Forests, Lands and natural Resource Operations; BC MOE - British Columbia Ministry of Environment; *CEA Act* -*Canadian Environmental Assessment Act*; CEQG - Canadian Environmental Quality Guidelines; DFO - Fisheries and Oceans Canada; EA - Environmental Assessment; EC - Environment Canada; NRCan - Natural Resources Canada; PAPA - Port Alberni Port Authority; SARA - *Species at Risk Act*; VC - Valued Component

5.7.1.1 Terrain, Soils and Surficial Geology Spatial Boundaries

The LSA boundary for soils, terrain and surficial geology includes the footprint area for the proposed Raven Project, plus a 500-m buffer. The LSA boundary buffer is based on the maximum potential extent of unmitigated effects on soils and terrain from subsidence, and potential effects on soil chemistry from fugitive dust. The RSA boundary for soils, terrain and surficial geology is based on 1:50,000 soils mapping by BC MOE and follows the boundaries selected for wildlife and vegetation and wetlands for consistency. Figure 5.7-1 shows the boundaries for terrestrial study areas.

5.7.1.2 Terrain, Soils and Surficial Geology Temporal Boundaries

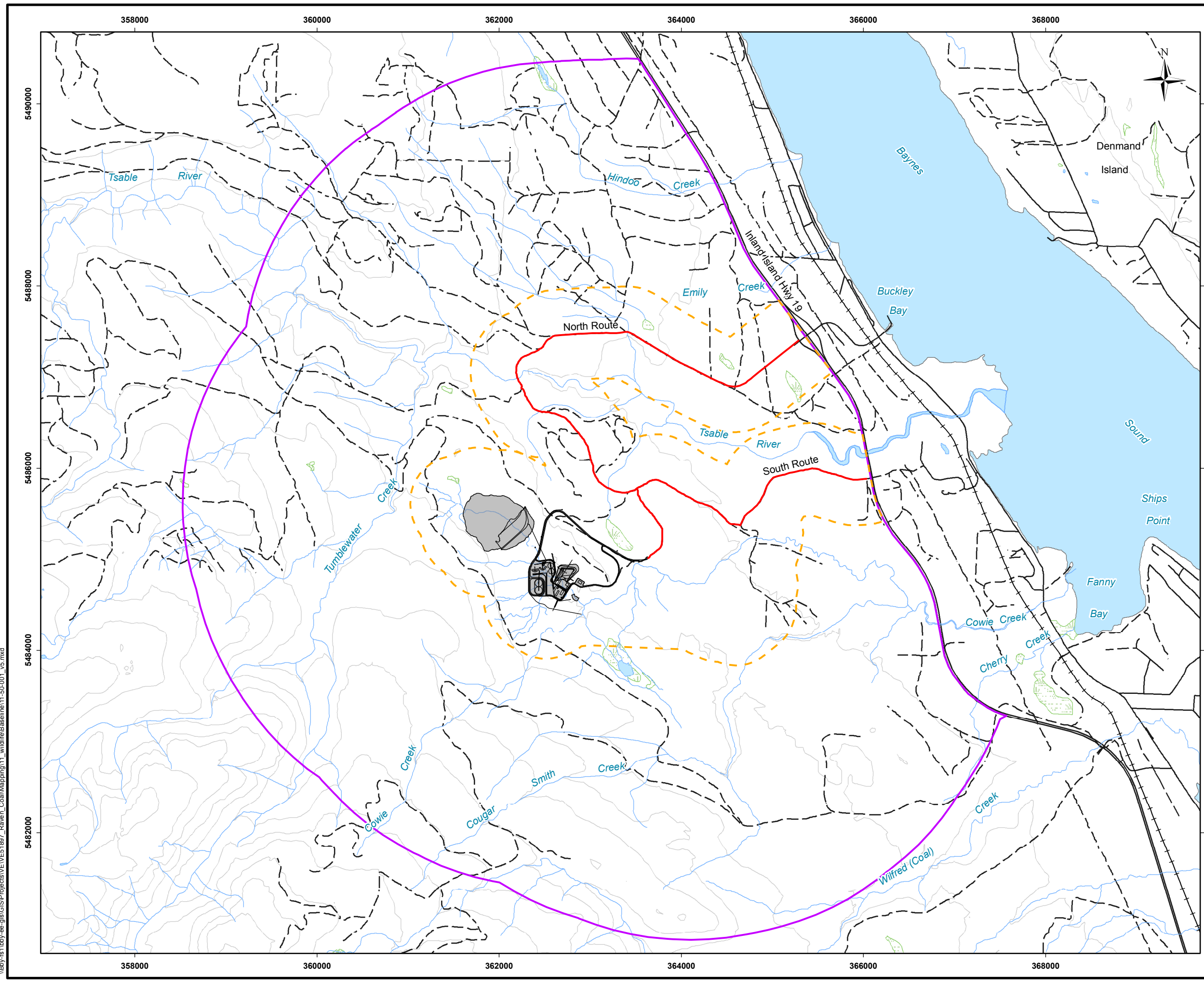
The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

5.7.1.3 Vegetation and Plant Communities Spatial Boundaries

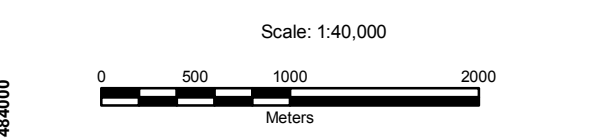
The LSA for vegetation and wetlands, which is the same for other terrestrial studies (Figure 5.7-1), is set at 500 m beyond the footprint of the proposed mine and supporting facilities. Potential direct unmitigated effects on wildlife (i.e., noise and dust) are expected to be observed within this area. The RSA boundary is set so as to encompass all the vegetation community types that may potentially be affected by the proposed Raven Project development, and that may be used by wildlife in the area. Wetlands and riparian corridors are of particular importance in having special floristic characteristics as well as providing habitat for wetland dependent wildlife such as amphibians.

5.7.1.4 Vegetation and Plant Communities Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.



- Legend**
- Proposed Access Road
 - Paved Road
 - - - Gravel/Rough Road
 - + + + Railroad
 - Elevation Contour (100 m)
 - Watercourse
 - Waterbody
 - Wetland
 - - - Terrestrial LSA
 - Terrestrial RSA
 - Potential Location of Site Facilities



Note:
Wildlife and vegetation included in terrestrial study area

Reference
TRIM scale 1:20,000

CLIENT:	Compliance Coal Corporation <small>100% Concor Joint Venture</small>	Compliance Coal Corporation
PROJECT:	Raven Underground Coal Project	
Terrestrial Spatial Boundaries		
DATE:	ANALYST:	Figure 5.7-1
February 22, 2010	EO	
JOB No:	QA/QC:	PDF FILE:
VE51897	TB	11-50-001_terra_study_area.pdf
GIS FILE:		
11-50-001		
PROJECTION:	DATUM:	
UTM Zone 10	NAD83	

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5.7.2 Terrain, Soils and Surficial Geology

5.7.2.1 Detailed Terrain, Soils and Surficial Geology Baseline

This section will describe the ground conditions and land suitability classification at the mine site, ancillary facilities, access road, and power line route.

Soils mapping will be completed in conjunction with Terrestrial Ecosystem Mapping (TEM) for vegetation and wildlife. The BC RISC has bioterrain and TEM standards that will be followed (RISC 1996, 1998d, 2002b). These require air photo type mapping followed by ground truthing at specific intervals dependent on the scale of the maps required. For the site footprint, 1:10,000 scale maps will be required; this would need confirmation with BC MOE prior to commencing work. Terrain hazards are identified by terrain mapping at the same scale as TEM. Terrain stability ratings (see also Section 22.6) will be assigned to each polygon through aerial photograph interpretation based on the criteria outlined in the "Mapping and Assessing Terrain Stability" (BC Ministry of Forests (BC MOF) 1999).

Field sampling follow up will be carried out by a combined team of soils / surficial geology / terrain, wildlife, and vegetation specialists to check preliminary type mapping of the proposed Raven Project area. This level of analysis will be required for the immediate footprint and a buffer of approximately 500 m around the proposed disturbance site. For regional level (i.e., RSA) information, existing reports and TEM mapping should suffice, but will have to be confirmed with BC MOE.

A description of surface soils and surficial geology will be provided, including:

- Physiography and topography;
- Terrain and surficial geology - landform, slopes, drainage characteristics, surficial material;
- Soils - classification, suitability for reclamation, quality, erosion potential;
- Geology - stratigraphy, bedrock, structural, coal seam development, correlation and potential for subsidence; and
- Geological cross sections that traverse the proposed underground mine areas and provide characterization to appropriate depths.

Background concentrations of metals and soils suitability for reclamation will be required for the EA and the *Mines Act* permit. Lab and data analysis of selected soils samples will be analyzed for pH, texture (particle size), total carbon, total nitrogen, cation exchange capacity, conductance, total sulphur, exchangeable cations (calcium, magnesium, sodium and potassium), available metals (aluminum, copper, iron, phosphorus, manganese, zinc), and sand salinity if applicable. Soil elemental analysis will be completed for samples taken within the proposed Raven Project footprint for the parameters listed below in Table 5.7-2.

This analysis would be compared against existing CCME guidelines to determine the baseline chemical conditions of the soil.

Analyses and data collected will be used for assessment of soil suitability for reclamation and characterization of soil chemical properties (i.e., pH, electrical conductivity, sodicity and saturation percentage), and physical properties (i.e., texture, moist consistency, and volumetric stone content).

Table 5.7-2: Soil Elemental Parameter List

Trace Elements	Other Elements
Aluminum	Calcium
Arsenic	Magnesium
Barium	Potassium
Cadmium	Sodium
Chromium	Cation exchange capacity
Cobalt	
Copper	Physical Parameters
Lead	pH
Manganese	Conductivity
Mercury	Texture
Molybdenum	Volumetric stone content
Nickel	
Selenium	
Thallium	
Vanadium	
Zinc	

5.7.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will identify potential effects on the environment when terrain, surficial geology, bedrock, or soils are disturbed or used in any phase of the proposed Raven Project. For each VC, the assessment will consider the potential effects of:

- Erosion and sedimentation in relation to altered drainage in all parts of the proposed development infrastructure (e.g., power line ROW and mine roads);
- Effects on landform (terrain) diversity;
- Ground freezing occurrences and effects on containment structures;
- Coarse rejects stockpiles and fine rejects stockpiles and / or ponds, topsoil and till storage, borrow pits and aggregate use with resulting terrain disturbance;
- Rock types, including geochemistry and ML/ARD potential;

- Potential for subsidence, including possible resulting changes in surface and groundwater quality and flows;
- Existing geological faults within the potentially affected areas encompassed by both above and below ground operations;
- Interaction between existing geological faults with mine subsidence which create or exacerbate barriers to fish passage, and which interact with groundwater and surface water flow patterns;
- Seismicity and natural erosion potential, landslides and slope instabilities;
- Potential effects of climate change on natural hazard risk; and
- Volume and characteristics of material stockpiled for reclamation and changes to stockpiled material over time.

Proposed mitigation measures would be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed followed by assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.7.3 Vegetation and Plant Communities

5.7.3.1 Detailed Vegetation and Plant Communities Baseline

The Application / EIS will include a complete and detailed description of the local and regional vegetation and wetlands data near the proposed Raven Project, including, but not limited to:

- **Terrestrial vegetation:** Documentation of: (a) trees, other terrestrial plants, lichens, mosses, invasive and noxious plant species (species composition, relative abundance and distribution, forest cover) that provide habitat and / or food for wildlife; and (b) potential for proposed Raven Project activities to affect such terrestrial vegetation;

- **Wetlands:** Documentation of: (a) wetlands that provide habitat and / or food for wetland wildlife; and (b) potential for activities to affect wetlands. Wetlands will be classified according to provincial classification system, and includes aquatic vegetation;
- **Rare and Listed species:** Documentation of plant species covered by SARA, COSEWIC, and BC Provincial Red- and Blue-Lists; and
- **Species of importance to humans:** Documentation of plant species that are of importance to the local economy, local communities, and Aboriginal communities.

Vegetation and plant communities within the study area will be mapped and will follow a modified protocol outlined in “Standard for Terrestrial Ecosystem Mapping in British Columbia” (RISC 1998d). TEM uses a combination of pre-field photo interpretation and delineation followed by site visits to classify and map ecosystems within each polygon. During the TEM field program, representative polygons will be visited, classified to the site series level, assigned a structural stage and modifiers. The final ecosystem map will be adjusted and revised based on the ground plots and field data collected. The final ecosystem map will be at a scale of 1:10 000. The VENUS database will be used to handle and analyze final ecosystem data.

Wetlands and riparian areas will be identified and classified based on MacKenzie and Moran (2004) and their distribution will be characterized as part of the TEM studies. Because of the importance of wetland areas, particular care will be taken to survey and map these areas during the TEM program. Wetland ecological function assessments will be conducted for wetlands affected by the proposed Raven Project.

Appropriate standards and protocols will be used for rare plant surveys and will be appropriately referenced in the Application / EIS. Time periods and levels of effort will be documented. A list of potential rare vascular plant species, given the biogeoclimatic (BGC) subzone and geographic location of the proposed Raven Project, will be used to stratify the landscape and focus rare plant searches.

In addition to online searches, BC MOE will be contacted for information on listed species that potentially may occur in the proposed Raven Project site (BC Conservation Data Centre (BC CDC) 2010). A targeted investigation for these species and habitats will be combined with TEM studies. A list of potential rare vascular plant species given the BGC subzone and geographic location of the proposed Raven Project area will be used to stratify the landscape and focus rare plant searches. In advance of TEM, sampling locations will be governed by the distribution of BGC subzones and ecosystem units in the study area. Both vascular and non-vascular plants will be documented during these surveys. Herbarium voucher specimens may be collected for identification purposes when necessary. Rare plant associations will be identified and mapped in conjunction with the TEM studies and sensitive ecosystems will be mapped based on the Sensitive Ecosystems Inventory (SEI)

(Ward et al. 1998). A SEI identifies and maps rare and fragile ecosystems (sensitive ecosystems) in a given area. SEI methodology can either be based on air photo interpretation for SEI polygons, or as an SEI theme based on TEM polygons (BC MOE 2011). For the proposed Raven Project, sensitive ecosystems will be mapped as a separate layer based on SEI. Sensitive ecosystems will be considered within the context of the Comox Sub-unit (Ward et al. 1998). A review of invasive plants and nuisance weeds as designated by the BC *Weed Control Act* (Government of BC 1996g) will be completed and presence / absence recorded during the TEM program. Timber resource values will be examined within the entire footprint area of the proposed Raven Project. This will include access roads, the mine site, and power line alignment. To assess economic effects, the work is planned to be initiated as part of the baseline data collection following finalization of the power line alignment and ROW.

Data collected as part of this TEM program will follow the methodology standard found in "Describing Terrestrial Ecosystems in the Field" (Luttmerding 1990) and will be analyzed to determine the distribution of ecosystems including listed and sensitive ecosystems. Species richness and diversity will be evaluated and invasive species distribution will be characterized.

Evaluation of the specific impacts to vegetation from construction and post-construction mine activities (i.e., land clearing, construction, mine operation, and transmission line operation) on specific VCs will be determined.

The vegetation personnel will work in close communication with surficial geology, terrain, and wildlife personnel due to the extensive and logical overlap among these disciplines.

5.7.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will identify potential effects on vegetation and plant communities from activities related to the proposed Raven Project. The assessment will include:

- Local plant associations classified as ecological communities, including trees, shrubs, herbs, mosses and lichens;
- Plant species of importance to Aboriginal groups, either directly as food, or indirectly as food for important harvest wildlife species (information to be obtained from available TK studies and published literature);
- COSEWIC and SARA-listed plant species;
- Habitat loss or alteration which is long-term, direct or indirect;
- Wetlands;
- Vegetation productivity;

- Vegetation capability and vegetation diversity, including but not limited to intra- and interspecific diversity and landscape diversity; and
- Potential for invasive, noxious plants, as defined in the BC *Weed Control Act*.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described, and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Section 10 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.8 Wildlife and their Habitat

This section of the Application / EIS will describe scope, approach, methods, and analysis used to describe wildlife and wildlife habitat within the proposed Raven Project's area of potential influence. The Application / EIS will include a description of wildlife habitat, mammals, birds, amphibians and reptiles, rare and endangered species, and species of importance to humans.

5.8.1 Valued Components Scoping and Rationale

The selected VCs for wildlife and their habitat are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included a part of the rationale for selection. The preliminary rationale for selecting wildlife and wildlife habitat VCs is described below in Table 5.8-1. The preliminary rationale will be updated to integrate results from consultation and the Working Group that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, and biodiversity and sensitivity to potential effects of the proposed Raven Project.

Table 5.8-1: Wildlife and their Habitat Valued Components

Valued Component			Rationale						
Common name	Species of focus	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations	
Ungulates	Roosevelt elk	Breeding, foraging. Use site for life requisites	First Nation concerns, BC MOE concern for population status, overwintering habitat in proposed Raven Project area. Provincially Blue-listed. Observed in study area during numerous field visits	Traditional knowledge and use study, Qualicum First Nation Traditional Knowledge Workshops, 19 January 2010 and 8 March 2010 and other First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Hunting importance to locals and guide outfitters in the area	SARA, BC <i>Wildlife Act</i>	
Small mammals	American water shrew	In streams and associated riparian areas	Red-listed in the province	First Nations with traditional territory in the area	BC MOE, BC MFLNRO	n/a	Local naturalists	BC <i>Wildlife Act</i>	
Waterbirds	Various (e.g. great-blue heron waterfowl, trumpeter swan)	Along watercourses and wetland use	Various provincial and federal listed species	First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Public	SARA, BC <i>Wildlife Act</i> , <i>Migratory Birds Convention Act</i>	
Songbirds	Olive-sided flycatcher, purple martin	Footprint activities of the study site	Red and Blue-listed species observed during field surveys	First Nations with traditional territory in the	BC MOE, EC, BC MFLNRO	n/a	Local naturalists	<i>Migratory Birds Convention</i>	

RAVEN UNDERGROUND COAL PROJECT

Valued Component			Rationale					
Common name	Species of focus	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations
Raptors	Western screech-owl, bald eagle, osprey	Footprint and above ground facilities and activities in the riparian areas.	during breeding season Special Concern listed by COSEWIC and Red-listed in the province	area First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Local naturalists	Act, BC Wildlife Act Migratory Birds Convention Act, SARA, BC Wildlife Act
Amphibians	red-legged frog and western toad	Footprint and above ground proposed Raven Project facilities and activities in the wetlands and riparian areas	Special Concern species present listed by COSEWIC and province. Identified breeders on-site	First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Local naturalists	BC Wildlife Act, SARA
Carnivores	Various	Footprint and above ground Project facilities		First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Local Naturalists	BC Wildlife Act, SARA
Invertebrates	Various	Host plants may be lost due to infrastructure placement	Provincially Red- and Blue-listed	First Nations with traditional territory in the area	BC MOE, EC, BC MFLNRO	n/a	Local Naturalists	BC Wildlife Act

Note: BC - British Columbia; BC MOE - British Columbia Ministry of Environment; BC MFLNRO- BC Ministry of forests, Lands and Natural Resource Operations; COSEWIC - Committee on the Status of Endangered Wildlife in Canada; CWS - Canadian Wildlife Service; n/a - not applicable; SARA - *Species at Risk Act*

5.8.1.1 Wildlife and Wildlife Habitat Spatial Boundaries

The wildlife LSA and RSA are common to terrestrial studies (Figure 5.7-1). The LSA is set at 500 m beyond the proposed footprint of the mine and supporting facilities. Potential direct unmitigated effects on wildlife (i.e., noise and dust) may be observed within this area. The RSA boundary extends in an arc approximately 4 km from the mine site, into the hills above the mine site, and down to the Island Hwy. The RSA boundary was set because this is the maximum probable extent of unmitigated effects on larger ranging species such as elk.

5.8.1.2 Wildlife and Wildlife Habitat Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each project phase will be described.

5.8.2 Wildlife and Wildlife Habitat

5.8.2.1 Detailed Wildlife and Wildlife Habitat Baseline

The Application / EIS will include a description of the local and regional wildlife near the proposed Raven Project, including, but not limited to:

- **Habitat:** Documentation of: (a) terrestrial habitat within the zone of influence for the proposed Raven Project (proposed footprint plus a 500-m buffer). The rationale for this buffer is that the area enclosed would include all habitats potentially affected by mine activities such as actual habitat loss, dust and noise. Habitats further away in the RSA would be described as necessary and would be applicable in the context of the wildlife studies and species of concern use by; (b) known and potential critical habitats (i.e., feeding, nesting, denning, and reproductive habitats) of identified wildlife species VCs; (c) potential for proposed activities to cause loss in quantity or quality of habitat; and (d) documentation of inventories and chosen wildlife VC suitability ratings based on vegetation / habitat mapping. It is probable that while wildlife may be sighted within the RSA, nesting and denning activities are likely to occur outside the RSA because much of the current area within the RSA is impacted by current and recent logging activities;
- **Mammals:** Documentation of: (a) mammalian wildlife such as ungulates, carnivores, furbearers, sensitive species and TU species; and (b) potential for proposed activities to affect mammalian wildlife (e.g., disruption of seasonal and daily movements);
- **Birds:** Documentation of: (a) avian wildlife such as songbirds, waterfowl, shorebirds, raptors, sensitive species, TU species and possible breeding locations,

impacts from proposed site activities would be assessed for impacts to select species of management concern; and (b) potential for proposed activities to affect avian wildlife in the RSA;

- **Amphibians and reptiles:** Documentation of: (a) amphibian and reptilian wildlife such as frogs, toads, snakes, turtles, sensitive species, TU species (species composition, distribution, life history characteristics, habitat utilization, and possible seasonal movements); and (b) potential for project activities to affect amphibian and reptilian wildlife within the LSA;
- **Rare and Listed species:** Documentation of wildlife species covered by *SARA*; COSEWIC; BC provincial Red- and Blue-Lists (BC CDC 2010) and how they may be affected by the proposed Raven Project; and
- **Species of importance to humans:** Documentation of wildlife species that are of importance to the local economy, local communities, Aboriginal communities and how they may be affected by the proposed Raven Project.

Assessment of mammalian wildlife and habitat will involve direct field observation techniques such as visual and auditory observations and subsequent documentation and other indirect evidence. This includes the documentation of large mammal movement corridors, tracks in the ground, mineral licks and mineral springs, foraged or scratched vegetation, hair and other biological traces. Air photos will be used to select transect locations. Pre-field photo interpretation will be combined with site visits to classify and map habitats. Background information and knowledge shared by local Aboriginal groups will be used to assess the movements and site use of mammals in conjunction with the field surveys throughout the RSA.

Assessment of avian wildlife and habitat will involve direct field observation techniques such as visual and auditory observations and subsequent documentation during the appropriate breeding periods for all species of management concern. Where applicable, the surveyors will also take notes on the types of habitat present along the transects (e.g., coniferous forest, deciduous forest, open habitat etc.). Vegetation mapping will be used to assess species use in each vegetation unit. Avian wildlife will be assessed with call playback techniques for raptors and other species where appropriate and at appropriate breeding periods. Vegetation and air photos will be used to select transect locations for breeding bird survey locations throughout the site at specific locations. Pre-field photo interpretation will be combined with site visits to classify and map habitats.

Evidence of amphibians, reptiles, and invertebrates, as well as all rare and listed species regardless of taxa, would be documented during the completion of all field activities. During the late spring and summer breeding times, all wetlands, watercourses and their riparian areas will be visited to identify species composition, breeding and dispersal potential for herpetofauna.

Invertebrate sampling for families of Odonata and Lepidoptera will be conducted using transect protocols through appropriate habitats for the species of management concern during breeding times. Each wildlife habitat will be identified with the aid of TEM studies. Aboriginal groups and BC MOE will be contacted when necessary for information on any threatened, rare, or endangered fauna potentially in the proposed Raven Project area and a targeted investigation for these species and habitats will be combined with TEM studies. All sampling locations will be discussed in the context of the BGC subzones in the study area and RISC (1999a).

All surveys for wildlife and wildlife sign will conform to modified RISC standards where applicable. For amphibians and reptiles, specific wetlands will be surveyed using systematic search protocols outlined in RISC (1998b). All other sightings of amphibians and reptiles will be collected from incidental sightings as part of the fisheries assessments. Songbird and water bird surveys will be performed as outlined in RISC (1999b). For raptor surveys, call-back methods will be used as described in RISC (2001a). Mammal surveys will be performed at the time of all field visits to the site. Mammal presence will be recorded as incidental and based on signs of presence and direct field observation. Any incidental small or large mammal sightings will be recorded as part of all surveys by the various disciplines. A winter snow survey for tracks on transects of known length will be completed (modified RISC 1999a). TK / TU study, Qualicum First Nation TK Workshop information will also be used to confirm mammal use. Where applicable, surveys will also follow RISC (1998a, 2002a). Modified RISC (1998c) will be used for invertebrate association surveys at select locations.

Data collected as part of this program will be analyzed according to standardized protocols for evaluation of wildlife, wildlife habitat, and vegetation communities. Evaluation of the specific impacts to vegetation, wildlife, and wildlife habitat from construction and post-construction mine activities (i.e., land clearing, construction, mine operation and transmission line operation) on specific VCs will be determined.

The wildlife personnel will work in close and constant communication with surficial geology and terrain personnel, vegetation and wetlands personnel, and environmental health personnel, due to the extensive and logical overlap among these disciplines.

5.8.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will identify potential direct and indirect effects on wildlife (including amphibians) and wildlife habitats (including habitats used by migratory birds defined and protected under the federal *Migratory Birds Convention Act, 1994* (Government of Canada 1994b)), giving consideration to, and demonstrating linkages between, predicted physical and biological changes resulting from the proposed Raven Project. The Application / EIS will individually assess each species identified as a VC.

The Application / EIS will include an assessment of potential effects on wildlife and wildlife habitat from various construction and post-construction activities (e.g., clearing,

construction, mining operation, and power line operation). The Application / EIS will include an assessment of the potential effects of the proposed Raven Project on the following:

- Terrestrial habitat, including the quality and quantity of any lost habitat for relevant species;
- Feeding, nesting, denning or breeding habitats;
- Any wetland habitat alteration or loss;
- Barriers to wildlife, including the roads developed as part of the mine and their potential effects on wildlife movements;
- Disturbance of daily or seasonal wildlife movements (e.g., migration and home ranges), which would include potential hazards and conflicts associated with mine access and travel corridors of terrestrial wildlife, particularly ungulates and bears;
- Any species that are rare, vulnerable, endangered, threatened, or of “special concern” as listed under provincial Blue- and Red-lists, SARA, COSEWIC, as well as, any species of international significance;
- Direct and indirect wildlife mortality from the mine operations and traffic;
- Wildlife productivity;
- Species of cultural, spiritual or TU importance to Aboriginal groups; and
- Implications of the proposed Raven Project acting as an attractant for particular species.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.9 Environmental Health

5.9.1 Valued Components Scoping and Rationale

The selected VCs for environmental health are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The rationale for selecting environmental health VCs is described below in Table 5.9-1. The rationale will be updated to integrate results from consultation and the Working Group that reflect Aboriginal interests, scientific and / or regulatory concerns, conservation status, biodiversity, and sensitivity to the potential effects of the proposed Raven Project.

Table 5.9-1: Environmental Health Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Humans	Exposure pathways such as inhalation, ingestion and dermal contact	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE, BC MFLNRO EC, HC, Agency	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Of interest to public and NGOs	National and Provincial Ambient Air Quality Objectives, BC CSR and CEQG, <i>Public Health Act</i>
Mammals (large carnivores / omnivores, ungulates, furbearers)	Ingestion of food water and soil / sediment. Inhalation and dermal exposures	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE,, BC MFLNRO EC, Agency	To be determined	Of interest to public and NGOs	<i>BCEAA, CEA Act, BC CSR and CEQG</i>
Birds (raptors, songbirds, waterfowl, shorebirds)	Ingestion of food water and soil/ sediment. Inhalation and dermal exposures	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE, BC MFLNRO EC, Agency	To be determined	Of interest to public and NGOs	<i>BCEAA, CEA Act, BC CSR and CEQG</i>
Amphibians	Direct contact with soil and water	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE, BC MFLNRO EC, Agency	To be determined	Of interest to public and NGOs	<i>BCEAA, CEA Act, BC CSR and CEQG</i>
Fish	Direct contact with water	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE, BC MFLNRO EC, Agency	To be determined	Of interest to public and NGOs	<i>BCEAA, CEA Act, Water Act, Fisheries Act, BCWQG, CEQG, BC CSR</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Invertebrates (terrestrial and aquatic)	Direct contact with water	VC assessed in recent EA process	Of interest to local Aboriginal groups with traditional territory in the area	BC MOE, BC MFLNRO, EC, Agency	To be determined	Of interest to public and NGOs	<i>Fisheries Act</i>

Note: Agency - Canadian Environmental Assessment Agency; BC CSR - British Columbia *Contaminated Sites Regulation*; BCEAA - BC *Environmental Assessment Act*; BC MFLNRO - British Columbia Ministry of Forests, Lands and natural Resource Operations; BC MOE - British Columbia Ministry of Environment; BCWQG - British Columbia Water Quality Guidelines; *CEA Act* - *Canadian Environmental Assessment Act*; CEQG - Canadian Environmental Quality Guidelines; EA - Environmental Assessment; EC - Environment Canada; HC - Health Canada; NGO - Non-Government Organization; VC - Valued Component

5.9.2 Environmental Health

The environmental health section will integrate environmental chemistry data presented in other sections, and examine potential adverse impacts to the health of people and other organisms from cumulative exposure to chemicals in all environmental media. Each VC identified will be addressed individually in the Application / EIS.

Where analytical data was not collected, mathematical media concentration modelling will be completed to identify the potential adverse impacts to the health of humans and other organisms. Other sections typically begin and end their analyses of chemistry data by simply comparing to CCME guidelines, which is an approach that could lead to potential health risks being under- or over-estimated when looked at individually. The environmental health section will quantify and prioritize potential carcinogenic and non-carcinogenic health effects in accordance with risk assessment methodologies from Health Canada (HC), EC, and the BC MOE.

This section of the Application / EIS will describe the assessment of the potential effects of each phase of the proposed activities on the health of the natural environment. An analysis of potential contaminant pathways and environmental relationships that are important for project planning will be provided. The Application / EIS will identify vulnerable ecosystem units, potential effects, and mitigation measures for any potentially significant adverse impacts identified during the assessment.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described, and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

5.10 Summary of Assessment of Potential Environmental Effects

A summary of any potential residual effects of the proposed Raven Project and their significance will be provided in the Application / EIS using the format presented in Table 5.10-1. Potential residual effects will be identified by phase (i.e., construction, operations, closure and decommissioning).

Table 5.10-1: Summary of Potential Environmental Effects Analysis

Valued Components (Note Phase of proposed Raven Project)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)

6 ASSESSMENT OF POTENTIAL ECONOMIC EFFECTS

6.1 Economic Background

The Application / EIS will include a description of the existing economic environment, local, regional and provincial settings.

6.2 Economic Health

6.2.1 Valued Economic Component Scoping and Rationale

The selected VCs for economic health are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information, which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. Each VC is broken down into unique indicators that together are considered broadly representative of the larger VC. The rationale for selecting economic VCs is described below in Table 6.2-1.

Table 6.2-1: Economic Health Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Provincial economy and government revenues	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	MPMO, BC MJTI, BC MEM	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	Municipal government's interest in increased demands on infrastructure and services, including housing and transportation, as well as government finances.	To be determined
Regional employment	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MRES D, BC MJTI, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	Commercial and public interest on regional employment and income	To be determined
Employment opportunities	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MJTI, MPMO, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	Local communities interests in potential employment effects	To be determined

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Contract and business opportunities	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MRES D, BC MJTI, MPMO, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	Commercial and public interest on contact and business opportunities	To be determined
Labour income	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MJTI, MPMO, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), ACRD	Government, business and public interest	To be determined
Local unemployment rate and trend	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MJTI, MPMO, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), ACRD	Government, business and public interest	To be determined

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Regional government finances	Proposed Project contribution to regional government finances	VC assessed in recent EA process		CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), ACRD	To be determined	To be determined
Employment and economic diversification	The proposed Raven Project is considered as a Major Project, BC MRES D	VC assessed in recent EA process	Some local Aboriginal groups have expressed interest in potential opportunities related to the proposed Raven Project, as well as possible economic and social effects	BC MJTI, MPMO, CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	Government, business and public interest	To be determined

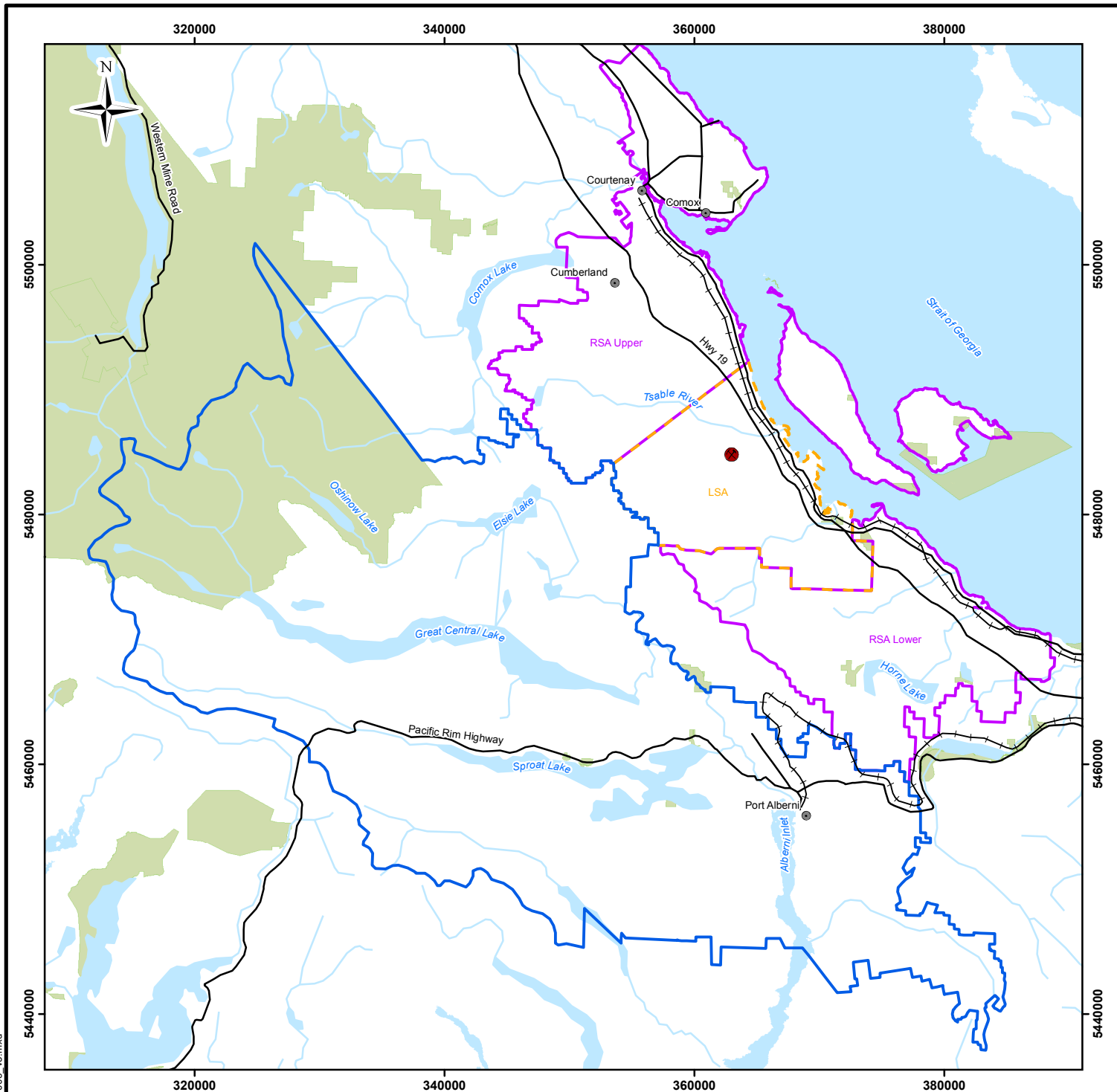
Note: ACRD - Alberni-Clayoquot Regional District; BC EAO - British Columbia Environmental Assessment Office; BC ILMB - Integrated Land Management Bureau; BC MEM - British Columbia Ministry of Energy and Mines; BC MRES D - British Columbia Ministry of Regional Economic and Skills Development; CVRD - Comox Valley Regional District; BC MJTI – BC Ministry of Jobs, Tourism and Innovation; EA - Environmental Assessment; MPMO - Major Projects Management Office; VC - Valued Component

6.2.1.1 Economic Health Spatial Boundaries

The proposed Raven Project is located in the newly created CVRD, and it is expected that proposed Raven Project construction and operation could draw workers and involve businesses in the CVRD as well as the northern end of the Nanaimo Regional District (NRD). Construction and operation of the Port Facility would also provide employment and business opportunities in the Alberni-Clayoquot Regional District (ACRD). The social and economic RSA consists of the urban and rural populations located within the: CVRD Area Regional District Electoral Area (RDEA) "A"; CVRD Area RDEA "B"; NRD RDEA H; and ACRD RDEAs D, E and F. As well as these areas, the RSA includes the City of Courtenay, the Town of Comox, the Village of Cumberland, and the City of Port Alberni. The RSA includes the following reserves: Comox 1; Qualicum; Tsahaheh 1; Ahahswinis 1; Klehkoot 2; and Alberni 2. Figure 6.2-1 shows the LSA and RSA boundaries for economic and social conditions.

6.2.1.2 Economic Health Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

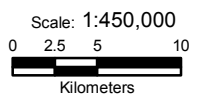




Legend

- Populated Place
- Raven Coal Project
- +— Rail
- Road
- Watercourse
- Waterbody
- Park or Protected Area
- Socio-Economic LSA
- Socio-Economic RSA
- Transportation LSA

Reference

Base Data: 1:1,000,000 scale from the Atlas of Canada, NRCAN



CLIENT:  Compliance Coal Corporation <small>the Comox Joint Venture</small>		
PROJECT: Raven Underground Coal Project		
<h2>Economic and Social Spatial Boundaries</h2>		
DATE: November 17, 2010	ANALYST: MY	<h3>Figure 6.2-1</h3>
JOB No: VE51897	QA/QC: JT	
GIS FILE: 14-50-003		PDF FILE: 14-50-003_socio_study_area.pdf
PROJECTION: UTM Zone 10	DATUM: NAD83	

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6.2.2 Economic Health

6.2.2.1 Detailed Economic Health Baseline

A range of economic information will be collected to characterize baseline conditions in the zone of the proposed Raven Project influence. At a minimum, local and regional economic profiles will be developed for Courtney, Comox, and communities in the CVRD. This will include Aboriginal reserves. The profiles will contain the following:

- Economic conditions will be described in terms of current labour force participation and unemployment rates, workforce experience by industry, income and economic diversification, community business and skills inventories, and local wage and information. The expected trends based on other economic development projects proposed for the region will also be described; and
- The status of municipal government finances, community plans, and any emerging community or regional issues will be described.

The proponent will initially develop community and regional profiles based on a review of available literature. The profiles will then be verified through interviews, meetings and consultations with knowledgeable individuals, and comments received through the public consultation program. The following approach will be applied to the data collection process:

- The profiles will be prepared using data from:
 - 2001 and 2006 Census data;
 - Relevant BC Statistics on community economic profiles (<http://www.bcstats.gov.bc.ca>);
 - Official Community Plans; and
 - Provincial Land Use Plans (PLUP).

The draft profiles will be confirmed and expanded following meetings and telephone conversations and interviews with: Chamber of Commerce representatives; CVRD; ACRD; and other regional district representatives including local, provincial and federal government representatives such as: the Comox-Strathcona Regional Hospital District; economic development officers; and BC MOTI. Information specific to the City of Port Alberni will be provided separately where that information exists.

The proponent will prepare initial profiles for each First Nation based on available literature research from BC Stats and SC. These profiles will be refined and expanded through meetings and consultations with representatives of the Aboriginal groups. Collated information will include summaries of Aboriginal employment and contracting capacity.

6.2.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

For the purpose of assessing economic effects, the proposed Raven Project will be described in terms of the construction and operations labour requirements, hiring standards, the operating work schedule, worker accommodation, transportation of people, materials and clean coal, capital and operating costs, and company procurement and purchasing policies. The assessment will include consideration of the economic effects attendant with the eventual closure and decommissioning of the mine. Other policies or strategies used to minimize adverse effects and enhance positive effects will also be described. Each of the VCs that are identified will be assessed individually in the Application / EIS.

The proponent will develop a detailed description of the proposed Raven Project that will be used to assess economic effects. This will include developing estimates of labour force requirements (including skill levels) for both construction and operations. It will also include estimates of the types and value of materials, goods and services that may be supplied by local businesses and what items would have to be imported into the region, and the costs of construction. Additional information on proposed policies related purchasing policies will also be summarized.

Two types of economic analysis will be undertaken. The first assessment will evaluate the extent to which proposed Raven Project construction and operations will affect the BC economy. The results of this assessment will help demonstrate the potential direct, indirect and induced economic effects that the proposed Raven Project would have on provincial GDP, employment and income, and will be used to determine what percentage of effects would be experienced outside the immediate region. This assessment will be undertaken by asking BC Stats to model the economic impacts using its provincial economic input-output model.

The second assessment will describe the regional and local impacts of construction and operations of the proposed Raven Project. The analysis will examine the demands of the proposed Raven Project for labour, goods, and services in the context of current and expected future regional capacity. This will determine what labour and materials may have to be imported, potentially creating additional demands on regional infrastructure and services. Opportunities to enhance potential Raven Project benefits and mitigate potential adverse effects would be described. This analysis will involve both qualitative and quantitative methods, such as supply and demand matching. It will also build on the results of interviews with officials and their knowledge of the provincial and regional economies, as well as professional judgement based on previous experience with similar types of projects.

Potential economic effects of the proposed Raven Project on Aboriginal groups will be determined by assessing demands for labour, goods and services in the context of the current capacity of Aboriginal groups to identify what labour and materials they may be able to contribute. Opportunities to enhance potential benefits and mitigate potential adverse effects will also be described. This analysis will involve both qualitative and quantitative

methods, such as supply and demand matching, and would also build on the results of interviews with officials and their knowledge of the provincial and regional economies, and professional judgement based on previous experience with similar types of projects.

The Application / EIS will describe the following economic effects related to constructing and operating the proposed Raven Project, including possible accidents and malfunctions:

- Estimates of effects on provincial GDP and other macroeconomic indicators;
- Estimates of revenues to provincial governments;
- Opportunities for direct employment (reported in PY and income opportunities) of regional residents, including Aboriginal groups;
- Opportunities for local and regional businesses, including Aboriginal businesses;
- Estimates of effects on local government finances;
- Other economic effects will be considered, including:
 - The potential for inflation and cost of living impacts;
 - The potential impact on the property values of residences and businesses located in close proximity to the proposed mine site, along the proposed coal haul route and near the proposed load-out facility;
 - Opportunities for sustainable economic development;
 - Potential effects on official community plans and preferred future economies; and
 - Potential effects on the aquaculture sector.

The Application / EIS will provide a summary of economic impacts related to the proposed Raven Project, in the context of other proposed economic development in the region (cumulative effects).

For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

6.3 Summary of Assessment of Potential Economic Effects

A summary of any potential residual effects of the proposed Raven Project and their significance will be provided in the Application / EIS using the format presented in Table 6.3-1. Potential residual effects will be identified by phase (i.e., construction, operations, closure and decommissioning).

Table 6.3-1: Summary of Potential Economic Effects Analysis

Valued Components (Note Phase of proposed Raven Project)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)
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7 ASSESSMENT OF POTENTIAL SOCIAL EFFECTS

7.1 Social Background

The Application / EIS will include a general description of the existing social condition, including surrounding areas within the zone of potential influences of the proposed Raven Project.

7.2 Social Conditions

7.2.1 Valued Component Scoping and Rationale

The selected VCs for social conditions are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information, which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. Each VC is broken down into a number of unique indicators that together are considered broadly representative of the larger VC. The rationale for selecting social VCs is described below in Table 7.2-1.

Table 7.2-1: Social Conditions Valued Components

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Social Conditions							
Regional population and demographics	Proposed Raven Project employment creates in-migration	VC assessed in recent EA process	To be defined	CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), ACRD	To be determined	To be determined
Housing	Employee and migrant potential housing needs	VC assessed in recent EA process	To be defined	CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	To be determined	To be determined
Regional services	Proposed Raven Project related pressure on regional services	VC assessed in recent EA process	To be defined	CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	To be determined	To be determined

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Regional infrastructure	Proposed Raven Project related use of regional infrastructure	VC assessed in recent EA process	To be defined	CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	To be determined	To be determined
Family and community wellbeing	Workforce demands (i.e., employment, higher income, more time away from home, new community dynamic; affect on real estate values; alignment with local and regional planning)	VC assessed in recent EA process	To be defined	CVRD, ACRD	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	To be determined
Transportation Transportation	Pressure on transport system due to coal hauling, workforce and visitors travel to and from minesite and to and from the Port Facility	VC assessed in recent EA process	To be defined	BC MOTI, City of Port Alberni	Vancouver Island Summary Land Use Plan (BC ILMB 2000), Electoral Area 'A' Electoral Area Plan (CVRD 1998), ACRD	To be determined	To be determined

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Non-Traditional Land Use							
Parks and protected areas	Potential effects due to land alterations, air emissions, associated mine facilities and traffic	VC assessed in recent EA process, professional judgement	To be defined	BC MOE, PC	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD, Somass Estuary Management Plan	To be determined	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>
Mining and exploration activities	Potential effects due to land alterations, associated mine facilities and traffic	VC assessed in recent EA process, professional judgement	To be defined	BC MEM	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD	To be determined	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>
Renewable resource use	Potential effects due to land alterations, associated mine facilities and traffic	VC assessed in recent EA process, professional judgement	To be defined	BC MEM, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD	To be determined	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>

RAVEN UNDERGROUND COAL PROJECT

Valued Component	Rationale						
	Interaction with proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Tourism and other recreational uses	Potential effects due to land alterations, associated mine facilities and traffic	VC assessed in recent EA process, Professional judgement	To be defined	BC MJTI, MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD, Somass Estuary Management Plan	To be determined	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>
Marine uses and tenures	Potential effects to Baynes Sound, Alberni Inlet, Trevor Channel		Local Aboriginal groups have expressed concern with respect to Baynes Sound	TC, EC, Agency, PC, DFO, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD, Somass Estuary Management Plan	Commercial aquaculture interests in Baynes Sound	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>
Visual and Aesthetic Resources							
Visual landscape	Potential effects due to land alterations, air emissions, associated mine facilities, traffic, and Port Facility design	VC assessed in recent EA process, and professional judgement	To be discussed with local Aboriginal groups	BC EAO, Agency, City of Port Alberni, BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Denman Island Local Trust Committee; City of Port Alberni	Requirement of both <i>BCEAA</i> and <i>CEA Act</i>

Note: ACRD - Alberni Clayoquot Regional District; Agency - Canadian Environmental Assessment Agency; *BCEAA* - BC *Environmental Assessment Act*; BC MFLNRO – British Columbia Ministry of Forests, Lands and natural Resource Operations; BC ILMB - BC Integrated Land Management Bureau; BC MEM - BC Ministry of Energy and Mines; MFLNRO - Ministry of Forests, Lands and Natural Resource Operations, BC MOE - BC Ministry of Environment; BC MOTI - British Columbia Ministry of Transportation and Infrastructure; BC MJTI - BC Ministry of Jobs, Tourism and Innovation; *CEA Act* - *Canadian Environmental Assessment Act*; CVRD - Comox Valley Regional District; DFO - Fisheries and Oceans Canada; EA - Environmental Assessment; EC-Environment Canada, PC - Parks Canada; TC - Transport Canada; VC - Valued Component

7.2.1.1 Social Conditions Spatial Boundaries

The proposed Raven Project is located in the newly created CVRD, and it is expected that proposed Raven Project construction and operation could draw workers and involve businesses in the CVRD as well as the northern end of the nrd. Construction and operation of the Port Facility would also provide employment and business opportunities in the ACRD. The social and economic RSA consists of the urban and rural populations located within CVRD Area RDEA “A” (which includes Denman and Hornby Island); CVRD Area RDEA “B”; NRD RDEA H; and ACRD RDEAs D, E and F. As well as these areas, the RSA includes the City of Courtenay, the Town of Comox, the Village of Cumberland, and the City of Port Alberni. The RSA also includes the following reserves: Comox 1; Qualicum; Tsahaheh 1; Ahahswinis 1; Klehkoot 2; and Alberni 2. Figure 6.2-1 shows the LSA and RSA boundaries for economic and social conditions.

7.2.1.2 Social Conditions Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

7.2.1.3 Transportation Spatial Boundaries

The transportation route for the proposed Raven Project is Hwy 19 (Inland Island Hwy route) to Hwy 4 to Port Alberni, including specific roads within the City of Port Alberni. The transportation study area to be used for the assessment of potential effects from proposed Raven Project transportation activities on regional and local transportation infrastructure includes the preferred transportation corridor between the mine site and Port Alberni as well as the area under the PAPA’s jurisdiction.

7.2.1.4 Transportation Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

7.2.1.5 Non-Traditional Land Use Spatial Boundaries

The LSA and RSA for land use were selected following a review of the study areas for other related disciplines (e.g., air quality, vegetation and wildlife) as well as the economic and

social environment. When available, PLUPs, management zones, and official community plans have also been reviewed for the area.

The LSA for the land use component was defined as the maximum area that captures potential direct disturbances from all of the alternatives being assessed. The NTLU LSA is defined by a 500-m buffer around the proposed Raven Project footprint to ensure potential direct unmitigated effects of the proposed Raven Project on land use are addressed.

Two separate NTLU RSAs have been defined for the proposed Raven Project:

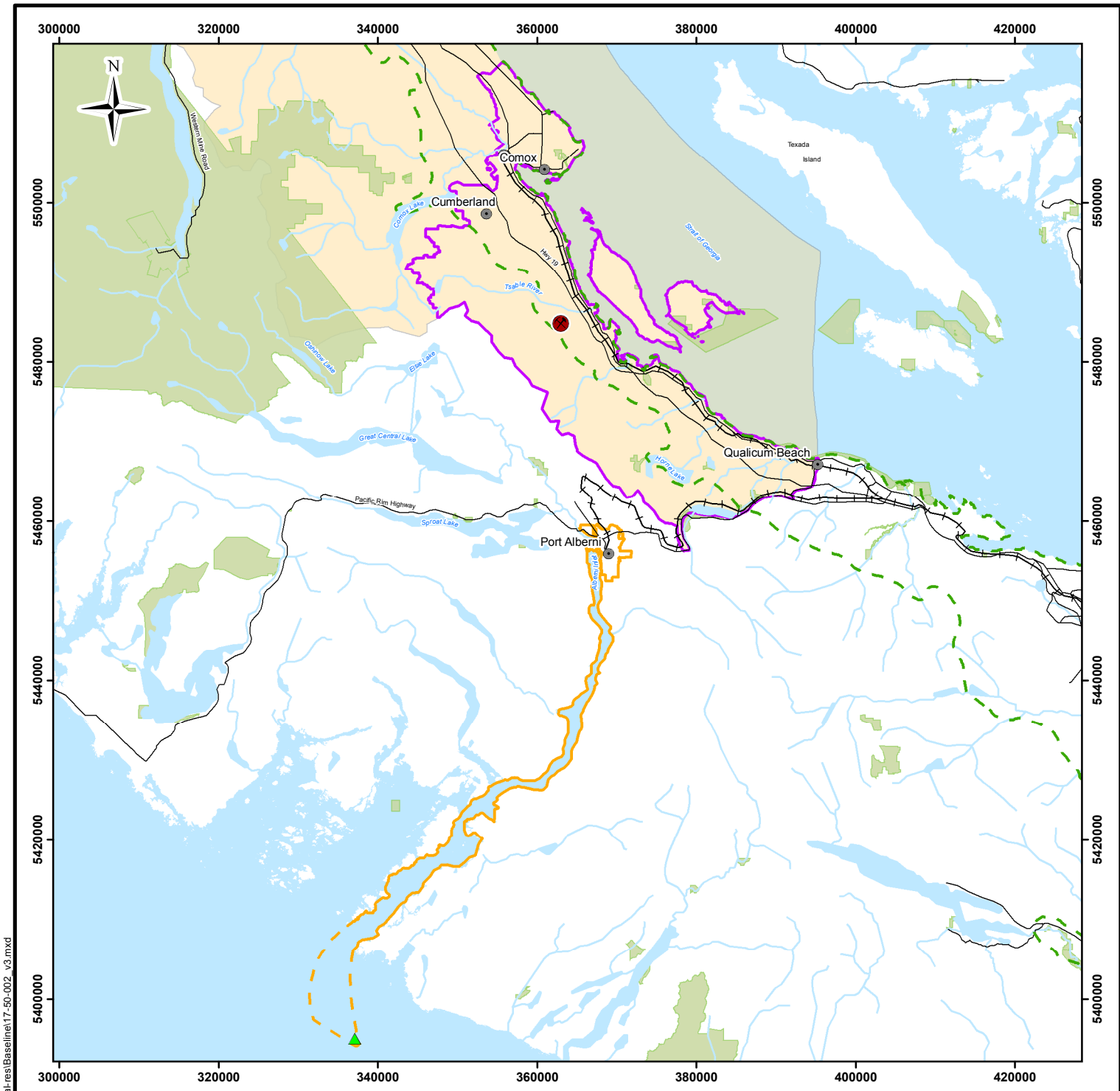
- Mine site NTLU RSA; and
- Port Facility NTLU RSA.

The proposed Raven Project mine site area and surrounding property are located on private land. The social and economic RSA (Figure 7.2-1) will be used as the basis for the mine site NTLU RSA as this area overlaps with representative biophysical and land use boundaries. The mine site NTLU RSA falls within Wildlife Management Unit (WMU) 1-6, which includes Denman and Hornby Islands; this boundary will be used for the eastern and southern limits of mine site NTLU RSA. The lower portion of this RSA also falls within the Regional Conservation Strategy Project Area (mainly within the southern portion of the Nanaimo Area Lowland Section) as described by the Comox Valley Land Trust. The mine site NTLU RSA will include commercial aquaculture operations in Baynes Sound. The mine site NTLU RSA considers land uses in the area as well as potential view points. The boundaries of the mine site NTLU RSA are as follows: the Beaufort Mountain Range north to Comox Lake; and south to the Pacific Rim Hwy down to Parksville. Courtenay and Comox are included as the most northern communities.

The proposed Port Facility NTLU RSA is based on the city limits for the City of Port Alberni and the marine study area Boundary. This RSA captures representative historical, current and potentially future land and marine uses located proximate to the proposed Port Facility. The study areas for NTLU are shown on Figure 7.2.-1.

7.2.1.6 Non-Traditional Land Use Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.



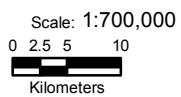
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Legend

- ▲ Cape Beale Pilotage Point
- Populated Place
- Raven Coal Project
- +— Rail
- Road
- Watercourse
- Waterbody
- Park or Protected Area
- Mine Site RSA
- Port Facility RSA
- Ecosession - Nanaimo Lowland
- Wildlife Management Unit 1-6

Reference

Base Data: 1:1,000,000 scale from the Atlas of Canada, NRCAN



CLIENT: Compliance Coal Corporation <small>with Comox Joint Venture</small>		
PROJECT: Raven Underground Coal Project		
<h2 style="margin: 0;">Non-traditional Land Use Spatial Boundaries</h2>		
DATE: February 22, 2010	ANALYST: EO	<h3 style="margin: 0;">Figure 7.2-1</h3>
JOB No: VE51897	QA/QC: SB	
GIS FILE: 17-50-002		
PROJECTION: UTM Zone 10	DATUM: NAD83	

7.2.1.7 Visual and Aesthetic Resources Spatial Boundaries

The study areas selected for assessing potential effects on visual resources ensure that representative viewpoints encompassing the components of the proposed Raven Project, including the load-out facility are included. The study areas will be defined to ensure that potential effects on protected areas, recreational use, residential and commercial land use and known tourism activities, which are landscape dependent, are adequately captured.

Local Study Area

The LSA is selected to ensure that a representative viewshed is reviewed around the proposed Raven Project components. For this project, the LSA consists of the footprint of the proposed Raven Project, plus 1 km beyond the areas proposed for mining, stockpiling, materials processing, access, and the power line. This is based on:

- The perceived extent of the primary effects of the proposed Raven Project on the terrestrial environment;
- The presumption that the effects on the terrestrial environment (e.g., mining and rejects management) also represent the primary effects to visual aesthetics in the area;
- Most of the light emissions from the proposed Raven Project and support facilities would fall within this defined area; and
- The nearest receptor, which is associated with Hwy 19 (i.e., vehicle traffic), is located at a distance greater than 1 km east of the proposed Raven Project.

Potential effects on receptors more than 1 km from the LSA will be included in the assessment for the RSA.

The LSA for Port Alberni will be included in the visual and aesthetic resources assessment of the surrounding area of the Port Facility (see figure 7.2.1).

Regional Study Area

The rationale for the RSA boundary is based on the proximity of potentially affected land uses, including residential and commercial areas, protected areas, recreational use, and known tourism activities. The rationale for selecting the study areas for visual resources and aesthetics has been developed to ensure it adequately captures potential effects as well as the landscape and associated land use in the area.

7.2.1.8 Visual and Aesthetic Resources Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social

effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

7.2.2 Social Conditions

7.2.2.1 Detailed Social Conditions Baseline

A range of economic and social information will be collected regarding baseline conditions. At a minimum, local and regional social profiles will be developed for Courtney and Comox and other communities in the CVRD and for Port Alberni. The regional profile may be extended to include other communities for which the proposed Raven Project may have implications (e.g., employment catchment areas). The profiles will contain the following:

- Demographic conditions in the communities and the region would be described in terms of:
 - Their history;
 - The current population and demographics (age and gender);
 - Recent population and mobility, including migration patterns;
 - Expected population growth;
 - Family and household structure;
 - Ethnicity;
- Social conditions in the region and the communities will be described using various indicators of wellness, such as: the number of people using income support programs, community crime rates, number of children in care, key social issues, community, leisure, volunteer and social networks / membership in community organizations, and the range of services available to manage the main social issues;
- Community and regional health will be described in terms of the incidence of key health issues and the availability of health services;
- Educational conditions will be described in terms of the current educational attainment of community and regional residents and the availability of educational services, programs and learning institutions within communities and the region, especially in regard to trades and apprenticeship programs; and
- Community infrastructure will be described in terms of the availability and capacity of existing housing, recreation, water and waste treatment facilities, power, etc.

The status of municipal government finances, community and regional plans (e.g., OCPs and regional growth strategies), and any emerging community or regional issues will be described. The proponent will initially develop these community and regional profiles based on a review of available literature. The profiles will then be verified through interviews,

meetings and consultations with knowledgeable individuals, and comments received through the public consultation program. The following approach will be applied to the data collection process:

- The boundaries of the study region will be confirmed;
- The profiles will be prepared using data from:
 - 2001 and 2006 Census data;
 - Relevant BC Statistics on community economic and social profiles (<http://www.bcstats.gov.bc.ca>);
 - Official Community Plans; and
 - PLUPs.

The draft profiles will be confirmed and expanded following meetings and telephone conversations and interviews with: Chamber of Commerce representatives; CVRD; and other regional district representatives including local, provincial and federal government representatives such as the Comox-Strathcona Regional Hospital District, economic development officers, and BC MOTI.

The proponent will develop a detailed description of the proposed Raven Project that will be used to assess social effects. This will include developing estimates of labour force requirements (including skill levels) for both construction and operation. It will also include estimates of the types and value of materials, goods and services that may be supplied by local businesses, what items would have to be imported into the region, and the costs of construction. Additional information on proposed policies related to training and hiring of local residents and purchasing policies will also be summarized.

The proponent will prepare initial profiles for each First Nation based on available literature research from BC Stats and SC. These profiles will be refined and expanded through meetings and consultations with representatives of the Aboriginal groups.

The social assessment will describe the regional and local impacts of all phases of the proposed Raven Project. The analysis will examine the demands for labour, goods and services in the context of current and expected future regional capacity to determine what labour and materials may have to be imported, potentially creating additional demands on regional infrastructure and services. Opportunities to enhance potential benefits and mitigate potential adverse effects will also be described. This analysis will involve both qualitative and quantitative methods, such as supply and demand matching, and will also build on the results of interviews with officials and their knowledge of the provincial and regional economies, and professional judgement based on previous experience with similar types of projects and the socio-economic settings.

7.2.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

Potential effects of the proposed Raven Project on Aboriginal groups will be determined by assessing demands for labour, goods and services in the context of the current capacity of Aboriginal groups to identify what labour and materials they may be able to contribute.

Opportunities to enhance potential benefits and mitigate potential adverse effects will also be described. This analysis will involve both qualitative and quantitative methods, such as supply and demand matching, and will also build on the results of interviews with officials and professional judgement based on previous experience with similar types of projects.

The Application / EIS will describe the methodology used to assess social impacts in terms of:

- Overall approach;
- Temporal and spatial boundaries;
- The measurement of social impacts; and
- CEA.

The Application / EIS will describe the methods used to identify social VCs of the proposed Raven Project setting. A rationale for their selection will also be included in the Application / EIS. This will include a discussion of the major issues raised by the public during the development of the AIR / EIS Guidelines and other proponent consultation activities with the public. Potential effects that have been identified during issues scoping include:

- Health and well-being of communities, families and individuals;
- Education and training; and
- Public safety and protection.

For the purpose of assessing social effects, the proposed Raven Project will be described in terms of: the construction and operations labour requirements; hiring standards; recruitment and placement policy; the operating work schedule; worker accommodation; transportation of people; materials and clean coal; capital and operating costs; and company procurement and purchasing policies. The assessment would include consideration of the social effects attendant with the proposed Raven Project including closure and decommissioning of the mine. Other policies or strategies used to minimize adverse effects and enhance positive effects will also be described.

To the extent that the proposed Raven Project may directly or indirectly attract new people into the region, the assessment will identify the magnitude of these population increases. This will include demographic characteristics and the social impacts of a workforce with different characteristics, and describe the resulting effects on:

- Educational facilities;
- Community services;
- Community infrastructure; and
- Cultural impacts on regional lifestyle.

The assessment will also examine how the proposed Raven Project will add to traffic volumes on the provincial and regional road systems and the effects this may have on regional residents.

The Application / EIS will provide a summary of social impacts related to the proposed Raven Project in the context of other proposed economic development in the region (cumulative effects), and will describe mitigation measures to be implemented in response to these impacts. The Application / EIS will identify any residual effects that may result after the proposed mitigation and enhancement strategies have been implemented. The assessment will draw on other sections of the Application / EIS to identify social effects potentially associated with residual effects identified in other disciplines (i.e., wildlife, fisheries, water quality, and land use sections, as well as information from available TU and TK studies and published reports).

For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced as appropriate. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Section 10 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

7.2.3 Transportation

7.2.3.1 Detailed Transportation Baseline

The following baseline information for roads and highways would be provided in the Application / EIS:

- Existing transportation infrastructure capacity;
- Existing traffic patterns / volumes and recent trends;
- Existing pedestrian use / safety issues; and
- Dangerous goods routes.

Appropriate access points on and off Hwy 19 will be determined in consultation with BC MOTI. If direct access onto Hwy 19 is requested, a rationale will be provided, including time savings per trip and economic impact. The Application / EIS will include a detailed description of the proposed trucking route through the Alberni Valley to the terminal. A detailed description of the shipping corridor from the terminal to the Cape Beale Pilotage Station will be provided. As well, a description of the existing railway infrastructure will be provided.

Traffic data as part of the feasibility study will be collected from BC MOTI. At minimum, collected data will include existing traffic and truck volumes for Hwys 19 and 4, and preferred route through Port Alberni. Vehicle accident and injury data will be collected from the Royal Canadian Mounted Police (RCMP).

A summary of marine traffic within the PAPA's jurisdiction will also be included in the assessment.

7.2.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will identify potential effects on transportation infrastructure, safety and impacts on local use from activities related to the proposed Raven Project.

Potential impacts on transportation infrastructure, traffic, and safety will be analyzed qualitatively and quantitatively. The analysis will examine project demands in the context of current highway and road capacity and use, including local road-use patterns related to accessing recreational / tourism activities. The analysis will identify potential traffic issues and will identify opportunities for scheduling mine related traffic to minimize potential adverse effects, especially in areas that are determined to be possible "bottlenecks" in terms of capacity or risk.

The transportation route for the proposed Raven Project is Hwy 19 (Inland Island Hwy route) to Hwy 4 to Port Alberni. Route alternatives within Port Alberni will be discussed with the City of Port Alberni, PAPA, potentially affected Aboriginal groups and other stakeholders.

The section will reference the Vancouver Island Highway Agreement and highlight the areas relevant to the proposed Raven Project, as well as refer to the original pavement design for Hwys 19 and 4 and to the design life left in the existing pavement structure. The analysis will include consideration of urban areas, including Port Alberni and outskirts, and tourist areas that fall within the study area boundaries.

The assessment will include relative and absolute increase in traffic volumes on the two highways. Increase in truck volumes will be identified. The effect on BC MOTI access strategy will be reviewed. Effects of the mine related traffic on pavement structure and life span for the two highways will be considered, as well as required maintenance levels. The potential for increased truck traffic to create an additional need for Commercial Vehicle Safety Enforcement presence on transportation routes will be reviewed.

The assessment of potential transportation effects will include an assessment of the potential for spills and accidents, in terms of both safety and environmental effects. Safety considerations will include the number and characteristics of vehicles, speeds, proximity to existing developments, road crossings, and the condition of intersections with other roads (e.g., site distance, presence of acceleration lanes, existing road capacity). Without limiting the above scope of work, Cathedral Grove and Cameron Lake, two primary areas of concern to the public, will be assessed. The need for winter chain-up areas, both eastbound and westbound, at the base of the “Alberni Summit”, will be assessed. Further, the proponent will assess whether the brake check area at the top of the summit should be lengthened to accommodate the increased truck traffic.

Linkages between marine traffic within PAPA’s jurisdiction and potential effects of the proposed Raven Project will be identified and described.

Traffic management plans, and safety considerations for site access roads (with high volumes of truck traffic) will be identified. Proposed mitigation measures will be identified and relevant management plans will be referenced.

Any identified residual effects of the proposed Raven Project will be discussed followed by assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

7.2.4 Non-Traditional Land Use

7.2.4.1 Detailed Non-Traditional Land Use Baseline

The assessment will include review of formal PLUPs as well as land use information not formalized in plans (e.g., Aboriginal groups land use objectives).

The scope of the land use baseline will be determined based on review of the available information. A summary of the publicly available baseline data describing non-traditional activities that occur within the study area will be compiled. The Application / EIS will also summarize land status, including land owners, licencees, and ROW as well as the non-typical users of lands such as agro-forestry, shellfish production and harvest, adventure tourism, community watersheds, and railway and utility ROWs.

The land use baseline section will provide a description of the historical, current and potential future NTLUs within the selected study area. This information will facilitate the formulation of the Project Inclusion List for use in the CEA.

The following two methods will primarily be used to complete the compilation of available baseline information:

- Information from various government websites and reports will be summarized and referenced; and
- Telephone interviews with local and provincial government agencies will be conducted to confirm available references and identify any unforeseen information gaps.

Following the review of information compiled during the detailed desktop study, data gaps will be identified and reviewed with relevant local and provincial government agencies to determine if additional information is available (e.g., reports held by BC MFLNRO, Crown Land Use Agreements, etc.). Stakeholders, including land tenure holders (e.g., timber rights holders, ROW holders, etc.) may be contacted for specific information to address gaps if within the scope of the proposed Raven Project. The mine site is on private land.

7.2.4.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section will describe the effects of the proposed Raven Project on existing and foreseeable NTLU identified and described in the baseline section. The Application / EIS will incorporate the management objectives and strategies, defined in the Vancouver Island Summary Land Use Plan (BC Integrated Land Management Bureau (BC ILMB) 2000), for assessing impacts at a regional scale.

Maps and / or descriptions of existing and past land and resources uses in relation to the proposed development will be included. The assessment will focus on key issues related to NTLU, which are determined by the physical project and the natural environmental setting of the proposed Raven Project. Scoping and identification of potential effects may include the following non-traditional land and resource uses, if applicable potential proposed Project-related effects are identified:

- Seasonal and permanent camp areas and maintenance camps;
- Hunting, trapping, outfitting, and sport fishing areas;
- Commercial fishing and aquaculture in Baynes Sound;
- Tourism activities; and
- Protected areas, such as parks.

The compiled land use information will be analyzed as follows:

- The significance of effects on adjacent land use and access will be determined for the proposed Raven Project, including potential laydown, setup, and new access areas;
- Potential constraints and effects with respect to parks, ecological reserves, and other protected areas in the vicinity of the proposed Raven Project will be identified;
- Potential effects of construction and operations activities on tourism and recreational opportunities, such as recreational boating, diving, nature-based tourism, hiking, horseback riding, hunting, and mountain biking will be assessed;
- Potential effects on commercial aquaculture in Baynes Sound will be assessed;
- Potential effects of loss of access or quality of recreational experience due to ROW clearing, and / or presence of project facilities will be addressed; and
- Potential effects that construction and routine operations of the proposed Port Facility will be addressed.

The Application / EIS will include analysis of the above potential impacts. Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

7.2.5 Visual and Aesthetic Resources

7.2.5.1 Detailed Visual and Aesthetic Resources Baseline

The information in the land use section will be used to develop a description of the land use in the area that may be visually affected by the proposed Raven Project. Land use by residents and tourists identified in the area will be reviewed and various representative viewpoints will be identified. The baseline analysis will describe the setting, whether or not a visual resource is present, and why it qualifies as a visual resource.

Recreational activities by residents and tourists identified in the area will be reviewed; various viewpoints identified as being scenic and accessible will be identified. The baseline analysis will describe the setting, whether or not a visual resource is present, and why it qualifies as a visual resource. An inventory of existing visual features will be developed. This would include a summary of any existing visual landscape inventories done within the region.

The visual and aesthetics resources potentially affected by the proposed Raven Project will be identified by a variety of measures including the following:

- An inventory of visual and aesthetic resources will be compiled following the review of the appropriate land and resource management plans which may include recreational values, protected areas and areas identified as scenic;
- Internet databases and available information on tourism, recreational use, scenic areas and aesthetic resources will be reviewed;
- Various individuals familiar with the area (e.g., tourism officers), will be interviewed; and
- Potential viewers' perspective based on proposed Raven Project component locations will be developed.

Literature and references reviewed as part of the visual land aesthetic resources baseline description will include:

- "Visual Impact Assessment Guidebook. Forest Practices Code of BC" (BC MOF 2001);
- BC MFLNRO - Internet based Land and Resource Data Warehouse. URL: <http://www.lrdw.ca/>;
- CVRD - <http://www.rdcs.bc.ca/>;
- Strathcona Regional District - <http://www.strathconard.ca/>; and
- Vancouver Island Economic Trust - <http://www.islandcoastaltrust.ca/index.php>.

A separate field study will not be required for visual aesthetics. Team members who are undertaking field studies (i.e., fisheries, vegetation or wildlife) will be asked to take photographs from the identified representative viewpoints (e.g., such as the west-side Denman Island ferry terminal, Boyle Provincial Park, community and public gathering places). The specific location and direction for each photograph will be recorded for reference purposes. Available literature and field observations (reported during field studies for other disciplines) will be analyzed and the potential for scenic resources program.

7.2.5.2 Potential Effects of the Proposed Project and Proposed Mitigation

This section of the Application / EIS will include an assessment of the visual and aesthetic impact of the proposed development, and will consider the possible effects of construction and operations, including air emissions and dust from mining operations, on visual and aesthetic resources. Potential effects from transportation and operations associated with the proposed Port Alberni Port Facility will also be assessed. Potential changes to the existing landscape, during all phases of the proposed Raven Project will be evaluated. Potential effects on the visual and aesthetic resources will be assessed using the following two approaches:

- Indirect effects within the RSA will be assessed by identifying areas from which the site may be observed and determining if various “representative viewpoints” would be affected; and
- Direct and indirect effects on the visual landscape within and immediately adjacent to the LSA will be described and clarified for each project phase and component.

A viewshed analysis will identify areas that can be seen from specific viewpoints and will take into account the elevation of various proposed Raven Project structures (i.e., tallest project facility) for both the mine site and Port Facility. If potential visual effects are identified when viewed from representative viewpoints a visibility assessment will be conducted using three-dimensional viewshed modelling (such as World Construction Set / Nature 3-d Studio computer software or equivalent type of program)., Input data will be based on the digital elevation model from the NTS which provides three-dimensional topographic information.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g., some of the information included was based, in part, on public information provided by others) will be described.

7.3 Summary of Assessment of Potential Social Effects

A summary of any potential residual effects of the proposed Raven Project and their significance will be provided in the Application / EIS using the format presented in Table 7.3-1. Potential residual effects would be identified by phase (i.e., construction, operations, closure and decommissioning).

Table 7.3-1: Summary of Potential Social Effects Analysis

Valued Components (Note Phase of proposed Raven Project)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)
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8 ASSESSMENT OF POTENTIAL HERITAGE EFFECTS

8.1 Heritage Background

The Application / EIS will include a description of the existing heritage resources, including surrounding areas within the zone of potential influences of the proposed Raven Project.

8.2 Heritage Resources

8.2.1 Valued Component Scoping and Rationale

The selected VCs for heritage resources are those VCs with an identified interaction with the proposed Raven Project. Where available, supporting information, which shows importance of the VC to the proponent, scientists, Aboriginal groups identified by BC EAO and the Agency, government agencies, and the public is included as part of the rationale for selection. The rationale for selecting heritage VCs is described below in Table 8.2-1.

Table 8.2-1: Heritage Resources Valued Components

Valued Component	Rationale						
	Interaction with Proposed Project activities	Scientific literature and professional judgement	Aboriginal groups identified by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Archaeological sites	Potential effects due to land alterations associated with mine development	VC assessed in recent EA process, Professional judgement, Provincial guidelines	Aboriginal groups whose territory overlaps with proposed development	BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	Are defined and protected by BC legislation – <i>Heritage Conservation Act RSBC 1996</i>
Historic heritage sites	Potential effects due to land alterations associated with mine development	VC assessed in recent EA process, area of historic resource extraction activity	Individuals, Aboriginal groups and historical or heritage community groups	BC MFLNRO	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	Individuals; local heritage groups	May be protected by Order-in-Council or by <i>Local Government Act</i> , <i>Heritage Conservation Act</i> must be addressed under the <i>CEA Act</i>

Note: BC EAO - British Columbia Environmental Assessment Office; BC ILMB - British Columbia Integrated Land Management Bureau, BC MFLNRO - British Columbia Ministry of Forests, Lands and Natural Resources Operations; *CEA Act* - *Canadian Environmental Assessment Act*; EA - Environmental Assessment; VC - Valued Component

8.2.1.1 Heritage Resources Spatial Boundaries

The LSA and RSA will be developed in consultation with local Aboriginal groups and local historical societies. Figure 8.2-1 shows the preliminary study area boundaries for archaeology and heritage resources. Culturally modified trees (CMT) were scoped into the methodology; two CMTs were identified and recorded outside the study area. The Archaeological Impact Assessment (AIA) LSA is set at 50 m beyond the proposed footprint of the mine and supporting facilities including associated transportation corridors. Information about the proposed Raven Project indicates no risk for the development to extend near the shoreline. Currently the closest south-easterly portion of the facility is 3.5 km west of the shoreline therefore no shoreline or tidal zones would be included in any archaeological assessments. The Reconnaissance Karst Potential Mapping tool available at the Geographic Data Discover Service was overlaid against the archaeological overview study area resulting in no karst potential present within the study area.

If it is determined that the bow wake may potentially affect the shoreline, specifically associated with erosion, then:

- A desktop review (Archaeological Overview Assessment (AOA)) will be conducted to identify known archaeological sites that potentially could be affected due to erosional effects from the bow wake; and
- An archaeological inventory (AIA) will be conducted to inventory and assess those locations that could/would be affected by the bow wake in Alberni Inlet and / or Barkely Sound, for previously undocumented archaeological sites.

8.2.1.2 Heritage Resources Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed Raven Project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction.

8.2.2 Heritage Resources

8.2.2.1 Detailed Heritage Resources Baseline

The Application / EIS will include a complete and detailed description of the local and regional archaeological and heritage resources near the proposed Raven Project, potentially including archaeological sites, cultural landscapes, and paleontological sites.

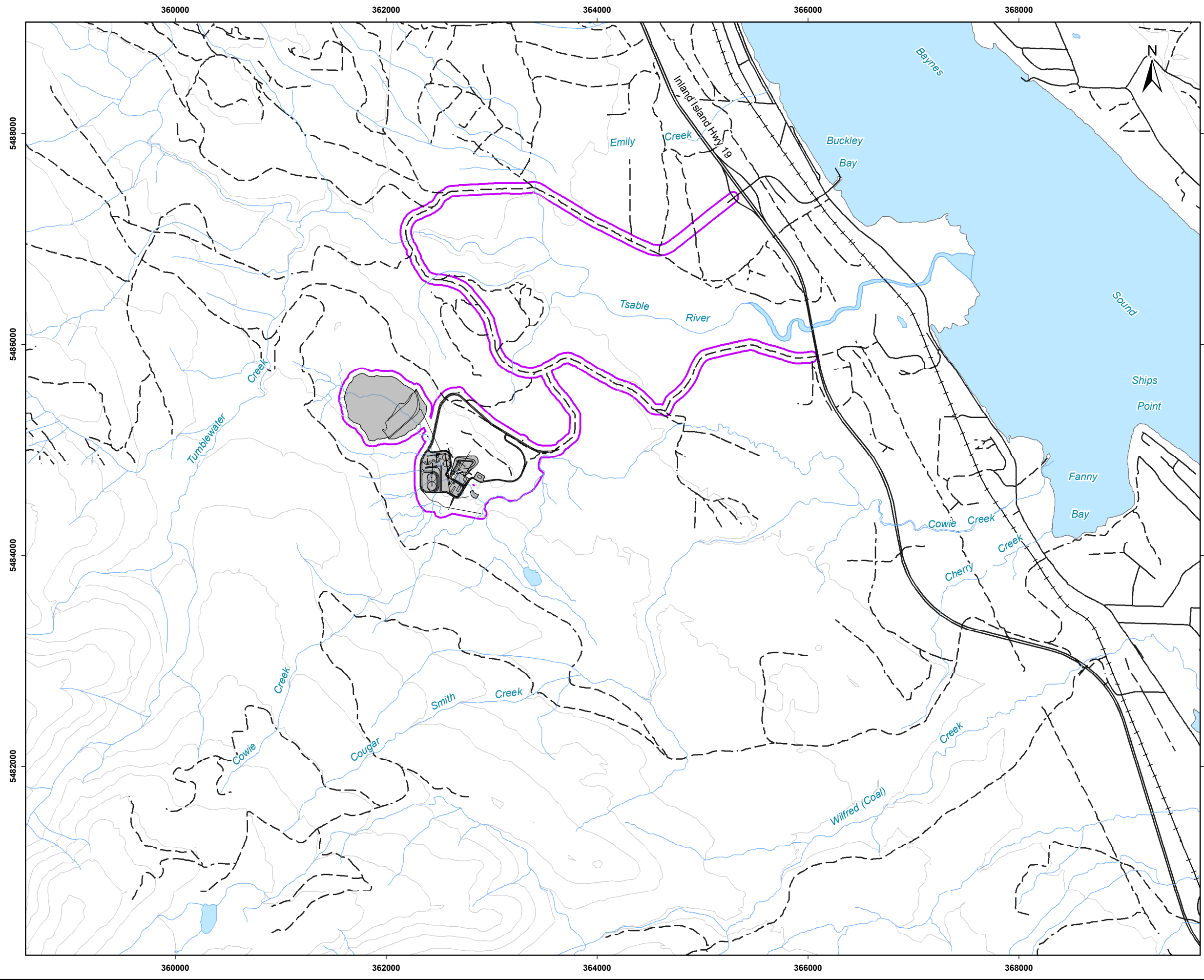
The methods for identifying potential or actual paleontological resources are the same as for archaeological site discovery techniques. The archaeological and heritage resources baseline study and impact assessment will be completed by a regional paleontological expert from the Courtenay Museum and Archives.

Cultural landscapes are included in the study, as individual archaeological sites belong to a larger regional cultural continuum.

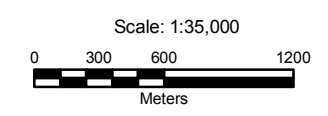
8.2.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

The section of the Application / EIS will identify potential effects on archaeological resources and consider each requirement of the *Heritage Conservation Act (HCA)* (Government of BC 1996c). The approach to historic sites is identical to that for archaeological sites.



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- Legend**
- Paved Road
 - - Gravel/Rough Road
 - + Railroad
 - Elevation Contour (100 m)
 - Watercourse
 - Waterbody
 - Archaeological Impact Assessment Study Area
 - Potential Location of Site Facilities



Reference
 LiDAR (5m) used to define Cowie and Cougar Smith Creek Watersheds
 TRIM used in other watersheds
 Basedata: TRIM

CLIENT:	 Compliance Coal Corporation	
PROJECT:	Raven Underground Coal Project	
Archaeology and Heritage Resources Spatial Boundaries		
DATE: October 4, 2010	ANALYST: EO	Figure 8.2-1
JOB No: VE51897	QA/QC: BO	PDF FILE: 15-50-002_arch_study_area.pdf
GIS FILE: 15-50-002		
PROJECTION: UTM Zone 10	DATUM: NAD83	

The Application / EIS will identify proposed mitigation measures, as recommended in the AIA, for sites where impacts cannot be avoided.

Local Aboriginal groups will be consulted to determine existing information and establish data gaps. Local historical societies will be consulted to determine data gaps from their perspective. An AOA will be conducted of the proposed Raven Project and surrounding areas by an archaeologist acceptable to Aboriginal groups whose traditional territory includes the proposed project site.

The AOA in the Application / EIS will conform to the technical standards in the “British Columbia Archaeological Impact Assessment Guidelines” (Archaeology Branch 1998 - Section 3.4 - Overview and Appendix A) and in “Archaeological Overview Assessments as General Land Use Planning Tools - Provincial Standards and Guidelines” (Archaeology Branch 2009). The Application / EIS will include collaboration, input, and feedback regarding archaeological methodology and TK.

Available TK and TU information will be used during development of the archaeological studies and included in the Application / EIS. Considered information will include site-specific primary sources and the published literature.

An AOA report will be included in an Appendix to the Application / EIS, which will contain a detailed description of how archaeological potential was assessed. AOA studies typically utilize several tools, including a fieldwork portion of the AOA, or a preliminary field reconnaissance to assist in assessing potential, and depending on availability, also includes historic information, TU / TK sites, previous archaeological studies, archaeological sites located within the vicinity of a project area, biophysical data, and paleo-ecological data.

The main activities of the AOA would include the following:

- Background literature review of relevant archaeological, historical, ethnographic and environmental information;
- Request for First Nation(s) perspectives on archaeological potential in the study area; including available archaeological TU / TK information;
- Preliminary assessment of distribution of archaeological potential in the study area;
- A preliminary field reconnaissance to help assess archaeological potential;
- Preparation (per the referenced standards) of recommendations for follow-up impact assessment studies; and
- Preparation of a report on methods and results.

Information gathered in AOA studies is meant to provide baseline data to select suitable locations for subsurface testing in addition to further intensive and thorough surface inspection coverage where additional locations may be identified and targeted for

subsurface testing. An AIA has been recommended prior to any land alteration activities associated with the proposed development. The Application / EIS will include a chance find procedure that includes notification of Aboriginal groups if artifacts, as mentioned in the HCA, are found at any stage of activities related to the proposed Raven Project.

Cultural landscapes may be analyzed through identification of site patterning. This is dependent on site density, distribution, and available traditional information as critical factors in identifying, quantifying, and qualifying cultural sites and how they fit into larger regional landscapes. Current available data suggests industrial impact to the study area has impacted available cultural evidence. Yield of anticipated archaeological data does not justify establishing a methodology for assessing cultural landscapes as a dataset.

Archaeological data will be assessed by the archaeologist conducting the surveys using standards approved by the Archaeology Branch, BC MFLNRO. Cultural landscapes will be analyzed through identification of site patterning. Reports will be prepared for the Archaeology and Heritage Branches and the proponent for inclusion in the Application / EIS. Archaeological reports will also be provided to Aboriginal groups and to any other parties identified by the Archaeology and Heritage Branches with interests in the study area.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects corresponding proposed mitigation measures would be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects would be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance.

8.3 Summary of Assessment of Potential Heritage Effects

A summary of any potential residual effects of the proposed Raven Project and their significance will be provided in the Application / EIS using the format presented in Table 8.3-1. Potential residual effects will be identified by proposed Raven Project phase (i.e. construction, operations, closure and decommissioning).

Table 8.3-1: Summary of Potential Heritage Effects Analysis

Valued Components (Note Phase of proposed Raven Project)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)

9 ASSESSMENT OF POTENTIAL HEALTH EFFECTS

This section of the Application / EIS would describe scope, approach, methods, and analysis used to describe the human health component of the proposed Raven Project setting. The Application / EIS will include a current health profile and baseline description of public health parameters.

9.1 Health Background

The Application / EIS will include a description of the existing health related conditions, including surrounding areas within the zone of potential influences of the proposed Raven Project.

9.2 Human Health

9.2.1 Valued Component Scoping and Rationale

The selected VCs for human health are those VCs with an identified interaction with the proposed Raven Project. Information which shows importance of the VC to the proponent, scientists, Aboriginal groups included by BC EAO and the Agency, government agencies, and the public is included as a part of the rationale for selection. The preliminary rationale provided below will be updated to integrate results from consultation and the Working Group that reflect First Nation groups', scientific and / or regulatory concern, and sensitivity to potential effect of the proposed Raven Project. The preliminary rationale for selecting human health VCs is described below in Table 9.2-1.

Table 9.2-1: Human Health Valued Components

Valued Component	Rationale						
	Interaction with Proposed Raven Project activities	Scientific literature and professional judgement	Aboriginal groups included by BC EAO and the Agency	Applicable government agencies	Land and resource management plans	The public and other stakeholders	Federal and provincial regulations and guidelines
Public health	Health effects of potential changes to air quality, noise, drinking water quality and country foods on health of direct receptors (public) within the LSA	Health Effects of Air Pollution (HC 2006), Canadian Handbook on Health Impact Assessment (HC 2004)	To be discussed with local Aboriginal groups	VIHA, BC EAO, HC	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD	WHO, Denman Island Local Trust Committee	<i>Public Health Act, Drinking Water Protection Act</i>
Healthy living	Including healthy living choices in proposed Raven Project design may improve workers health		To be discussed with local Aboriginal groups	BC EAO	Vancouver Island Summary Land Use Plan (BC ILMB 2000), CVRD, ACRD	Potential for concerns related to public safety	To be determined
Worker safety and health	To be determined	To be determined	To be discussed with local Aboriginal groups	WorkSafeBC	Vancouver Island Summary Land Use Plan (BC ILMB 2000)	To be determined	To be determined

Note: ACRD - Alberni-Clayoquot Regional District; BC EAO - British Columbia Environmental Assessment Office; BC ILMB - British Columbia Integrated Land Management Bureau; CVRD - Comox Valley Regional District; HC - Health Canada, LSA - Local Study Area; WHO - World Health Organization; VIHA – Vancouver Island Health Authority

9.2.1.1 Public Health Spatial Boundaries

As the human health study is based on work of other disciplines, the LSA corresponds to other study areas such as air quality, noise, economic, and social study areas. These areas will be defined in terms of potential human receptors (populations). The RSA would be based on a combination of areas of the economic and social RSAs. The potential effects of the proposed coal haul route and Port Facility on human health will be considered in the Application / EIS.

9.2.1.2 Public Health Temporal Boundaries

The Application / EIS will present the rationale for the proposed temporal boundaries to be used for the EA relevant to each VC for the life of the proposed Raven Project, including consideration of each proposed project phase (i.e., construction, operations, decommissioning / closure, and post-closure) and the possibility of economic and social effects occurring before construction. Any annual or seasonal variation related to VCs and biophysical constraints for each proposed Raven Project phase will be described.

9.2.2 Public Health

9.2.2.1 Detailed Public Health Baseline

A range of human health information will be collected from other disciplines and supplemented to present the baseline conditions in the zone of influence of the proposed Raven Project.

The Application / EIS will include a description of public health parameters affecting the public health setting of the proposed Raven Project, as required to meet BC EAO guidelines (BC EAO 2006, Mine Proponent's Guide: Appendix C: Checklist of Baseline Data Needs). The Application / EIS will also make reference to HC guidance documents for health assessment (HC 2004, 2010). HC will be consulted for chemical contaminant guidance that could be of a public health concern. Chemical tolerances for export standards for fish and fish products will be taken into account and results presented.

A description of the following existing public health parameters will be included in the Application / EIS:

- Noise levels;
- Local landscape aesthetics;
- Water sources;
- Water quality;
- Air quality; and
- Services (e.g., water supply, waste disposal).

Data from these disciplines will be summarized in this human health section of the Application / EIS and reported from a human health perspective.

The human health discipline lead will work with the soil, water, air, vegetation, wildlife, economic and social discipline leads to identify data requirements for discussion from a human health perspective. Where possible, paired sampling of country foods and environmental media will be completed (i.e., soil and vegetation). Mathematical media concentration modelling will be completed to identify the potential adverse impacts to the health of humans and other organisms.

9.2.2.2 Potential Effects of the Proposed Project and Proposed Mitigation

Public health and safety risks to the general population and to Aboriginal groups will be discussed as part of the health impact assessment. The human health section will qualitatively examine the potential for the proposed Raven Project to cause increased exposure to health hazards identified above (e.g., noise, air quality, water quality, environmental health). These will be reported in this section of the Application / EIS from a human health perspective. The human health risk assessment will include the analysis of effects from contamination of country foods, potable water and air emissions, as well as other representative potential exposure pathways identified. Potential risks to health will be assessed for people within the vicinity of the proposed Raven Project, using worst-case scenario assumptions for potential receptors (including those living along the transportation corridor).

The human health discipline lead will work with the soil, water, air, vegetation, wildlife and economic and social discipline leads to identify data requirements for discussion from a human health perspective. Additionally, the public health issues raised by selected government agencies, local health agencies (e.g., VIHA) and local communities will be gathered through the consultation program and review of TK information. Research will be completed by literature review, statistical analysis or in coordination with other disciplines (e.g., if other disciplines have produced or reported partial data sets that could be interpreted from a public health perspective).

A screening level risk assessment approach will be completed for the evaluation of human health. The human health assessment will include any Chemical of Potential Concern (COPC) associated with the proposed Raven Project that might adversely affect the long-term health of humans and animals. Emphasis will be placed on assessing the risks due to exposure to metal COPCs, as metals usually pose the most potential for chronic health risks at mines due to their concentrations and volumes in mining wastes, and their persistence in the environment. The assessment will focus on multiple exposure pathways as the COPCs are mobilized in the environment and in biological components.

Information provided by the environmental baseline sections will be consulted to determine which metals may potentially affect air, soil, country foods, or water. If a metal is predicted to potentially affect the environment, then it would be included in a conservative COPC

screening procedure. If radiological parameters are determined to be a potential concern, the requirements for identifying radiological parameters will be determined in consultation with HC. In the screening procedure, the maximum predicted concentration of metal will be compared to a conservative risk-based guideline that is protective of environmental and / or human health.

A conceptual site exposure model of exposure pathways will be prepared in the risk assessment to identify the potential contaminant sources, release mechanisms, exposure routes and final receptors. For example, if water quality modelling indicates that residual effects remain after mitigation; potential cumulative effects to Baynes Sound shellfish will be assessed. The exposure model will evaluate potential exposure pathways (e.g., human consumption of potentially contaminated fish and shellfish).

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects will be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Sections 10 and 22.19 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance. Relevant limitations that are associated with the CEA (e.g. some of the information included was based, in part, on public information provided by others) will be described.

9.2.3 Healthy Living

9.2.3.1 Detailed Healthy Living Baseline

The Application / EIS will describe public use of the lands in the vicinity of the proposed Raven Project, including recreational activities.

9.2.3.2 Potential Effects of the Proposed Project and Proposed Mitigation

The Application / EIS will:

- Describe those activities that may be impacted and the mitigation measures that are proposed to minimize impacts or otherwise replace opportunities to carry out those activities;
- For site-specific activities, indicate whether these activities could be enhanced by some action by the proponent (e.g., contributing to local organizations that support recreation); and

- Describe information and / or education programs that might be employed to encourage healthy living lifestyles for workers employed at the proposed Raven Project.

Proposed mitigation measures will be identified and relevant management plans will be referenced. Any identified residual effects of the proposed Raven Project will be discussed, followed by an assessment of potential cumulative effects. For any identified cumulative effects, corresponding proposed mitigation measures will be described and relevant regional management plans (including provincial regional management plan strategies) will be referenced. Residual cumulative effects would be described and their significance will be determined. Reference to relevant monitoring / follow-up plans described in Section 10 of the Application / EIS will be included.

Based on the analysis provided in this section of the Application / EIS, a conclusion will be provided regarding potential residual effects of the proposed Raven Project or potential residual cumulative effects and their significance.

9.2.4 Worker Safety and Health

The Application / EIS will identify potential safety and health considerations for proposed Raven Project employees and contractors. The section will refer to the Occupational Health and Safety Management Plan described in Section 10.

9.3 Summary of Assessment of Potential Health Effects

A summary of any potential residual effects of the proposed Raven Project and their significance will be provided in the Application / EIS using the format presented in Table 9.3-1. Potential residual effects will be identified by phase (i.e., construction, operations, closure and decommissioning).

Table 9.3-1: Summary of Potential Health Effects Analysis

Valued Components (Note Phase of proposed Raven Project)	Potential Effect	Key Mitigation Measures	Potential Residual Effect	Significance Analysis of Residual Effects (Summary Statement)
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10 SUMMARY OF PROPOSED ENVIRONMENTAL AND OPERATIONAL MANAGEMENT PLANS

This section of the Application / EIS will describe the components of the proponent's EMS for the proposed Raven Project. The Application / EIS will maintain, as the objective of the EMS, to provide a consistent approach to environmental management through resource allocation, the assignment of responsibilities, and ongoing evaluation of environmental practices, procedures, and processes.

10.1 Environmental Management System

The Application / EIS will describe the components of the conceptual EMS for the proposed Raven Project. The EMS will be designed to ensure a consistent approach to responsible environmental management by inclusion of the following EMS elements:

- **Planning:** defining the scope of the EMS; establishing an environmental policy for the proposed Raven Project; identifying applicable legal and other (non-regulatory) requirements; setting environmental performance objectives; and developing the EMPs discussed;
- **Implementation:** resource allocation and the assignment of roles and responsibilities; environmental management training; internal and external communications; EMS documentation and records and document control; and operating controls, including emergency response activities;
- **Checking and corrective action:** ongoing monitoring of environmental performance; inspection and evaluation of environmental management practices, including environmental compliance; and
- **Continual improvement:** senior operational management review of the EMS and identification of improvements in environmental performance of the proposed Raven Project.

The EMS will emphasize key stakeholder engagement initiatives for environmental management, including educational and consultation programs with First Nation and Aboriginal groups' communities and other key stakeholders.

10.2 Environmental Management Plans

The Application / EIS will provide a conceptual overview of the various EMPs that the proponent will develop for the proposed Raven Project as part of the EMS. The EMPs will include both preliminary monitoring and management requirements and will be designed to provide an integrated approach to environmental and safety management and deliver assurance to interested parties regarding all phases and activities of the proposed Raven Project. The monitoring and management plans will be based on the principle of adaptive management, and will describe the environmental practices and procedures to be applied

during planning, construction, and operations / maintenance and decommissioning phases of the proposed Raven Project. A method for ongoing (post-Application / EIS) development of adaptive management strategies will also be provided. Monitoring program requirements will be further developed with regulatory agencies during the permitting phase.

A three step process will be used for the development of EMPs:

- A high level framework will be included in the Application / EIS which will commit the proponent to specific and detailed goals, objectives, and procedures for producing the EMPs. Included in this step will be a procedure for re-evaluation of the monitoring plan, methods and objectives for adaptive management goals;
- The second step, production of the formal EMPs, may be initiated after the issuance of the EA Certificate, if a Certificate is issued, but before construction is started. This step will follow the procedures and commitments developed in the first step; and
- The third step will be the development of detailed Standard Operating Procedures (SOPs) to fulfill the obligations defined in the second step.

The Application / EIS will include an overview of individual or consolidated monitoring and management plans covering the following topics:

- Air Quality Management Plan:
 - This EMP will ensure that all aspects of the proposed Raven Project that could potentially affect air quality (e.g., emissions from vehicles and equipment, fugitive dusts) are anticipated, identified, monitored, evaluated, and controlled so that air quality in the vicinity of the proposed Raven Project is protected;
- Aquatic Resources Management Plan (including conceptual fisheries compensation plan per requirements of the *Fisheries Act* and monitoring plan):
 - This EMP will ensure that all aspects of the proposed Raven Project that could potentially affect aquatic resources (e.g., habitat loss) are anticipated, identified, monitored, evaluated, and controlled so that aquatic resources in the vicinity of the proposed Raven Project are protected;
- Archaeology and Heritage Resources Management Plan:
 - This EMP will ensure that all aspects of the proposed Raven Project that could potentially affect archaeological and cultural heritage resources (e.g., chance finds) are anticipated, identified, evaluated, and controlled so that archaeological and cultural heritage resources in the vicinity of the proposed Raven Project are protected;

- Construction Management Plan:
 - This EMP identifies the full extent of all construction phase environmental measures from all other EMPs. It functions as a master plan for ensuring coordinated comprehensive delivery of all construction related environmental commitments and supporting activities. It also establishes the protocol for regulatory environmental compliance monitoring and reporting;
- Dust Management Plan:
 - This EMP will describe guidelines and procedures for ensuring that all environmental risks related to surface and underground fugitive dust generation and emission are prevented, controlled, or mitigated, and will include monitoring requirements as appropriate. It will be developed based upon the potential environmental risks associated with all phases of the proposed Raven Project;
- Emergency and Spill Response Plan (including consideration of existing spill response capacity at the Port Alberni Port Facility):
 - This EMP is intended to provide a conceptual framework for emergency response at the proposed Raven Project. It will flow from the corporate commitments, goals and objectives, such as emergency spill response procedures and the protocol for communication in the event of an emergency. It will be developed concurrently with the Occupational Health and Safety Management Plan, since both address many of the same emergency situations;
- Erosion and Sediment Control Plan:
 - This EMP will provide a framework to minimize the potential for erosion, and sedimentation. It will specify SOPs for erosion and sediment control for all phases of mine life. Description of strategy and measures will include protection of all components subject to erosion, such as salvaged till and topsoil stockpiles, working yard area, and coal storage and stockpiles, through short-term controls, as well as controlling, collecting, and treating water that comes into contact with facilities in an environmentally sound manner;
- Hazardous Materials Management Plan (including explosives and petroleum management):
 - This EMP will identify potentially hazardous materials and provide a system for monitoring these materials. It will provide the policies and

procedures for ensuring compliance with provincial and federal regulatory requirements and BMPs for all hazardous materials;

- Hazardous Waste Management Plan:
 - This EMP will identify potentially hazardous waste materials and would describe measures and procedures designed for the safe temporary storage, handling, and transport of these materials. It will provide the policies and procedures for ensuring compliance with provincial and federal regulatory requirements and BMPs for all hazardous wastes;
- Incidental Mine Fires Plan:
 - This EMP will provide management practices for responding to incidental mine fires;
- Mine Methane Management Plan:
 - This EMP will establish methane management, for safety purposes and / or collected and if it is used as a fuel, including monitoring safety procedures and systems for underground ventilation and degasification;
- Mine Waste Management Plan:
 - This EMP will provide management practices for disposing of mine wastes;
- Noise Management Plan:
 - This EMP will provide management practices to monitor and potential techniques to minimize noise from the proposed Raven Project;
- Non-Hazardous Solid Waste and Domestic Water Waste Management Plan:
 - This EMP will provide management practices for disposing of non-hazardous solid waste and domestic waste water;
- Occupational Health and Safety Management Plan:
 - This EMP will provide a management framework for occupational health and safety for the proposed Raven Project;
- Reclamation and Closure Plan:
 - This EMP will provide management practices for reclamation and closure activities for the proposed Raven Project;
- Recruitment, Training and Employment Plan:
 - This EMP will provide management practices for recruitment, training and employment of construction phase and operations phase personnel;

- Soil Management Plan:
 - This EMP will provide management practices for topsoil and till disturbed due to the proposed Raven Project;
- Transportation and Access Management Plan:
 - This EMP will provide management practices for transportation and access to and from the proposed Raven Project;
- Waste Water Management Plan:
 - This EMP will provide monitoring and management practices for waste water generated from the proposed Raven Project;
- ML/ARD Prediction and Prevention Plan:
 - This EMP will provide management practices for waste rock and rejects that could pose an environmental risk due to ML or ARD;
- Marine Resources Management Plan:
 - This EMP will be developed in cooperation with regulatory and other potentially affected parties to ensure that potential effects to marine resources and marine habitats related to the construction and post-construction activities of the proposed Raven Project (particularly but not limited to the upgrades to the proposed Port Alberni Facility and coal transportation along existing shipping lanes) are identified and adequately addressed, prevented and / or controlled;
- Vegetation Management Plan:
 - This EMP will provide monitoring and management practices for vegetation potentially affected by the proposed Raven Project. Established BMPs will be followed for vegetation management, which, if necessary, will include alternative vegetation management practices for invasive species;
- Dredging Management Plan:
 - This EMP will provide monitoring and management practices for any required dredging operations; on-land disposal is anticipated;
- Water Management Plan:
 - This EMP will provide monitoring and management practices for all surface and ground waters in and around the proposed Raven Project;
 - Groundwater Monitoring Management Plan;

- This EMP will provide monitoring and management practices for the groundwater monitoring program to protect potentially affected aquifers. This program will be developed in consultation with VIHA, BC MFLNRO and BC MOE, and will be based on scientific information collected during the pre-application and application stage of the proposed Raven Project; and
- Wildlife Management Plan:
 - This EMP will provide monitoring and management practices to ensure the health and well-being of wildlife, and the health and well-being of people potentially encountering wildlife in the vicinity of the proposed Raven Project.

11 COMPLIANCE REPORTING

The proponent commits to provide the following in the Application / EIS:

- Reporting structure as identified within the EMPs, monitoring plans and commitments, including a preliminary list of reporting procedures on environmental management and performance; and
- A preliminary list of anticipated compliance monitoring obligations associated with permits, authorizations, and licences issued.