5 Environmental Assessment Methodology

Environmental effects are changes to the current biophysical, social, economic, and cultural conditions that occur as the result of a project. An effects assessment is the process of identifying and quantifying the effects of a proposed project (i.e., its components and related physical activities) on environmental conditions.

This chapter describes the methodological approach used to identify the effects of the KSM Project (the Project), the potential cause-effect pathways, and impacts on environmental endpoints of concern. Chapter 5 is organized into the following sections:

- **Section 5.1** defines key terminology used in the methods and throughout the effects assessment chapters.
- **Section 5.2** describes the methods used to assess effects.
- **Section 5.3** presents information on other projects and land use activities in the regional area with the potential to interact cumulatively with residual Project-related effects.

The assessment of potential effects on Valued Components is presented in Chapters 6 to 25.

5.1 Key Terms

For the purposes of this document, **environment** means both the biophysical environment as defined under Paragraph 2 of the *Canadian Environmental Assessment Act* (CEAA; 1992), as well as human environments (i.e., health, socio-economic, and cultural components).

Valued components (VCs) are environmental, social, economic, health, or heritage components that the public, scientists, government agencies, Aboriginal groups, or other stakeholders consider important. Each VC has a unique attribute, or value that can be measured, e.g., increased or reduced wetland function, or a lower tolerance or higher sensitivity to environmental stressors.

Potential effects are the effects of a proposed project without the implementation of mitigation or management measures, with the exception of embedded design changes that may also serve to reduce the potential for adverse environmental effects.

Residual effects are the effects of a project that remain after mitigation and management measures are implemented. Project-specific or project-related effects are separate from cumulative effects.

Significance is a measure of the degree or severity of an effect caused to the environment by a proposed project.

Cumulative effects occur when multiple human actions combine to affect a VC.[1]

[1] For the purposes of this document, the term **cumulative effects'** is synonymous with '**cumulative impacts'**.

A **human action** is defined as a project or activity (CEA Agency 1999): projects are typically some form of commercial or industrial development that is planned, constructed, and operated (e.g., a mine or a resource access road); activities are the other actions of humans in an area, such as public highway traffic, hiking, and hunting. The cumulative effects of a project can be viewed as the total effects on a resource, ecosystem, or human community attributable to the project and all other human actions.

The relationship of potential, residual, and cumulative effects is shown graphically in Figure 5.1-1.

The concept of cumulative effects recognizes that human actions do not occur in isolation; proposed projects must be considered in context, taking into account the aggregate effects of past, present, and reasonably foreseeable future activities in the same region. For a cumulative effect to occur, a project or physical activity must cause a residual effect on a VC, and that VC must also be affected by one or more other human actions.

5.2 Assessment Objectives and Methods

5.2.1 Objectives

The objectives of the environmental assessment (EA) for the KSM Project are to:

- identify any potential effects on VCs resulting from the Project;
- identify residual effects by evaluating the effectiveness of mitigation measures to avoid, reduce, control, eliminate, offset, or compensate for potential effects;
- determine whether residual effects are significant or not;
- determine if residual effects will act cumulatively with the residual effects of other projects or human activities; and
- determine the significance of residual cumulative effects.

5.2.2 Federal and Provincial Environmental Assessment Requirements

The EA methods used for the KSM Project follow recommended provincial and federal guidelines and legislated requirements, pursuant to the *BC Environmental Assessment Act* (2002) and the *Canadian Environmental Assessment Act* (1992).

The Cumulative Effects Assessment/Cumulative Impact Assessment (CEA/CIA) meets both the requirements of the British Columbia Environmental Assessment Office (BC EAO) and the Canadian Environmental Assessment Agency (CEA Agency). The methods used for the CEA are adapted from Senner et al. (2002) and include initial guideline steps established in the *Cumulative Effects Practitioners Guide* (CEA Agency 1999). The process for determining cumulative impacts/cumulative effects considers only the residual effects of the Project that have the potential to interact with the residual effects from other projects and actions (Figure 5.1-1).

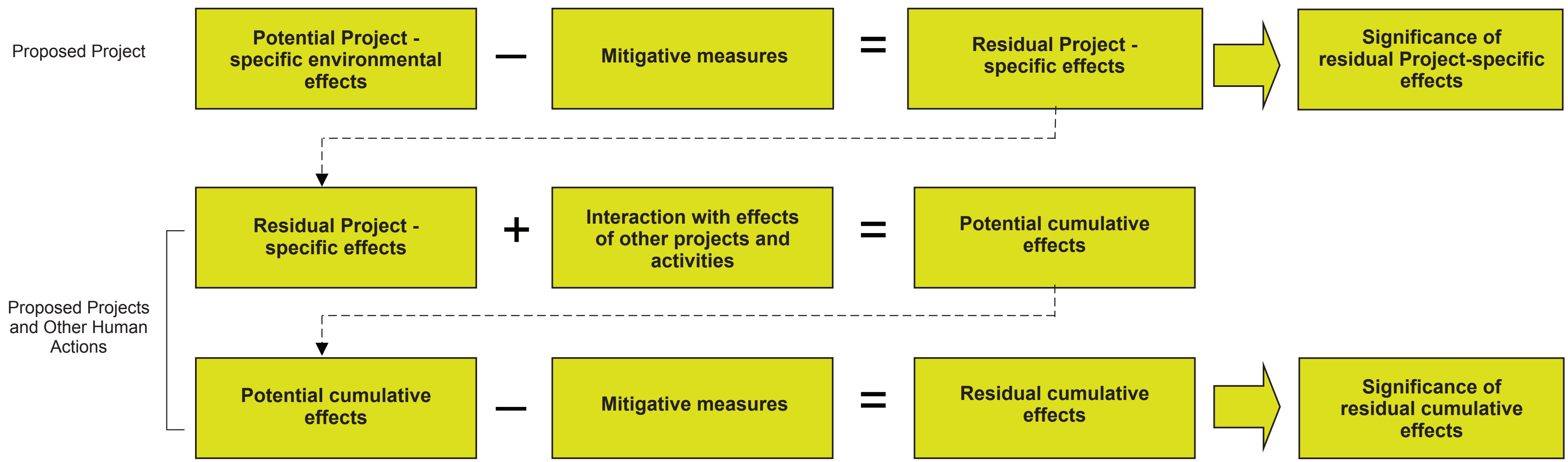

Figure 5.1-1

Relationship of Potential, Residual, and Cumulative Effects

5.2.3 Methods Overview

The effects assessment is organized into chapters by assessment topic (e.g., geohazards, wildlife, land use). Each chapter moves through the following steps:

1. A description of the environmental or baseline setting relevant to each VC;
2. A description of the historical activities that have affected the setting and which contribute to current baseline conditions;
3. An identification of the management directives relevant to each assessment topic drawn from provincial land and resource management plans;
4. A definition of the spatial and temporal boundaries required to assess the effects on each VC;
5. A scoping exercise to identify potentially affected VCs for different assessment topics;
6. A scoping exercise to identify potential interactions between Project components and VCs;
7. A description of the potential effects of the Project on each VC, and a description of any recommended mitigation measures to minimize Project effects. If potential effects can be fully mitigated, then they are not considered further in the assessment;
8. The identification and description of residual effects—those remaining after all mitigation measures will be applied—and a determination of their significance;
9. The identification of potential cumulative interactions between the residual effects of the Project and the residual effects of other human actions, together with a description of additional mitigation measures to minimize residual cumulative effects, and a determination of their significance; and
10. A summary of residual Project-related and cumulative residual effects and their significance.

5.2.4 Baseline Setting

The existing conditions in the baseline monitoring study areas, as they pertain to the selected VCs, are discussed in each assessment chapter. Information from Aboriginal groups is incorporated with information from scientific studies where available and relevant. Supporting documents, including annual baseline data reports, engineering, and technical reports are referenced and included in the appendices to the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS). Methods used to study the baseline are summarized, and the regulatory framework relevant to each assessment topic is discussed, including references to applicable laws, regulations, guidelines, and Best Management Practices (BMPs).

5.2.5 Historical Activities on Project Setting

In each assessment chapter, the influence of past and present human actions is described, including an overview of how past and present actions have historically affected VCs.

5.2.6 Summary of Land Use Planning Objectives

Each assessment chapter presents a summary of the provisions of land and resource use management plans that are relevant to the assessment topic or selected VCs. Plans relevant to the

Project include the Cassiar Iskut-Stikine Land and Resource Management Plan (CIS LRMP) and the Nass South Sustainable Resource Management Plan.

5.2.7 Spatial and Temporal Boundaries

5.2.7.1 Spatial Boundaries

For the Project-related effects assessments, distinct **spatial boundaries** are defined for each assessment topic. Spatial boundaries are determined based on the location and distribution of VCs, and the spatial extent of potential Project effects. The spatial scale may be confined to the Project footprint, a local study area, or a regional study area. Beyond the spatial boundaries, the Project is expected to have negligible potential effects on the VCs. The rationale for selecting specific spatial boundaries is explicitly stated in each chapter.

5.2.7.2 Temporal Boundaries

The potential effects of the Project will change over time, depending on the activities that occur during each phase of the Project. **Temporal boundaries** are the time periods considered in the assessment, which take into account the phases of the Project and the timelines of other human actions. Outside of these temporal boundaries, the Project is expected to have negligible potential effects on VCs.

<u>Project-specific Effects</u>

The phases of the Project form the temporal boundaries for the Project-related effects assessment. The four phases of the Project are:

1. **construction phase:** 5 years;
2. **operation phase:** 51.5 years;
3. **closure phase:** 3 years; and
4. **post-closure phase:** 250 years.

5.2.8 Valued Component Selection

For each assessment topic, a list of potential VCs is generated from the Application Information Requirements (AIR) and Comprehensive Study Scope of Assessment documents, issues raised during consultation with Aboriginal groups, government agencies (state and federal US agencies; Canadian federal, provincial, and local government), public, and stakeholders; these issues are reviewed in detail in Chapter 3, Information Distribution and Consultation. Land-use interviews, community and traditional knowledge, and professional judgment were also used to identify VCs. The potential VCs were then screened against the following criteria to determine if they should be included or excluded from further analysis:

- the occurrence of spatial and temporal overlaps between the Project and the VC such that interactions are possible;
- clear cause-effect pathways that can be measured (i.e., is there an understood relationship between the proximal cause of an effect and its receptor) so that an accurate characterization of the Project's direct and indirect effects on a VC can be made;

- availability of adequate data and analytical tools to measure an effect; and
- is there a perceived, reasonable likelihood that the VC could be affected by the Project.

In each assessment chapter, the VCs selected for assessment along with supporting rationale for why it was chosen is provided (see Table 5.2-1 below for an example).

Table 5.2-1. Identification and Rationale for Selected *<Example>* Valued Component(s)

VC	Identified by*				Rationale for Inclusion
	AG	G	P/S	O	

***AG = Aboriginal Group; G = Government; P/S = Public/Stakeholder; O = Other.**

VCs excluded from further assessment are also identified in each assessment chapter (see Table 5.2-2 below for an example).

Table 5.2-2. Identification and Rationale for Excluded *<Example>* Valued Component(s)

VC	Identified by*				Rationale for Exclusion
	AG	G	P/S	O	

***AG = Aboriginal Group; G = Government; P/S = Public/Stakeholder; O = Other.**

VCs selected for inclusion in Chapters 6 through 25 are listed in Table 5.2-3. Effects of the Project on VCs that have the potential to affect Nisga'a and Aboriginal groups' interests and rights are addressed in Chapter 29, Nisga'a Nation Interests, and Chapter 30, First Nations Interests.

Table 5.2-3. Valued Components Selected for Assessment

Assessment Topic	Valued Component
Chapter 6: Greenhouse Gas Emissions (Climate)	Greenhouse gas
Chapter 7: Air Quality	Ambient air quality
Chapter 8: Terrain, Surficial Geology, and Soils	Soil quantity Soil quality
Chapter 9: Geohazards	Terrain stability
Chapter 10: Geochemistry	n/a (cause-effect pathway to groundwater and surface water VCs)

(continued)

Table 5.2-3. Valued Components Selected for Assessment (continued)

Assessment Topic	Valued Component
Chapter 11: Groundwater Quantity	Changes in groundwater levels and flow patterns
Chapter 12: Groundwater Quality	Groundwater quality
Chapter 13: Surface Water Quantity	Changes in stream flows
Chapter 14: Surface Water Quality	Surface water quality
Chapter 15: Fish and Aquatic Habitat	Bull trout Dolly Varden Rainbow trout/Steelhead Pacific salmon (coho, sockeye, chinook) Aquatic habitat
Chapter 16: Wetlands	Wetland extent Wetland function
Chapter 17: Terrestrial Ecosystems	Potential pine mushroom habitat Avalanche track ecosystems Listed ecosystems Riparian and floodplain ecosystems Alpine and parkland ecosystems Old forests Other terrestrial ecosystems
Chapter 18: Wildlife and Wildlife Habitat	Moose Mountain goat Grizzly bear Black bear American marten Hoary marmot Bat species at risk and silverhaired bat Wetland birds Forest and alpine birds Raptors Western toad
Chapter 19: Noise	Noise levels
Chapter 20: Economic	Employment and income Business opportunities and economic development
Chapter 21: Heritage	Archaeological sites
Chapter 22: Social	Community demographics and infrastructure Education, skills development, and training Community well-being
Chapter 23: Land Use	Transportation and access Commercial recreation, hunting, and trapping Subsistence (current use of lands and resources for traditional purposes) Traditional/heritage value of land Water License Mining and mineral exploration Navigable waters
Chapter 24: Visual and Aesthetic Resources	Visual quality for users

(continued)

Table 5.2-3. Valued Components Selected for Assessment (completed)

Assessment Topic	Valued Component
Chapter 25: Human Health	Drinking and recreational water quality Air quality Country foods Noise

5.2.9 Identifying Potential Project-related Effects

For each assessment topic, the potential interactions of each Project component and activity with each VC are identified using an impact matrix approach (as shown in Table 5.2-4). Each Project component and activity associated with each phase of the Project is evaluated to identify potential interactions with VCs. If a Project component or activity does *not* interact with a VC, the cell in the matrix is left empty and no analysis is carried forward. If there *is* a potential for interaction between the Project component or activity and a VC, that cell is marked and the interaction is examined in detail. A marked cell does not indicate there will be a residual effect, only the potential for an effect to occur. The effects scoping matrices are reproduced in full for each topic and included in an appendix to each chapter. The potential direct effects are then evaluated by considering the application of mitigation to determine if residual effects will still occur. Table 5.2-4 is an abbreviated example of the scoping table used in each chapter.

Table 5.2-4. Potential Effects from Project on *<VC Example>*

Project Region	Project Area	*<Effect 1>*	*<Effect 2>*	*<Effect 3>*
Mine Site	Camp 3: Eskay Staging Camp			
	Camp 7: Unuk North Camp			
	Camp 8: Unuk South Camp			
	Coulter Creek Access Road			
	Mitchell Operating Camp			
	McTagg Rock Storage Facility			
	McTagg Twinned Diversion Tunnels			
	McTagg Power Plant			
	Mitchell Rock Storage Facility			
	Camp 4: Mitchell North Camp (for MTT construction)			
	Mitchell Ore Preparation Complex			
	Mine Site Avalanche Control			
	Iron Cap Block Cave Mine			
	Mitchell Pit			
	Mitchell Pit Block Cave Mine			
	Mitchell Diversion Tunnels			
	Upper Sulphurets Power Plant			
	Mitchell Truck Shop			

(continued)

Table 5.2-4. Potential Effects from Project on < *VC Example*> (completed)

Project Region	Project Area	*<Effect 1>*	*<Effect 2>*	*<Effect 3>*
Mine Site *(cont'd)*	Water Storage Facility			
	Camp 9: Mitchell Initial Camp			
	Camp 10: Mitchell Secondary Camp			
	Water Treatment and Energy Recovery Area			
	Sludge Management Facilities			
	Sulphurets Laydown Area			
	Sulphurets-Mitchell Conveyor Tunnel			
	Sulphurets Pit			
	Kerr Rope Conveyor			
	Kerr Pit			
	Camp 2: Ted Morris Camp			
	Explosives Manufacturing Facility			
	Temporary Frank Mackie Glacier Access Route			
	Camp 1: Granduc Staging Camp (existing camp operated by Castle Resources)			
Processing and Tailing Management Area	Mitchell-Treaty Twinned Tunnel			
	Construction Access Adit			
	Mitchell-Treaty Saddle Area			
	Camp 6: Treaty Saddle Camp			
	Camp 5: Treaty Plant			
	Treaty Operating Camp			
	Treaty Ore Preparation Complex			
	Concentrate Storage and Loadout			
	North Cell Tailing Management Facility			
	East Catchment Diversion			
	Centre Cell Tailing Management Facility			
	South Cell Tailing Management Facility			
	Treaty Creek Access Road			
	Camp 11: Treaty Marshalling Yard Camp			
	Camp 12: Highway 37 Construction Camp			
Off-site Transportation	Highways 37 and 37A			

Table 5.2-5 identifies the potential effects analysed in each assessment chapter. Potential effects of the Project with respect to the potential to impact specific Nisga'a Nation and Aboriginal groups' interests, issues and concerns are summarized in Chapters 29 and 30, together with specific measures taken to accommodate for any potential impacts on rights and/or title.

Table 5.2-5. Potential Effects of the KSM Project

Chapter	Assessment Topic	Potential Effect
6	Greenhouse Gas Emissions (Climate)	Change in atmospheric GHG levels
7	Air Quality	Change in ambient air quality
8	Terrain, Surficial Geology, and Soils	Loss of soil surface under Project footprint Loss of soil due to erosion or mass movement Soil compaction Soil contamination Loss of soil fertility
9	Geohazards	Construction effects of roads and facilities on: - Landslides - Avalanches
10	Geochemistry	Generation of metal leaching and acid rock drainage (ML/ARD)
11	Groundwater Quantity	Alteration of groundwater flow rates and directions due to changes in: - boundary condition - permeability
12	Groundwater Quality	Degradation of groundwater quality due to: - seepage of contact water - releases of industrial fluids
13	Surface Water Quantity	Changes in annual flow volumes Changes in monthly flow distribution Changes in peak flows Changes in low flows
14	Surface Water Quality	Degradation of surface water quality
15	Fish and Aquatic Habitat	Direct mortality Noise generation Erosion and sedimentation Water quality degradation Habitat loss and alteration
16	Wetlands	Loss of wetland extent Loss of wetland function Alteration or degradation to wetland function
17	Terrestrial Ecosystems	Loss of terrestrial ecosystems Alteration of terrestrial ecosystem natural patterns of diversity
18	Wildlife and Wildlife Habitat	Habitat loss Disruption of movement Sensory disturbance Direct mortality Indirect mortality Attractants Chemical hazards

(continued)

Table 5.2-5. Potential Effects of the KSM Project (completed)

Chapter	Assessment Topic	Potential Effect
19	Noise	Sleep disturbance Speech interference Complaints High annoyance Noise induced rattling
20	Economic	Change in employment Change in income and value-added Change in business activity Change in the economy
21	Heritage	Disturbance of recorded archaeological sites Disturbance of unrecorded archaeological sites
22	Social	Change in employment Change in population Change in demand Change in tax base Change in the quality of the natural environment, recreation, road traffic, and safety
23	Land Use	Change in traffic Change in access Change in sensory disturbances Change in quantity of resources Change in ability to access navigable waters Change in ability to safely navigate
24	Visual and Aesthetic Resources	Alteration of visual quality for river rafting tours Alteration of visual quality for heli-skiing tours Alteration of visual quality for guided backcountry expeditions Alteration of visual quality for guided angling trips Alteration of visual quality for visitors to the Treaty Creek site
25	Human Health	Human health effects from a change in drinking and recreational water quality Respiratory health effects due to changes in air quality Potential human health effects from ingestion of country foods Human health effects from noise

5.2.10 Potential Effects and Mitigation

For each potential effect identified in the impact matrices, standard ecological risk assessment frameworks that categorize the levels of detail and quality of the data required for the assessment are used. These tiers are as follows:

- **Tier 1:** Qualitative (expert opinion, including traditional and local knowledge, literature review, and existing site information, if available);
- **Tier 2:** Semi-quantitative (measured site-specific data and existing site information); and

- **Tier 3:** Quantitative (recent field surveys, detailed quantitative methods e.g., predictive modeling).

Where data are lacking, professional judgment is used to determine the extent of potential effects. The methodologies and underlying assumptions and data limitations are presented in the accompanying text. Each of the potential Project-specific effects is described in detail, together with the mitigation measures proposed to avoid, reduce, or eliminate them. Mitigation measures are supplemented by the use of additional considerations, for example considering alternative siting locations, changes in Project design, or best management practices. Mitigation measures that are recommended for use to reduce an adverse effect are considered to be technically, environmentally, and economically feasible. Key approaches to avoid, reduce, control, eliminate, offset, or compensate potential effects include:

- **Optimizing Alternatives:** Preventing or reducing adverse environmental effects by changing an aspect of the Project (e.g., choosing a new access route), see Chapter 33.
- **Design Changes:** Preventing or reducing adverse environmental effects by redesigning aspects of the Project (e.g., changing from a slurry pipeline to a conveyor).
- **Management Practices:** Eliminating or minimizing adverse effects through management practices that reduce or eliminate the cause of the effect, and/or the receptor (e.g., watering unpaved roads to control dust).
- **Follow-up Monitoring and Adaptive Management:** Monitoring the implementation of mitigation measures where uncertainty exists, and adjusting mitigation based on monitoring results.
- **Compensation:** Offsetting remaining effects that cannot be prevented or reduced through remedial or compensatory actions, so that the net effect on the community or ecosystem is neutral or beneficial (e.g., enhancement of similar habitat in another area, enhancement of other social/economic/cultural benefits).
- **Enhancement:** Providing measures to enhance a beneficial effect. Enhancement generally applies to socio-economic effects.

If the implementation of mitigation measures will eliminate a potential effect then no residual effect is identified on that VC, and the effect is eliminated from further analyses. If the proposed mitigation measures are not sufficient to eliminate the effect, the residual effect is briefly described. A summary of residual effects is summarized for each assessment topic, as shown in Table 5.2-6.

5.2.11 Determining the Significance of Residual Effects

Determining the significance of residual effects generally consists of three steps and follows the methodology described in the *Reference Guide for the Canadian Environmental Assessment Act: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (CEA Agency 1994):

- **Step 1:** determining whether the effect is adverse;
- **Step 2:** determining whether the adverse effect is likely; and
- **Step 3:** determining whether the adverse effect is significant.

Table 5.2-6. Potential Residual Effects on *<Assessment Topic>* Valued Components

Valued Component	Timing Start	Project Area(s)	Component (s)	Description of Effect due to Component(s)	Type of Project Mitigation	Project Mitigation Description	Potential for Residual Effect?	Description of Residual Effect

An evaluation of the significance of residual effects is based on a consideration of the following eight criteria, defined below:

1. **Magnitude:** The magnitude of a residual effect is defined as:
   - *Negligible*: no detectable change from baseline conditions;
   - *Low*: differing from the average value for baseline conditions to a small degree , but within the range of natural variation and well below a guideline or threshold value;
   - *Medium*: differing from the average value for baseline conditions and approaching the limits of natural variation, but below or equal to a guideline or threshold value; or
   - *High*: differing from baseline conditions and exceeding guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions).
2. **Geographic Extent:** The geographic extent of a residual effect on the biophysical VCs is defined as:
   - *Local*: an effect is limited to the Project footprint;
   - *Landscape*: an effect extends beyond the Project footprint to a broader watershed area;
   - *Regional*: an effect extends across the regional study area; or
   - *Beyond Regional*: an effect that extends possibly across or beyond the province.

   The **geographic extent** of a residual effect on a socio-economic environment VCs is defined as:
   - *Individual/Household*: an effect limited to individuals, families, and/or households;
   - *Community*: an effect extending to the community level;
   - *Regional/Aboriginal peoples*: an effect extending across the broader regional community or economy, or an effect extending to one or more Aboriginal groups; or
   - *Beyond Regional*: an effect extending possibly across or beyond the province.
3. **Duration:** The duration of a residual effect is defined as:
   - *Short-term*: an effect that lasts approximately one year or less;
   - *Medium-term*: an effect that lasts from 1 to 11 years;
   - *Long-term*: an effect that lasts between 12 and 70 years; or
   - *Far Future*: an effect that lasts more than 70 years.
4. **Frequency:** The frequency of a residual effect is defined as:
   - *Once:* an effect that occurs once during any phase of the Project;
   - *Sporadic*: an effect that occurs at sporadic or intermittent intervals during any phase of the Project;
   - *Regular*: an effect that occurs regularly during any phase of the Project; or
   - *Continuous*: an effect that occurs constantly during any phase of the Project.

5. **Reversibility:** The reversibility of the residual effect is defined as:
   - *Reversible Short-term*: an effect that can be reversed relatively quickly;
   - *Reversible Long-term*: an effect that can be reversed after many years; or
   - *Irreversible*: an effect that cannot be reversed (i.e., is permanent).
6. **Context:** The context or resiliency of a residual effect is defined as:
   - *Low*: the valued component is considered to have little to no unique attributes and/or there is high resilience to imposed stresses;
   - *Neutral*: the valued component is considered to have some unique attributes, and/or there is neutral (moderate) resilience to imposed stresses; or
   - *High*: the valued component is considered to be unique, and/or there is low resilience to imposed stresses.
7. **Probability:** The probability or likelihood of a residual effect occurring is defined as:
   - *Low*: an effect that is unlikely, but could occur;
   - *Medium*: an effect that is likely, but may not occur; or
   - *High*: an effect that is highly likely to occur.
8. **Confidence:** Confidence, which can also be thought of as scientific uncertainty, is a measure of how well residual effects are understood, which includes a consideration of the acceptability of the data inputs and analytical methods used to predict and assess Project effects. Confidence is defined as:
   - *Low* (< 50% confidence): The cause-effect relationship(s) between the Project and its interaction with the environment is poorly understood and/or data for the Project area or scientific analyses are incomplete, leading to a high degree of uncertainty;
   - *Medium* (50 to 80% confidence): The cause-effect relationship(s) between the Project and its interaction with the environment is not fully understood, and/or data for the Project area or scientific analyses are incomplete, leading to a moderate degree of uncertainty; or
   - *High* (> 80% confidence): The cause-effect relationship(s) between the Project and its interaction with the environment is well understood, and/or data for the Project area or scientific analyses are complete, leading to a low degree of uncertainty.

Definitions of each of these attributes may be VC specific and may vary accordingly; definitions used in the significance analysis will be provided for each VC. Quantitative thresholds are used (e.g., freshwater aquatic life guidelines, or ambient air criteria) to assist with evaluating the significance of residual effects. Other assessment end-points, such as the ability to meet or impair land and resource management planning objectives may also be used to assist significance determinations that are made based on a relative ranking of each term.

The significance of effects are ranked according to the categories in the following paragraph. Typical combinations of the eight significance criteria are provided to demonstrate how criteria may be compared or balanced against each other in the final outcome of significance; however, other combinations of the criteria are also possible.

- **Not significant (minor):** Residual effects have no or low magnitude, local geographic extent, short- or medium-term duration, and occur sporadically if at all. There is a high level of confidence in the analyses. The effects on the VC (e.g., at a species or population level) are indistinguishable from background conditions (i.e., occur within the range of natural variation as influenced by physical, chemical, and biological processes). Land and resource management plan objectives will be met.
- **Not significant (moderate):** Residual effects have medium magnitude; have local, landscape, or regional geographic extent; are short-term to chronic (i.e., may persist into the far future); and occur at all frequencies. Residual effects on the VC are distinguishable at the population, community, and/or ecosystem level. The ability to meet land and resource management plan objectives may be impaired. The probability of the effect occurring is low or medium. Confidence in the conclusions is low or medium.
- **Significant (major):** Residual effects have high magnitude, have regional or beyond regional geographic extent, are chronic (i.e., persist into the far future), and occur at all frequencies. Residual effects on the VC are consequential (i.e., structural and functional changes in populations, communities, and ecosystems are predicted). The ability to meet land and resource management plan objectives is impaired. The probability of the effect occurring is medium or high. Confidence in the conclusions can be high, medium, or low.

The Application/EIS will identify whether any of the adverse effects will require follow-up monitoring to determine the effectiveness of identified mitigation measures or to identify any emerging negative trends. A follow-up program may be optional for not-significant effects, but is required for any significant, major residual effects, or where there is uncertainty associated with the effectiveness of mitigation measures in reducing the potential for adverse effects. A summary of the follow-up programs for different VCs and effects is provided in Chapter 38 of the EIS/Application.

The assessment of residual effects and their significance is summarized for each assessment topic (as shown in Table 5.2-7).

5.3 Cumulative Effects Assessment

The CEA follows, where applicable, the approach used for the Project-related effects analysis and determination of significance presented above in Sections 5.2.9 through 5.2.11. As a starting point, only the Project-specific residual effects are carried forward into the CEA. The CEA will:

- provide the methodology and rationale used to identify other developments (past, current, and reasonably foreseeable future projects) that may temporally and spatially overlap with the residual effects of the Project (these projects are identified in Section 5.4 of this chapter);
- identify and describe any potential adverse effects from other developments in the respective CEA study area;
- describe the synergistic and additive effects of the overlapping cumulative activities as appropriate;

Table 5.2-7. Summary of Residual Effects for <*Assessment Topic*>

Description of Residual Effect	Project Component(s)	Timing of Effect	Magnitude	Extent	Duration	Frequency	Reversibility	Context	Likelihood of Effects		Significance Determination	Follow-up Program
									Probability	Confidence Level		

- identify additional mitigation measures that may be required to reduce adverse residual cumulative effects; and
- determine the significance of any adverse residual cumulative effects.

Cumulative effects are assessed in Chapters 6 through 25 to address provincial requirements. A summary of the cumulative effects assessment is provided in Chapter 37 to address federal requirements. The sections below describe the method for the Project cumulative effects assessment.

5.3.1 Issue Scoping

Human actions that could potentially interact with VCs are determined for each assessment topic. The list of projects and activities considered is described in Section 5.4.

Spatial overlap between the effects of the Project and other human actions is evaluated by developing a "linkage map" for each assessment topic and associated VCs, illustrating the areas where effects of the Project on a VC can reasonably be expected to occur. The maps are then used to determine which of the other human actions could potentially overlap spatially with the area of assessment topic and VC-specific effects. Linkage maps and impact matrices for each assessment topic, where relevant, are presented in the respective chapters. Spatial boundaries associated with the CEA are described in Section 5.4.1.

Temporal overlap is evaluated by examining the expected timing and duration of the potential Project effects and other human actions. This process includes an assessment of whether past human actions have affected the current condition of each VC (historical activities are presented earlier in each chapter). Unless there is a spatial overlap, temporal overlap is considered irrelevant. Temporal boundaries associated with the CEA are described in Section 5.4.2.

5.3.2 Identification of Potential Cumulative Effects

Using an impact matrix, each residual Project-related effect is considered in combination with presumed residual effects of past, present, and reasonably foreseeable future human actions where some spatial and temporal overlap occurs (as shown in Table 5.3-1). If a Project-related residual effect of the Project has *no* potential to interact with the effects from another human activity, then the cell in the matrix is left blank. A rationale describing why there is no predicted interaction is provided in the text, and those effects are no longer carried forward in the assessment. If there *is* a potential for an interaction between a residual Project-related effect with that of another human activity, the cell is marked, and the interaction is analyzed. A marked cell does not presume there to be a cumulative effect; rather, it is an indication that there is a *potential* for a cumulative effect.

5.3.3 The Potential for Cumulative Residual Effects, Mitigation, and Significance

The potential for cumulative residual effects is explored through either qualitative or quantitative means. The possibility of implementing additional mitigation by Seabridge or other parties responsible for the effects of other human actions is also considered in the CEA. Where these exist, additional mitigation measures and commitments made by Seabridge are described.

Table 5.3-1. Summary of Other Activities Expected to Interact Cumulatively with Project-related Residual Effects on *<VC>*

Description of KSM Project Residual Effect	***Potential for Cumulative Effect: Other Projects and Activities***		
	<Project/Activity 1>	***<Project/Activity 2>***	***<Project/Activity 3>***
<Residual Effect 1> *<Residual Effect 2>* *<Residual Effect 3>*			

For any cumulative residual effects that are identified (post-mitigation), a significance determination is carried out, adjusted for the predicted additive or synergistic effect of the cumulative interaction (Table 5.3-2). This allows for some ability to understand the Project's contribution to the cumulative impact (and for which there is a greater ability to address adverse effects), in relation to the effects imposed by other past, present, and reasonably foreseeable future human activities. Using a weight of evidence and relative ranking approach, combined with best professional judgment, the cumulative residual effect is categorized as either significant (major), not significant (moderate), or not significant (minor). Adjustments to follow-up programs to determine the effectiveness of identified mitigation measures or to identify any emerging negative trends are also made.

The assessment of cumulative residual effects and their significance is summarized for each assessment topic, as well as in Chapter 37.

5.3.4 Summary of Effects Assessment

At the end of each assessment chapter, a summary section presents the key findings for the assessment, including management, mitigation, or follow-up actions required to reduce adverse effects or enhance beneficial effects, as well as an overview of any Project-related or cumulative residual effects that are assessed as significant.

5.4 Human Actions Considered

Human actions (projects and activities) considered in the Project CEA are categorized as:

- past (closed) industrial projects;
- present (existing, active) projects;
- reasonably foreseeable future projects; or
- land use activities (past, present, and future).

Sections 5.4.3 to 5.4.5 summarize high-level data on human actions considered in the CEA. Where such data are not publicly available, professional judgment and data from comparable projects are used to predict trends. The assumptions made as well as the data sources utilized are documented.

Table 5.3-2. Summary of Cumulative Residual Effects on *<VC>*

														Likelihood of Effects							
Description of Residual Effect	Timing of Effect	Magnitude	Magnitude Adjusted for CE	Extent	Extent Adjusted for CE	Duration	Duration Adjusted for CE	Frequency	Frequency Adjusted for CEA	Reversibility	Reversibility Adjusted for CEA	Context	Context Adjusted for CEA	Probability	Probability Adjusted for CE	Confidence Level	Conf. Level Adjusted for CE	Significance Determination	Significance Adjusted for CEA	Follow-up Program	Follow-up Program Adjusted for CE

Note: CE = Cumulative Effect.

5.4.1 Spatial Boundaries for Cumulative Effects

A list of past, present, and reasonably foreseeable future projects in the KSM Project regional area were determined in consultation with the BC EAO and CEA Agency. The spatial extent considered in the socio-economic CEA encompasses all information in the biophysical CEA study boundaries, as well as:

- Stewart, Telegraph Creek, Dease Lake, Iskut, Hazelton, and New Hazelton;
- Gingolx, Gitwinksihlkw, Laxgalts'ap, and Gitlaxt'aamiks;
- Bell II;
- Meziadin Junction;
- Bob Quinn Lake;
- Town of Smithers; and
- City of Terrace.

Human actions considered in the CEA are:

- Past projects:
  - Eskay Creek Mine;
  - Granduc Mine (past producing);
  - Johnny Mountain Mine;
  - Kitsault Mine (past producing);
  - Snip Mine;
  - Sulphurets Project; and
  - Swamp Point Aggregate Mine Project.
- Present projects:
  - Forrest Kerr Hydroelectric;
  - Long Lake Hydroelectric;
  - Northwest Transmission Line (NTL);
  - Red Chris Gold-Copper Mine; and
  - Wolverine Mine (Yukon).
- Reasonably foreseeable future projects:
  - Arctos Anthracite Coal Project (formerly referred to as Mt. Klappan Coal Project);
  - Bear River Gravel;
  - Bronson Slope Mine;
  - Brucejack Gold Mine;

  - Galore Creek Mine;
  - Granduc Copper Mine;
  - Kitsault Moly Mine;
  - Kutcho Gold-Copper-Silver-Zinc Mine;
  - McLymont Creek Hydroelectric;
  - Schaft Creek Copper-Gold Mine;
  - Snowfield Gold-Copper Project;
  - Storie Moly Mine;
  - Treaty Creek Hydroelectric; and
  - Turnagain Nickel Mine.
- Land use activities:
  - Agriculture;
  - Fishing (see Chapter 23, Figure 23.1-9) ;
  - Guide outfitting (see Chapter 23, Figure 23.1-7);
  - Aboriginal harvest (fishing, hunting/ trapping, and plant harvest; Chapters 29 and 30);
  - Trapping (see Chapter 23, Figure 23.1-8);
  - Mineral exploration (see Figure 5.4-1)
  - oil and gas exploration;
  - Commercial recreation and tourism (see Chapter 23, Figure 23.1-9) ;
  - Forestry (see Chapter 23, Figure 23.1-10); and
  - Transportation (see Chapter 23, Figure 23.1-14).

These human activities are presented in Figures 5.4-1 and 5.4-2 and in the above referenced chapters.

5.4.2 Temporal Boundaries for Cumulative Effects

The following periods are evaluated as part of the CEAs:

- **Past:** 1964 to 2008, coinciding with the development of the Granduc mine, which influenced the growth of the community of Stewart and other human activities in the area (StewartBC.com 2004);
- **Present:** 2008 to 2013, from the start of the KSM Project’s baseline studies to the completion of the effects assessment; and
- **Foreseeable Future:** temporal boundaries are stated in each assessment chapter, and vary according to the time estimated for VCs to recover to baseline conditions (taking into account natural cycles of ecosystem change).

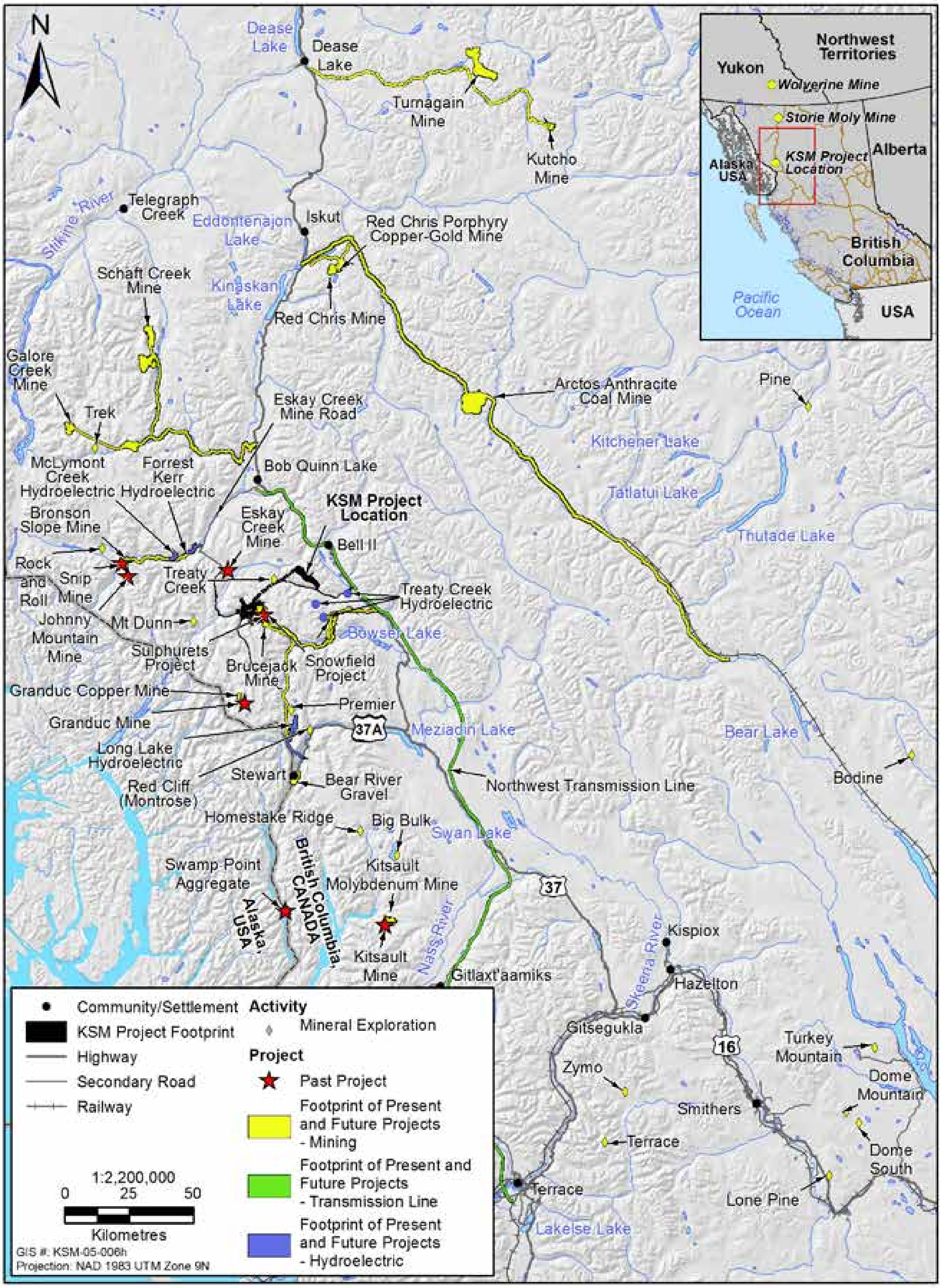

Figure 5.4-1

KSM Project Cumulative Effects Scoping: Projects and Activities Considered for the Biophysical Environment Assessment

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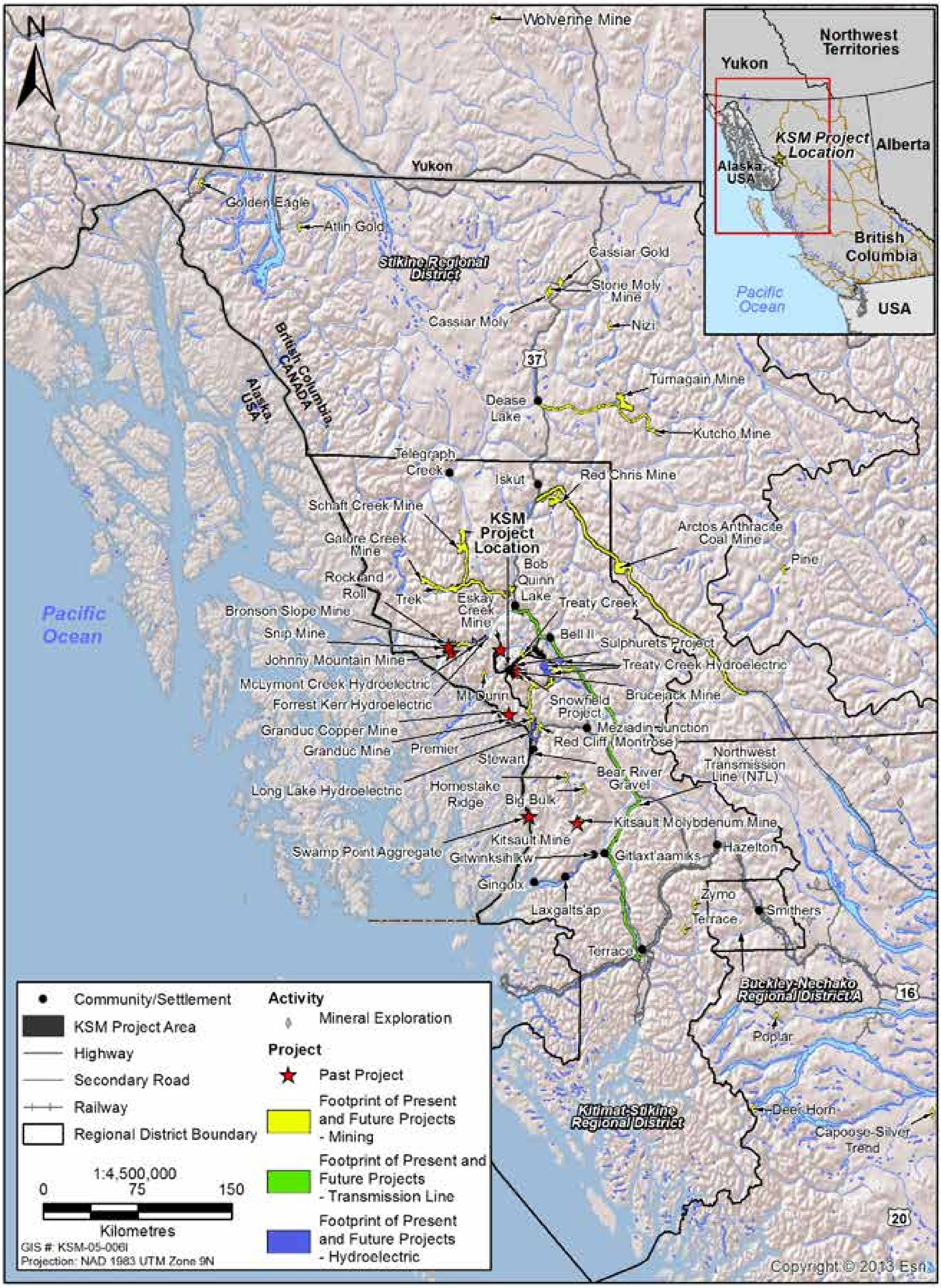

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KSM PROJECT

KSM Project Cumulative Effects Scoping: Human Activities (Projects) and Areas Considered for the Human Environmental Assessment

Figure 5.4-2

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5.4.3 Past Industrial Projects

Past industrial projects within the KSM Project CEA study areas are confined to mining activities. Mining projects within the CEA study areas that have been active since 1964 (the past temporal boundary) but are now closed are listed in Table 5.4-1. The project locations are shown on Figures 5.4-1 and 5.4-2 and summarized below.

Table 5.4-1. Summary of Closed Mining Projects in the CEA Study Areas

Mine	Coordinates	Owner	Commodities	Project Type	Operational Period
Eskay Creek Mine	56° 39' N 130° 27' W[4]	Barrick Gold Corporation[3]	Gold, silver, zinc, copper, lead [3]	Underground[3]	1995 to 2008[2]
Granduc Mine (past producer)	56°12' N 130° 20' W[6]	Newmont Mining Corporation Ltd. Esso Resources Canada[5]	Copper, gold, silver[5]	Underground[5]	1971 to 1978 1980 to 1984[6]
Johnny Mountain Mine	56° 37' N 131° 04' W[7]	International Skyline Gold Corp. [7]	Gold, silver, copper, zinc, lead[7]	Underground[8]	1988 to 1990[7] 1993[8]
Kitsault Mine (past producer)	55 ° 25' N 129° 25' W[10]	B.C. Molybdenum, a subsidiary of Kennco Exploration (Western) Ltd. from 1963 to 1972; Climax Molybdenum Company of British Columbia (CMC) and affiliates from 1973 to 1998.[11]	Mainly molybdenum; also silver, lead, zinc, copper, and tungsten[10]	Open pit mining[11]	1967 to 1972[9] 1981 to 1982[9]
Snip Mine	56° 40' N 131° 06' W[14]	Cominco Ltd.; Homestake Canada Inc. (beginning in 1996); and acquired by Barrick Gold Corp. in 2001[15]	Gold, silver, copper, zinc, lead[14]	Underground	1991 to 1999[14]
Sulphurets Project	56º 30' N 130º 12' W[17]	Newhawk Gold Mines Ltd.	Gold, silver[16]	Advanced underground exploration and bulk sampling program[16]	1986 to 1990[16]
Swamp Point Aggregate Mine	55 ° 28' N 130 ° 02' W[7]	Ascot Resources Ltd. [1]	Sand and gravel aggregate quarry, and ship-loading facility[1]	Aggregate quarry	Construction and operation between 2006 and 2008, closed in 2011[18]

Data sources: [1] BC EAO (2010); [2] Murphy and Napier (1996); [3] McGurk, M., F. Laundry, and R. MacGillvray (2005); [4] InfoMine (2010); [5] McGuigan and Harrison (2010); [6] BC MEMPR (1988); [7] BC MEMPR (2008); [8] Skyline Gold Corp. (2006b); [9] Avanti Mining Inc. (2012a); [10] BC MEMPR (2010b); [11] AMEC (2010); [12] BC MEMPR (2007a); [13] Jayden Resources Inc. (2010); [14] BC MEMPR (2007b); [15] Sibbick and MacGillivray (2006); [16] Price (2005); [17] BC MEMPR (2006); [18] Ascot Resources Ltd. (2010)

5.4.3.1 Eskay Creek Mine

The Eskay Creek Mine was an underground gold-silver mine located approximately 80 km north of Stewart, BC. The closed mine is approximately 18 km (straight-line distance) from the Project site. Operation of the mine began in 1995 and required the construction of the Eskay Creek Mine road that will be used by the KSM Project. The mine was closed in the first quarter of 2008 (Murphy and Napier 1996). During decommissioning, restoration activities included removing buildings and infrastructure and re-vegetating some of the project area. Restoration is continuing. The mine site will continue to be monitored (Rescan 2010b).

Project Facts:

- **Production** – Approximately 750 t of ore per day (McGurk, Laundry, and MacGillvray 2005).
- **Project Lifespan** – 13 years.
- **Footprint** – 27 ha of land was cleared between 1998 and 2004, 9 ha of which were reclaimed by 2004 (Barrick Gold Corp. 2004).
- **Access** – Access to the mine site was via the Iskut Road (30 km) and the Eskay Creek Mine road (30 km; Murphy and Napier 1996). These roads were built between 1991 and 1994 from Highway 37 along the Iskut River to Volcano Creek and up to the mine site.
- **Traffic Volume** – Between three and five loads (6 to 10 trips) per day along Highway 37 (Rescan 2006).
- **Tailing Storage** – Waste rock and tailing were stored under water. Between 1995 and 2001, they were stored in Albino Lake. Beginning September 2001, tailing was discharged through a pipeline to Tom Mackay Lake (McGurk, Laundry, and MacGillvray 2005).
- **Water (inputs/outputs)** – As of 2008, water continues to flow from the waste rock impoundment (Albino Lake), the tailing impoundment (Tom MacKay Lake), and the mine site into Ketchum Creek and into the Unuk River (McGurk, Laundry, and MacGillvray 2005).
- **Employment** – At full capacity, the mine directly employed 350 people (Mineral Resources Education Program of BC 2009).

5.4.3.2 Granduc Mine (Past Producer)

The Granduc Mine was a copper mine located approximately 40 km (straight-line distance) south of the Project site. Much of the current town of Stewart was built to support the development of the Granduc Mine (Silver Standard Resources Inc. 2010). Construction of the Granduc Mine began with tunnel driving in 1964 and was completed in 1970. The mine operated until 1978, was re-opened in 1980, and operated again until its closure in 1984. The proposed Temporary Frank Mackie Glacier access route will begin near the former Granduc mill site, about 30 km (straight-line distance) from the proposed Project.

Project Facts:

- **Production –** The project was built with a mill capacity of 2,000 tpd (McGuigan and Harrison 2010). A total of 15.2 Mt of ore was produced over the life of the mine (BC MEMPR 1988).
- **Project Lifespan** – Eight years (1970 to 1978) and four years (1980 to 1984).
- **Footprint** – The mine included underground workings, a mill site near Summit Lake and an 18.4-km tunnel connecting them (StewartBC.com 2004). Concentrator facilities were located at Tide Lake in the Bowser River Valley, and an all-weather road was constructed from Tide Lake to Stewart (Reinhard 2008).
- **Access**– The mine site was accessed by helicopter, or by the 35-km long Summit Lake Road.
- **Traffic Volume** – The Granduc Mine hauled approximately 24 loads per day of concentrate to the Stewart Bulk Terminals until its closure in 1984 (StewartBC.com 2004).
- **Tailing Storage** – Tailing were not contained (P. Wojdak, pers. comm.).
- **Water (inputs/outputs)** – Tailing were washed down Bowser River Valley into Bowser Lake (Heffernan 2005; P. Wojdak, pers. comm.). Groundwater for the power plant, industrial water runoff, shower drainage, floor waste in the process areas, etc., were also collected and discharged to the Leduc River, which drains into Alaska.
- **Employment** – The mine employed 750 people (StewartBC.com 2004).

5.4.3.3 Johnny Mountain Mine

The Johnny Mountain Mine is a closed underground mine located in the Iskut River watershed about 50 km northwest of the Eskay Creek Mine road, in the Bronson Slope area south of Snip Mine. The Johnny Mountain mine began operation in 1988 and closed in 1990 (BC MEMPR 2008). Skyline Gold re-opened the mine for a limited two-month production run in 1993 (Skyline Gold Corp. 1993). The property still offers exploration potential (Skyline Gold Corp. 2006b).

Project Facts:

- **Production –** A total of 175,000 t were mined between 1988 and 1990, and 21,850 t were mined in 1993 (Skyline Gold Corp. 2006b).
- **Project Lifespan** – Two years.
- **Footprint –** The footprint is adjacent to, but independent of, Snip Mine. When weather prevented use of the Johnny Mountain airstrip, the Bronson airstrip was shared with the Snip Mine (P. Wojdak, pers. comm.).
- **Access –** The mine was a fly-in/fly-out operation with its own airstrip. A road connected the mine site to the Bronson airstrip at Snip Mine, as an alternative access route (P. Wojdak, pers. comm.).
- **Traffic Volume –** The mine relied mostly on access by air.
- **Tailing Storage –** The tailing impoundment is located on Johnny Mountain (P. Wojdak, pers. comm.).

- **Water (inputs/outputs)** – Not available.
- **Employment –** The mine employed approximately 155 people (BC MEMPR 1989).

5.4.3.4 Kitsault Mine (Past Producer)

The Kitsault Mine is a closed mine located in the Nass Area about 135 km south of the proposed KSM Project. Between January 1968 and April 1972, approximately 9.3 Mt of ore were produced with about 10.4 million kg of molybdenum recovered. In 1981 and 1982, about 4 Mt of ore were produced, yielding approximately 3.1 million kg of molybdenum. (Avanti Mining Inc. 2009). Reclamation of the mine was completed in 2006.

Project Facts:

- **Production –** Between January 1968 and April 1970, approximately 9.3 Mt of ore were produced with about 22.9 million pounds of molybdenum recovered. Over 4 Mt of ore were milled during 1981 and 1982.
- **Project Lifespan –** Four years of mining (1967 to1972), and two additional years of milling (1981 and 1982).
- **Footprint –** The disturbed area is approximately 175 ha. It included an open pit, two waste rock management facilities (Patsy and Clary), two low grade ore stockpiles, overburden stockpiles, the mill and concentrator buildings, truck shop, service and haul roads, and settling pond at the base of the open pit (AMEC 2010).
- **Access –** The mine was accessed by road north of Terrace to Nass Camp via Highway 113 and the Nass Camp Forest Service Road to Cranberry Junction.
- **Traffic Volume –** Not available.
- **Tailing Storage –** Tailing were piped to Alice Arm for submarine disposal (AMEC 2010).
- **Water (inputs/outputs)** – The mine discharged into Lime Creek at the head of Alice Arm.
- **Employment –** In December 1969, the mine employed 210 people (BC DMPR 1970).

5.4.3.5 Snip Mine

Snip Mine is a closed underground mine located in the Iskut River watershed about 50 km northwest of the Eskay Creek Mine. The Snip Mine operated between January 1991 and June 1999, first by Cominco Ltd. and then, beginning in 1996, by Homestake Canada Inc. The mine was successfully closed and reclaimed in 1999 (Sibbick and MacGillivray 2006). Like the Johnny Mountain mine, it is located in the Bronson Slope area and the property still offers exploration potential (Skyline Gold Corp. 2006b).

Project Facts:

- **Production –** From 1991 to 1999, the mine produced 32.093 t of gold, 12.182 t of silver, and 249,276 kg of copper from 1.2 Mt of ore (BC MEMPR 2007b).
- **Project Lifespan** – Eight years.
- **Footprint –** The mine consisted of an underground mining operation, mill, tailing impoundment, and ancillary facilities.

- **Access –** The mine was a fly-in/fly-out operation accessible by helicopter (Sibbick and MacGillivray 2006). The site could also be accessed by boat (Price 2003), or hovercraft along the Iskut and Stikine rivers.
- **Traffic Volume–** The mine relied mostly on access by air (P. Wojdak, pers. comm.).
- **Tailing Storage –** The tailing impoundment was constructed in the saddle of a narrow valley forming the headwaters to both Monsoon and Sky creeks. Dams were constructed at each end to form a tailing impoundment approximately 150-m wide and 800-m long. Discharge from the impoundment was directed toward Sky Creek (Sibbick and MacGillvray 2006).
- **Water (inputs/outputs) –** The mine site is drained by the Bronson, Monsoon, and Sky creek drainages. Both Bronson and Monsoon creeks flow directly into the Iskut River, whereas Sky Creek flows into the Craig River and then to the Iskut River (Sibbick and MacGillivray 2006).
- **Employment** – On average, 122 people were employed by the mine (BC MEMPR 1993).

5.4.3.6 Sulphurets Project

The Sulphurets Project was an advanced underground exploration project located near Brucejack Lake. Newhawk Gold Mines Ltd. excavated underground workings between 1986 and 1990 as part of an advanced exploration and bulk sampling program. Construction of the underground workings generated approximately 124,000 t of waste rock. The waste rock was placed as a shallow pad along the southern boundary of Brucejack Creek and used as the foundation for the camp and other facilities (Price 2005). The operation never went into production, and in 1996 the Sulphurets property was placed in care and maintenance. Development plans for the project were indefinitely suspended and Newhawk Gold Mines Ltd. decided to fully reclaim the property in 1998 (Price 2005).

<u>Project Facts:</u>

- **Production –** The operation never went into production (Price 2005).
- **Project Lifespan** – The operation never went into production (Price 2005).
- **Footprint** – Sulphurets was an underground exploration project, with a waste rock pad adjacent to Brucejack Creek (Price 2005).
- **Access** – Overland access was from Highway 37, along a logging road to the barge landing on Bowser Lake, by boat up the length of the lake (NE to SW end), then by dirt road up the Bowser River to the toe of the Knipple Glacier and up the mountain to access the glacier, 7 km on an ice road up the Knipple Glacier and finally 1 km on a mine road along the southern edge of Brucejack Lake to the Sulphurets Camp (Price 2005).
- **Traffic Volume** – Not available.
- **Tailing Storage** – No tailing were produced, as operation never went into production (Price 2005).
- **Water (inputs/outputs)** – Underground workings and waste rock pad were adjacent to Brucejack Creek, and mine water and potentially acid rock drainage-generating waste

rock were deposited into Brucejack Lake. Brucejack Creek flows from Brucejack Lake, under the Sulphurets Glacier, eventually emerging in Sulphurets Creek, which flows to the Unuk River (Price 2005).

- **Employment** – The operation never went into production.

5.4.3.7 Swamp Point Aggregate Mine

The Swamp Point Aggregate Mine was an aggregate (sand and gravel) pit and ship-loading facility located on the Portland Canal (BC EAO 2010). The project location was approximately 50 km south of Stewart, BC and 115 km southeast of the KSM Project. The lifespan of the project was estimated at approximately 18 years, with a maximum production capacity of about 3.3 Mt of aggregate per year (BC MOE 2006).

Ascot Resources Ltd. received an EA Certificate for the Swamp Point project in 2006 and began site development in October of that year, with plans to export sand and gravel to west coast North American markets by ships and barges (Ascot Resources Ltd. 2010). The first shipment of aggregates began in April 2007, while construction of both onshore and deep water infrastructure continued (Ascot Resources Ltd. 2009, 2010).

In July 2008, Ascot Resources Ltd. suspended construction of its ship loading facility at Swamp Point in reaction to the economic downturn (Ascot Resources Ltd. 2010). In June 2011, the camp at the mine site was closed and removed and most of the associated equipment was removed (Ascot Resources Ltd. 2010).

<u>Project Facts:</u>

- **Production –** 3.3 Mt of aggregate/year (BC MOE 2006).
- **Project Lifespan –** 18 years, but never went into full production (BC MOE 2006).
- **Footprint –** The project included lay-down areas, haul roads, mining and processing equipment, and a ship loading facility (Ascot Resources Ltd. 2010).
- **Access –** Site access was by air or water. There was no road access to the site (Ascot Resources Ltd. 2010).
- **Traffic Volume –** There was no vehicle traffic. Vessel traffic was Panamax class (70,000 dwt) freighters (Ascot Resources Ltd. 2010).
- **Tailing Storage** – not applicable.
- **Water (inputs/outputs)** – Water was diverted from Steep Creek to Reservoir Lake and withdrawn from Reservoir Lake (BC MOE 2006).
- **Employment** – The project was expected to create 20 to 50 direct, non-seasonal jobs (BC MOE 2006).

5.4.4 Present Projects

With the suspension of construction for the Galore Creek Mine project in late 2007, and closure of the Eskay Creek Mine in March 2008, there are currently no operating mine projects close to the Project (BC Stats 2010). However, the Red Chris Mine is currently under construction, and the Wolverine Mine project in the Yukon, approximately 490 km away from the Project, is currently engaged in operation phase activities. Wolverine Mine Project concentrate is trucked to the Port of Stewart for shipment to overseas smelters.

Currently there are a number of hydroelectric developments in the region. The NTL, Long Lake Hydroelectric Power, and the Forrest Kerr Hydroelectric Power projects are engaged in construction activities. These existing projects are summarized in Table 5.4-2. Anticipated present project timelines for construction and operation are shown in Figure 5.4-3.

5.4.4.1 Forrest Kerr Hydroelectric Power

The Forrest Kerr Hydroelectric Power Project is a proposed run-of-river hydroelectric power facility located on the Iskut River near the confluence of Forrest Kerr Creek, approximately 50 km west of Bob Quinn Lake junction (Glassman 2003), and about 30 km northwest of the Project.

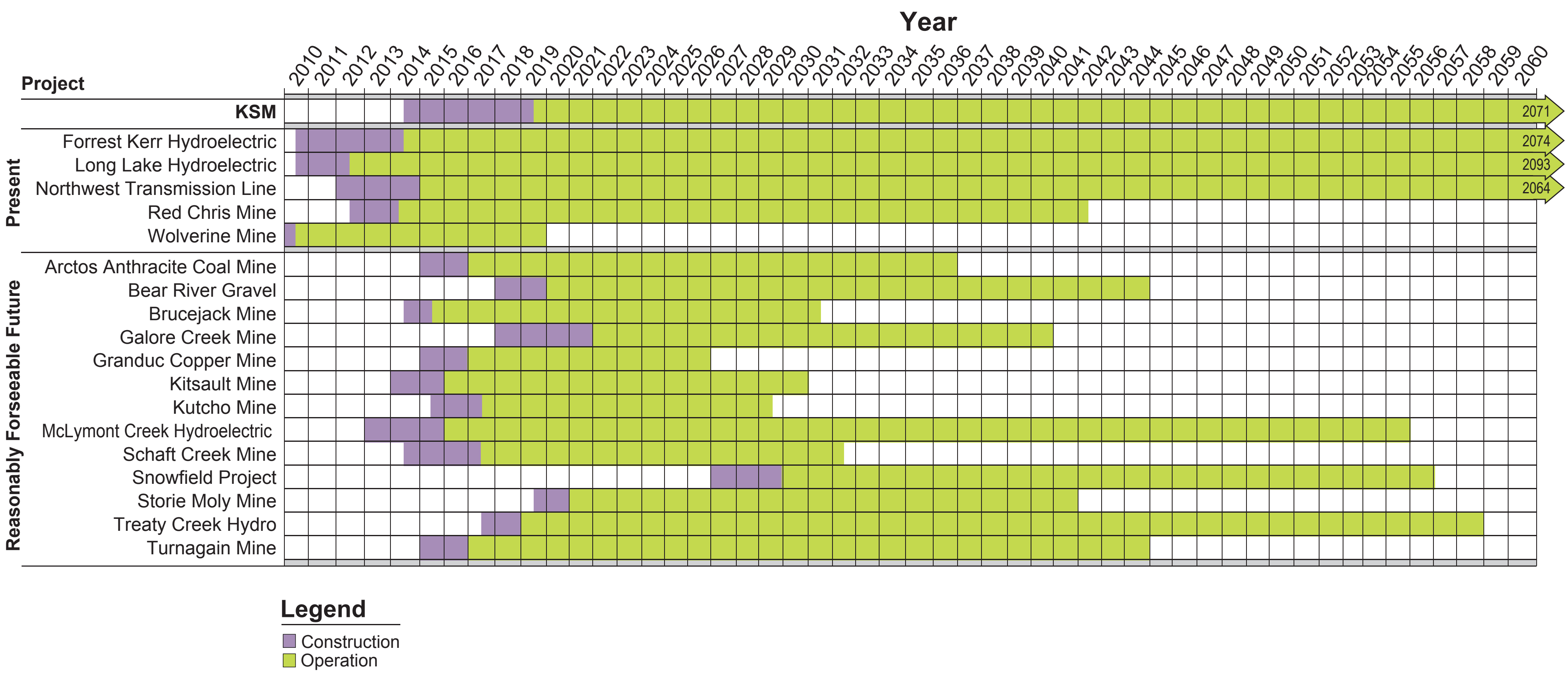
The project received an EA Certificate in 2003 and successfully applied to amend the certificate in 2009/2010 to increase generation capacity to 195 MW (Cambria Gordon 2009). The project includes provisions for interconnection with the McLymont Creek (about 70 MW) and the Volcano Creek (about 16 MW) hydropower projects, both of which are earlier in the planning stages, through the Forrest Kerr switchyard. Due to its small size, the Volcano Creek project is not subject to the EA process. For the purposes of the CEA, it is considered an extension of the Forrest Kerr project and not discussed further. The McLymont Creek project is discussed in Section 5.4.5.9.

During 2012 and 2013, AltaGas will continue to advance the project by completing feasibility engineering reviews and environmental studies.

As of June 2010, site development activities were underway (JOC News Service 2010). Construction began in spring 2011 and the project is expected to come into service mid-2014 (NDIT 2012a). It will provide enough electricity for about 70,000 homes in BC, and will deliver electricity to the previously announced NTL (JOC News Service 2010; Simpson 2010).

Project Facts:

- **Production –** A 195 MW run-of-river hydroelectric power project with a transmission line capacity of 287 kV (Cambria Gordon 2009; AltaGas Renewable Energy Inc. 2010; Simpson 2010).
- **Project Lifespan –** Construction will last 48 months, and the project life will be 60 years, considering the 60-year electricity purchase deal between AltaGas Income Trust and BC Hydro (JOC News Service 2010; Simpson 2010; NDIT 2012a).
- **Footprint** – At the generation site area, approximately 29 ha of land will be cleared for a plant site, an underground powerhouse, and tailrace (AltaGas Renewable Energy Inc. 2010). The approximately 37.3-km long transmission line will run from the plant site, along the new 8 km access road and the Eskay Creek Mine road to Highway 37 at Bob Quinn. It will have a right-of-way clearing width of 68 m (Glassman 2003).



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Estimated Present and Future Project Timelines

Figure 5.4-3

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Table 5.4-2. Summary of Present Projects within the CEA Study Area

Project	Coordinates	Owner	Project Type	Anticipated Construction Period	Anticipated Operational Period	Current Regulatory Status
Forrest Kerr Hydroelectric	56°44' N 130°39' W[1]	Coast Mountain Power Corp.	195 megawatt[3] hydroelectric power generation and 188 km[1] transmission line.	48 months[12]	From mid-2014 for 60 years[2]	Certified as of July 2010, and site development began June 2010[2]
Long Lake Hydroelectric	56°6'N 129°59'W[7]	Regional Power/ Premier Power Corp[5]	31 megawatt hydroelectric project, and 10 km transmission line[6]	24 months[5]	From December 20126 for 80 years[8]	Construction began July 2010[6]
Northwest Transmission Line	Along Highway 37 from Terrace to Bob Quinn Lake[1]	BC Hydro	344 km 287-kV transmission line[9]	39 months	From Spring 2014[9] for 50+ years	Certified as of February 2011, and construction began January 2012[9]
Red Chris Mine	57° 42' N 129° 47' W[10]	Imperial Metals Corp.	Open pit mine: copper, gold, and silver[10]	22 months[10]	28.3-year mine life[10]	Certified as of August 2005 and extended in 2010, and construction began May 2012[10]
Wolverine Mine	61°9' N 130°44' W	Yukon Zinc Corp.	Underground mine: copper, lead, zinc, and silver[4]	20 months[4]	From 2010 for 9.5-year mine life[11]	Construction completed as of 2010[11]

Data sources: [1] BC EAO (2010); [2] JOC News Service (2010); [3] Simpson (2010) [4] Yukon Zinc Corp. (2006a); [5] NDIT (2012b); [6] Regional Power (2012); [7] Wikimapia (2012); [8] CEA Agency (2012b); [9] BC Hydro (2012); [10] Gillstrom, Anand, and Robertson (2012); [11] Yukon Zinc Corp. (2012); [12] NDIT (2012a).

- **Access** – Access to the project is from Highway 37 and the Eskay Creek Mine road. A new 8 km gravel road was constructed in 2005 (Cambria Gordon 2009). The airstrip at Bob Quinn Lake will also be used to transport personnel and materials.
- **Traffic Volume** – It is assumed that there will be limited traffic along Highway 37 and the Eskay Creek Mine road during operation. The primary traffic will be employees heading to and from the Forrest Kerr camp. These trips are expected to amount to approximately one trip per day.
- **Tailing Storage** – Not applicable.
- **Water (inputs/outputs) –** Water will be diverted from the Iskut River through a 3.1-km tunnel, resulting in approximately 252 m^3/s diversion flow, and returned to the Iskut River at the tailrace (Glassman 2003; AltaGas Renewable Energy Inc. 2010).
- **Employment –** A construction workforce of about 400 will be required, and operation will provide permanent employment for 6 to 10 people (Cambria Gordon 2009; NDIT 2012a).

5.4.4.2 Long Lake Hydroelectric

Long Lake Hydroelectric Project is located on Cascade Creek, approximately 17 km north of Stewart, BC (CEA Agency 2012b). The project includes redevelopment of a 20-m high rockfill dam located at the head of Long Lake, and a new 10-km long 138 kV transmission line. In 2010 the project was awarded a contract with BC Hydro, construction began in July 2010, and the project is expected to be in operation by the summer of 2013 (NDIT 2012b; Regional Power 2012; Wikimapia 2012).

<u>Project Facts:</u>

- **Production –** A 31 MW hydroelectric project (CEA Agency 2012b).
- **Project Lifespan** – 80 years (CEA Agency 2012b).
- **Footprint** – The project includes a 20-m high rockfill dam, a 7.2-km long penstock, and a 10-km long 138 kV transmission line (NDIT 2012b).
- **Access** – On-site project facilities will use existing service roads (NDIT 2012b).
- **Traffic Volume** – Traffic is expected to increase during the construction period; during operation, employee traffic is assumed to amount to approximately one trip per day.
- **Tailing Storage** – Not applicable.
- **Water (inputs/outputs)** – The storage dam will create a reservoir inundating an area of approximately 278 ha (CEA Agency 2012b), but will improve the water quality of the Cascade Creek and Salmon River by providing more flows and diluting effluents from past mining operations (Regional Power 2012).
- **Employment** – The project will employ up to 160 people during construction (NDIT 2012b). It is assumed the project would create one or two full-time jobs during operation.

5.4.4.3 Northwest Transmission Line

The NTL will be an approximately 344 km electricity transmission line (BC Hydro 2012). The 287-kV capacity line will generally follow the Highway 37 corridor, running from the Skeena Substation at Terrace and connecting with a new substation near Bob Quinn Lake, and will pass within about 10 km of the KSM Project (BC Hydro 2012).

BC Hydro received an EA Certificate in February 2011 and construction began January 2012. The project is expected to be operational in 2014 (BC Hydro 2012).

Project Facts:

- **Production** – A new 344-km long 287 kV transmission line between the Skeena Substation at Terrace and Bob Quinn Lake (BC Hydro 2012).
- **Project Lifespan –** 50 or more years (Rescan 2010b).
- **Footprint** – Vegetation will be cleared from the transmission line right-of-way (ROW) to a total width of approximately 38 m (19 m each side). Dangerous trees that could fall on the electrical wires outside this ROW will also be selectively cut (Rescan 2010b).
- **Access–** Access to the northern segment of the transmission line will use Highway 37 and the Eskay Creek Mine road. Helicopters may be used in areas where terrain access is hazardous or exceptionally difficult. New permanent, semi-permanent, or temporary roads and the expansion or improvement of existing Forest Service roads and trails may be required along some sections of the route (Rescan 2010b).
- **Traffic Volume–** Traffic is expected to increase during the construction period (Rescan 2010b). During operations, a limited amount of seasonal traffic on an annual basis to assess dangerous trees and periodically clear vegetation is expected.
- **Tailing Storage** – Not applicable.
- **Water (inputs/outputs)** – No water use, but the transmission line will cross many watersheds and rivers (Rescan 2010b).
- **Employment –** Project construction would create an estimated 860 full-time equivalent jobs during the construction phase (Rescan 2010b).

5.4.4.4 Red Chris Mine

Red Chris Mine is a proposed open-pit mine that will produce copper and gold. The project is located on the Todagin Plateau between Ealue and Kluea lakes, approximately 18 km southeast of the village of Iskut and about 145 km north of the Project (BC EAO 2005b). The project received an EA Certificate in 2005, which was extended in 2010. Federal approval of the project under the CEAA (1992) was challenged by a third party, and the Supreme Court of Canada allowed development to proceed in 2010 (RCDC 2010).

Construction of an exploration access road was completed in 2008 to reduce the reliance on helicopter support, and allow deep drilling exploration to be initiated. Construction of the mine was based on the anticipated northward extension of the existing electrical transmission line from Meziadin Junction to Iskut. Construction on the NTL began in January 2012, and Red Chris

Mine construction began shortly after, in May 2012 (BC Hydro 2012; Gillstrom, Anand, and Robertson 2012).

Project Facts:

- **Production** – The project's mill production rate will be 30,000 tpd (Gillstrom, Anand, and Robertson 2012).
- **Project Lifespan** – 28-year mine life (Gillstrom, Anand, and Robertson 2012).
- **Footprint** – The mine will comprise two open pits that will eventually merge into one, a processing plant, waste rock dump, low grade ore stockpiles, tailing impoundment, runoff collection system and mine effluent treatment plant, a new 23-km access road, and parallel power line from Highway 37 to the mine site (BC EAO 2005a).
- **Access** – The mine site would be accessed by a new 23-km long access road that would leave Highway 37 on the south side of Coyote Creek (BC EAO 2005a).
- **Traffic Volume** – Concentrate would be transported by truck to the Stewart Bulk Terminals via a new access road and Highway 37, using approximately 28 one-way trips per day (BC EAO 2005a). Traffic carrying cargo other than concentrate is estimated at 11 one-way trips per day.
- **Tailing Storage** – Black Lake is proposed to be used as a tailing pond for the project. This lake is at the headwaters of Trail Creek where there is the potential for loss of fish habitat (BC EAO 2005a).
- **Water (inputs/outputs)** – Water output from the mine may drain into Coyote Creek, Quarry Creek, and Kluea Lake via Trail Creek. The project plans to withdrawal fresh water from the groundwater aquifer, and possibly the Klappan River if there is insufficient groundwater available (BC EAO 2005a).
- **Employment –** The project will generate approximately 250 direct full-time jobs (BC EAO 2005a).

5.4.4.5 Wolverine Mine Project

Yukon Zinc Corporation's Wolverine Mine is an underground zinc-silver-copper-lead-gold mine located in southeast Yukon, 190 km northwest of Watson Lake, 282 km northeast of Whitehorse, and approximately 490 km north of the KSM Project (Yukon Zinc Corp. 2012).

Yukon Zinc Corp. initiated an EA pursuant to the *Yukon Environmental Assessment Act* in 2004 for the mine, and the project received authorization in September 2006. (Yukon Zinc Corp. 2006a, 2006b). Major site construction was completed in 2009 and 2010, and mill commissioning began in late 2010. Production is currently increasing to design capacity (Yukon Zinc Corp. 2012).

Project Facts:

- **Production –** The project has a proposed milling rate of 1,400 tpd and a mining rate of 1,700 tpd (Yukon Zinc Corp. 2007).

- **Project Lifespan –** 9.5-year mine life, which includes 1.5 years of pre-production development (Yukon Zinc Corp. 2007).
- **Footprint –** The industrial complex will include a truck shop, mill, laboratory, and office buildings.
- **Access –** Access to the Wolverine deposit is via a new mine site access road that was completed September 2007. The site is also supported by aircraft (Yukon Zinc Corp. 2006a).
- **Traffic –** Yukon Zinc will transport its concentrates south through Watson Lake, Yukon, then via Highway 37 to the Port of Stewart (Yukon Zinc Corp. 2006a). Nine truckloads of concentrate are hauled each day (Tobin 2009), and it is estimated that there is one truckload that carries other mine cargo every other day.
- **Tailing Storage –** The tailing impoundment covers an area approximately 600-m long and 300-m wide. The maximum dam height will be 19.5 m (elevation 1,306.5 m) at start-up and 26.5 m at full build out (elevation 1,313.5 m; Yukon Zinc Corp. 2010).
- **Water (inputs/outputs)** – Waste water will be treated and discharged to Go Creek (Yukon Zinc Corp. 2008).
- **Employment** – Mine operation will require approximately 150 people who will live on-site in a self-contained camp (Yukon Zinc Corp. 2008).

5.4.5 Reasonably Foreseeable Future Projects

Reasonably foreseeable future projects are those within the CEA that have entered or completed the BC EA process, or are anticipated to enter the BC EA process during the review of the Project. Table 5.4-3 summarizes the projects that meet these criteria; their locations are shown on Figures 5.4-1 and 5.4-2.

There is uncertainty around the prediction of project effects from projects that are in the pre-application stage of the BC EAO process and have not yet completed the EA process (Figure 5.4-3). Potential effects and influences that can be predicted are based on publically available information and professional judgment. Assumptions are made considering typical projects of similar size and type where information is missing or lacking. For example, the anticipated future project timelines for construction and operation shown in Figure 5.4-3 are mostly Seabridge estimates.

5.4.5.1 Arctos Anthracite Coal Project

The Arctos Anthracite Coal Project (formerly Mount Klappan Coal Project) is a proposed open pit mine. The project entered the EA process in 2004 when it submitted a Project Description to the BC EAO, describing an anticipated production of up to 1.5 Mt of coal per year (BC EAO 2010). Plans included facilities to crush and wash coal at the mine site, load coal onto trucks, and haul product to the Port of Stewart along a proposed new access route connecting to Highway 37 (BC EAO 2010). In 2008, work was temporarily deferred as Fortune Minerals Inc. was seeking a joint venture partnership to develop the project (BC EAO 2010).

Table 5.4-3. Summary of Reasonably Foreseeable Future Projects within the CEA Study Area

Project	Coordinates	Owner	Project Type	Anticipated Construction Period	Anticipated Operational Period	Current Regulatory Status
Arctos Anthracite Coal Project	Between 57°06'N and 57°23'N; and 128°37'W and 129°15'W[2]	Fortune Coal Ltd.[1]	Open pit: anthracite coal[1]	24 months	20 years[2]	Pre-application[1]
Bear River Gravel	55°56'00"N 129°38'30"W[3]	Glacier Aggregates Inc.[1]	Gravel extraction[1]	24 months[3]	25 years[3]	Pre-application[1]
Bronson Slope Mine	56°39' N 131°05' W[4]	Skyline Gold Corp[3]	Open pit mine: Gold, copper, silver, molybdenum[5], and magnetite[4]	36 months	20 years	Deferred, drafting Project Description
Brucejack Mine	56° 28' N 130° 11'W[6]	Pretium Resources Inc.	Underground: gold and silver[6]	12 months[6]	16 years[6]	Pre-application
Galore Creek Mine	57° 13' N 131° 26' W	Galore Creek Mining Corporation (NovaGold and Teck Resources)	Open pit mine: copper, gold and silver[1]	48 months[7]	18 years[7]	Certified in 2007[1], re-drafting Project Description
Granduc Copper Mine	56° 14' N 130° 20' W[8]	Castle Resources Inc.	Underground	24 months	10 years	Drafting Project Description
Kitsault Mine	55º25'19" N 129º25'10" W[9]	Avanti Kitsault Mining Inc.[1]	Open pit mine: molybdenum[1]	25 months[9]	15 years[9]	Approved March 18, 2013[1]
Kutcho Mine	58°12'N 128°22'W[11]	Capstone Mining Corp.[10]	Underground/open-pit (~4% of production) mine: copper, zinc, gold and silver[10]	18 months[10]	12 years[10]	Pre-application[1]
McLymont Creek Hydroelectric	56°41' N 130°47' W	AltaGas Renewable Energy Inc.	Hydropower	3 years[12]	40 years[12]	Certified[1]
Schaft Creek Mine	130 °58'48.9" N 57 °22'4.2" W [13]	Copper Fox Metals Inc.	Open pit mining: copper, gold, molybdenum, silver[13]	36 months[13]	15 years[13]	Pre-application[1]

(continued)

Table 5.4-3. Summary of Reasonably Foreseeable Future Projects within the CEA Study Area (completed)

Project	Coordinates	Owner	Project Type	Anticipated Construction Period	Anticipated Operational Period	Current Regulatory Status
Snowfield Project	56°29' N 130°12' W[14]	Pretium Resources Inc.	Open pit mine: gold, copper, molybdenum, and rhenium	36 months	27 years	Not yet in Pre-application
Storie Moly Mine	59°14'30"N 129°51'24"W[15]	Columbia Yukon Explorations	Open pit mine: molybdenum[16]	15 months	20 years[16]	Not yet in Pre-application Draft Project Description submitted for review
Treaty Creek Hydroelectric	Unknown	Northern Hydro Ltd.[17]	Hydropower	Unknown	Unknown	Not yet in Pre-application
Turnagain Mine	58°30' N 128°45' W [18]	Hard Creek Nickel Corp.	Open pit mine: nickel[18]	24 months[19]	28 years[20]	Not yet in Pre-application

Data sources: [1] BC EAO (2013); [2] Rescan (2004); [3] Cambria Gordon Ltd.(2006); [4] BC MEMPR (2010c); [5] Skyline Gold Corp. (2006a); [6] Rescan (2013); [7] NovaGold (2012); [8] Cambria Geosciences Inc. (2010); [9] Avanti Mining Inc. (2011); [10] Capstone Mining Corp. (2011); [11] JDS Energy & Mining Inc. (2010); [12] Government of BC (2012); [13] Copper Fox Metals (2010); [14] Armstrong, Brown, and Yassa (2009); [15] Watts, Griffis, and McOuat Limited and Mintec Inc. (2009); [16] Purcell and Wheeler (2008); [17] HydroWatch (2012); [18] Wardrop (2010c); [19] AMEC (2008); [20] AMC Mining Consultants (2011).

Since 2004, Fortune Minerals completed technical reports assessing production rate and transportation alternatives, including trucking to Stewart Bulk Terminals and shipment by rail to Ridley Terminal in Prince Rupert (Marsten 2005; Fortune Minerals Ltd. 2009). In 2010, Fortune Minerals announced the development of a railway transportation option for hauling product from the mine site along 150 km of new railway connecting to the current terminus of track at Minaret, and to the Ridley Coal Terminal in Prince Rupert (Drötboom 2010). Updates to the project's technical study were completed to include this option, along with an increase in project capacity to 3 Mt per year (Marston Canada Ltd. 2011).

For the purposes of the CEA, it is assumed that the project will have a two-year construction phase beginning in 2015.

Project Facts:

- **Production –** 3 Mt per year of product (Marsten 2005, 2007; Fortune Minerals Ltd. 2010).
- **Project Lifespan** – Minimum 20-year mine life (Marsten 2005, 2007; Fortune Minerals Ltd. 2010).
- **Footprint** – Open pit mine at four resource areas, including the Lost-Fox deposit area; a wash plant, and mine and off-site infrastructure (Rescan 2004).
- **Access** – Current access to the property is by road along a BC Rail right-of-way and the Ealue Lake Road off Highway 37 (Fortune Coal Ltd. 2006).
- **Traffic Volume** – Coal will be transported by rail along 150 km of new railway connecting to the current terminus of track at Minaret, and then to the Ridley Coal Terminal in Prince Rupert (Marston Canada Ltd. 2011). It is assumed that other mine cargo will also be transported via rail.
- **Tailing Storage** – The project will include a tailing storage facility (Rescan 2004).
- **Water (inputs/outputs)** – The headwaters of the Stikine, Nass, and Skeena River systems are in the general vicinity of Arctos Anthracite. Proposed development will occur primarily in the upper drainage of the Little Klappan River, which flows into the Stikine River (Rescan 2004; Marsten 2005).
- **Employment –** Projections estimate that over 200 workers will be needed for construction, and over 400 full-time jobs will be created for 20 years of operation. This totals in excess of 8,500 person years of direct employment (Rescan 2004).

5.4.5.2 Bear River Gravel

The Bear River Gravel project is located in Stewart, BC, at the mouth of the Bear River, approximately 65 km from the KSM Project. While reducing the risk of flooding on the Bear River, Glacier Aggregates Inc. plans to extract, process, and ship the gravel resource (Cambria Gordon 2006).

The most recent Project Description available on the BC EAO website discusses plans to extract 2 Mt per year of gravel from the lower Bear River in the first year of operation, with the potential to extract up to 3.8 Mt per year within the first five years. Two years of initial construction is anticipated before the project becomes operational. Construction activities will continue through the first few years of operations, until the project reaches its full production capacity. During operation, the project plans to ship material from the deep sea Port of Stewart to Pacific Rim markets (Cambria Gordon 2006).

The project began the harmonized provincial/federal EA process in 2005, and an updated Project Description was submitted in 2006. On July 6, 2012, the new *Canadian Environmental Assessment Act, 2012* (2012) came into force, and as a result, there is no longer a requirement to complete an EA of this project under the *Canadian Environmental Assessment Act, 2012* (CEA Agency 2012a). While there is no information on anticipated EA submission dates or construction start dates, for the purpose of this assessment it is assumed that construction will begin in 2018.

Project Facts:

- **Production** – Up to 3.8 Mt per year within five years (Cambria Gordon 2006).
- **Project Lifespan** – 25 years (Cambria Gordon 2006).
- **Footprint –** The Project encompasses an area of approximately 175 ha including sections of the Bear River, Portland Canal, and District of Stewart industrial land base. The project plans to use and expand on existing infrastructure (Cambria Gordon 2006).
- **Access** – Access is by paved highway connecting the project to northern BC routes. The deep-sea Port of Stewart also supports year-round marine transportation (Cambria Gordon 2006).
- **Traffic Volume** – Two ships per month will accommodate initial gravel extraction rates with four ships per month accommodating the projected increased rates. The facility will accommodate ships up to 70,000 dwt (Cambria Gordon 2006).
- **Tailing Storage –** Not applicable.
- **Water (inputs/outputs)** – The project is located at the confluence of the Bear River and the Portland Canal. Process water may be extracted from the Bear River or a well upstream of the intertidal zone (Cambria Gordon 2006).
- **Employment –** The project will generate approximately 100 person-years of employment during construction and approximately 40 permanent positions during operation (Cambria Gordon 2006).

5.4.5.3 Bronson Slope Mine

The Bronson Slope gold deposit is located approximately 30 km west of the Eskay Creek Mine road (Skyline Gold Corp. 2006a). The proposed Bronson Slope Project was advanced in the EA and *Mines Act* (1996) approval processes in the mid-1990s, but was deferred in 1996 (Skyline Gold Corp. 2006a).

In 2008, Skyline Gold Corporation submitted its Bronson Slope Project Description to the BC EAO and the CEA Agency (Skyline Gold Corp. 2008). The Application/EIS appears as withdrawn on the BC EAO's e-Pic website and the Major Project Management Office (MPMO) website (MPMO 2010; BC EAO 2013).

The Preliminary Assessment completed in 2009 assumes that power for the project will be supplied from the proposed NTL or possibly by a direct connection to the BC Hydro grid near the proposed Forrest Kerr Hydroelectric Power station. Other alternative electricity generation and supply options are also being evaluated and a more comprehensive pre-feasibility study is expected in the near future (Leighton Asia Ltd. 2009).

For the purposes of the KSM Project CEA, it is assumed that the project will have a two-year construction period with operations based on a mill feed rate of 15,000 tpd. Given that the Project is still early in the planning process and a Project Description is under development, it is also assumed that this construction period will not begin until after the KSM Project is operational in 2019.

Project Facts:

- **Production –** 15,000 tpd gold-copper-silver-molybdenum mine proposal in British Columbia (Leighton Asia Ltd. 2009).
- **Project Lifespan** – 20-year mine life (Leighton Asia Ltd. 2009).
- **Footprint –** The proposal includes an open pit mine, concentrator plant, tailing storage locations, access road, and a transmission line that connects to the BC Hydro grid. Mine site infrastructure would include a waste storage facility and plant site (Leighton Asia Ltd. 2009).
- **Access** – The project is currently accessed by the airstrip located adjacent to the confluence of Bronson Creek and the Iskut River (Leighton Asia Ltd. 2009).

  Currently, mine access roads, the Iskut Road (30 km) and the Eskay Creek Mine road (30 km), run from Bob Quinn on Highway 37 to the Eskay Creek Mine, and a connecting development access road (5 km) has been constructed to the Forest Kerr Hydroelectric Power site. The Bronson Slope project is approximately 30 km east of the Forrest Kerr road along the Iskut River, and conceptual designs for a permanent access road to the mine site are being worked on. A conceptual design for such a road was developed by a consortium of exploration companies, the Province of BC, and Canada in the early 1990s. The existing network of basic roads around the property will also require upgrading (Leighton Asia Ltd. 2009).
- **Traffic Volume** – It is assumed that concentrate traffic from Bronson Slope will be travelling to Stewart along the Eskay Creek Mine road, Highway 37 and 37A, and that other cargo will travel along Highway 37, south to Highway 16. Volumes are estimated at three concentrate haul trips per day and six cargo trips per day.
- **Tailing Storage –** Two tailing facilities are proposed for the 51.7 Mm^3 of tailing expected to be produced during the life of mine: Cell A with an area of 1 km^2, would be located southwest of the Snip tailing pond, and Cell B would be a small 130 m by 275 m depression (called Boundary Lake) located north of the main valley (Leighton Asia Ltd. 2009).

- **Water (inputs/outputs)** – Surplus water derived from tailing and runoff would be discharged into Bronson Creek. Sky Creek is located downstream of the tailing impoundments.
- **Employment –** Approximately 241 employees would be needed during operation.

5.4.5.4 Brucejack Mine

The Brucejack Mine is a proposed high-grade underground gold and silver mine located 65 km north of Stewart, and immediately east of the KSM Project. Pretium Resources Inc. (Pretivm) submitted the project description to the BC EAO in December, 2012. The mine is expected to process 2,700 tpd over a 16-year mine life, producing approximately 16 Mt of mineralized material. Construction is anticipated to take approximately one year. Mineral processing will involve conventional sulphide flotation and gravity concentration. The mine will produce gold doré from the gravity concentrate, and gold-silver flotation concentrate that will be dewatered and trucked off-site to the port at Stewart, BC (Rescan 2012).

A 75 km exploration road west from Highway 37 will be used to access the mine site. The road extends along Wildfire Creek, Scott Creek, the Bowser River, and up the Knipple Glacier, and will require upgrading to support operational hauling activities (Rescan 2012).

Construction of the Project is expected to start in H2 2014. Following a one-year construction period the mine is expected to operate for a minimum of 16 years before closure (Rescan 2012).

<u>Project Facts:</u>

- **Production** – Processing rate of 2,700 tpd producing a total of 16 Mt of mineralized material (Rescan 2012).
- **Project Lifespan** – 16-year mine life (Rescan 2012).
- **Footprint** – Besides underground mining operations in two deposits, the footprint would include a process plant~~s~~, a camp facility, a tailings storage facility, and a power transmission line.
- **Access** – The project is currently accessible with the use of a chartered helicopter from the town of Stewart, or seasonally from Bell II (Tetra Tech-Wardrop 2011).
- **Traffic Volume** – It is estimated that the project would require 11 trips per day to Stewart for concentrate haulage trucks, and approximately 1 trip per day for other mine cargo.
- **Tailing Storage** – Approximately 8 Mt of the flotation tailings will be paste backfilled to the underground workings, while an estimated 8 Mt of the flotation tailings will be deposited in Brucejack Lake (Rescan 2012).
- **Water (inputs/outputs)** – The process plant for the Project will require approximately 1,800 m^3/d or 75 m^3/h of water which will be provided by collecting underground mine seepage water, and extracting freshwater from Brucejack Lake. Excess water will be treated and discharged into Brucejack Lake (Rescan 2012).

- **Employment** – The Project will support an estimated 500 person-years of employment during construction, and at least 4,800 person-years of employment during operations (Rescan 2012).

5.4.5.5 Galore Creek Mine

The Galore Creek Mine Project is a proposed copper-gold-silver open-pit mine located approximately 90 km northwest of the proposed KSM Project (Rescan 2006). The project received an EA Certificate in 2007 and construction on an access road from Highway 37 to the Galore Creek mill site began in mid-2007. Approximately 48 km of the road was completed when the project was halted later in 2007 (Delaney 2010). The project is jointly owned by NovaGold and Teck Resources, and in 2011 NovaGold announced its intention to sell its interest in the Galore Creek partnership (NovaGold 2012).

In 2011, studies on reducing the construction and production costs were completed. The most recent prefeasibility study has redesigned the project, decreasing the footprint in the Galore Creek Valley and increasing the footprint in the More Valley, as well as increasing the scale to a nominal 95,000 tpd capacity (NovaGold 2012).

The new Project Description has mining and waste rock facilities in the Galore Creek Valley, and plant and tailing facilities in the adjacent West More Valley. A 13.6 km tunnel would be used for conveying ore and moving equipment between the two facilities. From the proposed mill site in the West More Valley, a 71 km pipeline would transfer concentrate to a filter plant and concentrate truck-loading facility located near Highway 37. From the filter plant, the concentrate would be transported by truck to the Port of Stewart (NovaGold 2012).

Considering the extent of the project changes, it is assumed for the purposes of the CEA that the Galore Creek Mine Project would not begin construction until 2018.

<u>Project Facts:</u>

- **Production** – Project plans are to process up to 95,000 tpd (NovaGold 2012).
- **Project Lifespan** – 18 years, after a 4-year construction period (NovaGold 2012).
- **Footprint** – The project includes five open pits, waste rock facilities, process plant, 13 km conveyor tunnel, a 71 km slurry pipeline, and an 87 km access road (NovaGold 2012).
- **Access**– Access to the mine site from Stewart is via Highway 37A and 37. An access road was built from Highway 37, along More and Sphaler creeks to the Porcupine River, and up to Scotsimpson Creek. The proposal includes development of the remainder of the 87 km access road (Rescan 2006).
- **Traffic Volume –** The number of concentrate truck loads from the mine is estimated at 34 trips per day. In addition, it is estimated that approximately 36 trips per day will be required for other mine supplies.
- **Tailing Storage –** About 510 Mt of tailing will be stored in West More Valley (NovaGold 2012).

- **Water (inputs/outputs) -** The Galore Creek Valley drains into the Stikine River through the Scud River, and into Alaskan waterways. The concentrate de-watering plant will discharge treated water to the Iskut River (Rescan 2006). Discharge water from the tailing impoundment will be into West More Creek (NovaGold 2012).
- **Employment –** The project will create approximately 553 long-term jobs and will employ approximately 900 to 1,000 people during construction (Rescan 2006).

5.4.5.6 Granduc Copper Mine

The reopened Granduc Copper Mine is located 40 km northwest of Stewart in northwestern British Columbia and previously produced between 1971 and 1984 (see Section 5.3.3.2). Castle Resources Inc. acquired the Granduc property from Bell Copper in July 2010, and began exploration drilling with the aim of redeveloping the mine (Marketwire 2010a; Scales 2012).

In 2011, Castle Resources had the 17 km tunnel rehabilitated, and plans to rehabilitate specific levels of the old underground mine to establish underground drill stations for exploration. Castle Resources is currently working on a Preliminary Economic Assessment that will evaluate mining methods, tailing impoundment, and a suitable milling process (Dickson 2012). It is expected that mine will use sub-level caving techniques (Dickson 2012; Scales 2012).

Castle Resources Inc. will be submitting a Project Description to the BC EAO in the first quarter of 2013. Baseline work would be completed in 2013 with the EA Application submission in 2014 and construction beginning in 2015 (Castle Resources Ltd. 2012). For the KSM CEA, it is expected that construction would take about two years and it is also assumed that the mine would be in operation for about 10 years.

Project Facts:

- **Production** – Mill production rate of 8,500 tpd (Dickson 2012).
- **Project Lifespan** –Life of mine is assumed to be 10 years.
- **Footprint** – The project is expected to include a new mill and tailing management options, as well as potential upgrades to the existing 54 km haul road (Dickson 2012).
- **Access** – Currently, access to the property is by helicopter from Stewart, BC, or a marshalling point on the access road (McGuigan and Harrison 2010). There is a 50 km access road to Port of Stewart that is currently closed during the winter season.
- **Traffic Volume** – Unknown.
- **Tailing Storage** – Unknown.
- **Water (inputs/outputs)** – Unknown.
- **Employment –** The Granduc Copper Mine and mill will create 250 to 300 jobs (Scales 2012).

5.4.5.7 Kitsault Mine

Re-opening of the Kitsault molybdenum mine, located about 135 km south of the Project, has been proposed by Avanti Kitsault Mining Inc. (Avanti; Avanti Mining Inc. 2009).

Avanti submitted an Application for an Environmental Assessment Certificate on April 30, 2012, which was approved on March 18, 2013 (BC EAO 2012b).

The project will be an open pit operation that will utilize the existing access roads and power line. Molybdenum concentrates will be trucked to the Port of Vancouver (AMEC 2010).

For the purposes of this assessment it is assumed that Avanti will begin the 25-month construction phase in 2014, with commissioning of the project in 2016.

Project Facts:

- **Production** – The projected production rate for the project is 40,000 to 50,000 tpd (Avanti Mining Inc. 2012b).
- **Project Lifespan** – 15- to 16-year mine life (Avanti Mining Inc. 2012b).
- **Footprint** – The new project infrastructure will include the Kitsault Pit, a conveyor material handling system, ore stockpile, process plant and camp accommodations, and a tailing management facility with an overall surface disturbance estimated at 664 ha (Avanti Mining Inc. 2012b).
- **Access –** The new Kitsault Mine can be accessed via water, float plane, or by a 100 km northbound paved road from Terrace to Nass Camp, and then a farther 95 km via an upgraded gravel road to site (Wardrop 2009). Existing roads to the project do not require significant upgrades (AMEC 2010).
- **Traffic Volume –** During construction, there will be an average of 48 one-way trips per day. During operation, approximately 80 tpd of molybdenum concentrate will be produced and transported from the mine site to the Port of Vancouver, generating a maximum of 54 one-way trips per day (Avanti Mining Inc. 2012b). It is assumed that the majority of this traffic will be along the Nass Forest Service Road, Highway 37, and Highway 37A.
- **Tailing Storage –** The tailing management facility will encompass Patsy Lake and require two embankments for impoundment (AMEC 2010).
- **Water (inputs/outputs) –** Patsy Creek flows will be dammed by the tailing management facility embankment and diverted. Discharge and seepage from the project may affect downstream water quality at Lime Creek and Patsy Creek (AMEC 2010).
- **Employment –** The proposed Project will employ up to 700 people during construction and approximately 300 during operations (Avanti Mining Inc. 2012b).

5.4.5.8 Kutcho Mine

The Kutcho Mine is a part underground, part open-pit copper-zinc-gold-silver project with three mineral deposits. The project is located approximately 120 km east of the community of Dease Lake and approximately 320 km northeast of the KSM Project.

In 2005, the EA process was initiated with the submission of a Project Description to the BC EAO. This Project Description was based on a design concept for a larger facility that used only open-pit mining (JDS Energy & Mining Inc. 2010).

In February 2011, Kutcho Copper Corp. released a pre-feasibility study describing the project as using mostly underground mining methods with a production rate of 2,500 tpd (JDS Energy & Mining Inc. 2010). The project will produce separate copper and zinc concentrates, with by-product gold and silver reporting to the copper concentrate. The concentrates will be transported to the Port of Stewart (Capstone Mining Corp. 2011).

Kutcho Copper Corp. plans to proceed towards submission of an EA Certificate Application, anticipated in 2013 (Capstone Mining Corp. 2012). It assumed that construction would begin in 2015.

Project Facts:

- **Production** – The project is expected to have a production rate of 2,500 tpd, mining 912,500 t of ore annually (JDS Energy & Mining Inc. 2010; Capstone Mining Corp. 2011).
- **Project Lifespan** – 12-year mine life (JDS Energy & Mining Inc. 2010; Capstone Mining Corp. 2011).
- **Footprint** – The proposed project is located within an area outlined by Andrea, Sumac, and Playboy creeks. The project is expected to have a small environmental footprint as a result of minimal open pit mining (4% of the total production), as well as utilization of tailing and waste for underground backfill and an encapsulated paste fill arrangement for any tailing and waste that are stored on surface (Capstone Mining Corp. 2011).
- **Access –** Access to the property is by air to the gravel airstrip located at the junction of Kutcho and Andrea creeks. There is an existing 131 km access road leading to the mine site from Dease Lake, which is also used to access the site. This road will be upgraded as part of project construction (JDS Energy & Mining Inc. 2010).
- **Traffic Volume –** Transportation of concentrate will be by truck from the mine site along Highway 37 to the Port of Stewart. Estimates of traffic volumes are about 12 concentrate trips per day and one trip per day carrying other mine cargo.
- **Tailing Storage –** Approximately 40% of the tailing will be used for hydraulic fill. Tailing not required for backfill will be filtered, but not cemented, to produce “dry tailings” for storage in the tailing management facility and the mined starter pit. Tailing will be managed by dry stacking them within a lined enclosure contained within a non-PAG waste rock berm (JDS Energy & Mining Inc. 2010).
- **Water (inputs/outputs)** – Water sources for the project have not been defined but possible options include runoff collection, wells, and dewatering from underground and drawing from creeks (JDS Energy & Mining Inc. 2010). If required during mine operation, dry stack surface water runoff will be treated to meet discharge standards and water quality criteria before being released in Andrea Creek. Andrea Creek flows into Kutcho Creek, which flows into the Turnagain River and then to the Liard River (JDS Energy & Mining Inc. 2010).

- **Employment –** The underground mine personnel requirement peaks at 139 personnel during full production, with 73 on site at one time (JDS Energy & Mining Inc. 2010).

5.4.5.9 McLymont Creek Hydroelectric Project

The McLymont Creek Hydroelectric Project is located approximately 100 km northwest of Stewart and 140 km southwest of Iskut (Government of BC 2012). The project is approximately 9.5 km from the Forrest Kerr Hydroelectric Power Project.

BC Hydro awarded AltaGas Renewable Energy Inc. an Electricity Purchasing Agreement in November 2011, and the project received an EA Certificate in May 2012 (BC EAO 2012a). The project is expected to be operational in November 2015 after a three-year construction period (Government of BC 2012).

Project Facts:

- **Production –** 70 MW of run-of-river hydroelectric energy (Government of BC 2012).
- **Project Lifespan** – 40 years (Government of BC 2012).
- **Footprint –** The project includes a new 9.5 km access road, a 6.2 km access road, a powerhouse, a 10 km transmission line, and an intake and other components located on McLymont Creek (Government of BC 2012).
- **Access** – The project's site will be accessed via the Eskay Creek Mine road, via Forrest Kerr and along a new 9.5 km access road (BC EAO 2012a).
- **Traffic Volume** – It is assumed that traffic along Highway 37 and Eskay Creek Mine road during operation will be generated by employees who are likely to be using the Forrest Kerr camp. It is expected to amount to approximately one trip per day (BC EAO 2012a).
- **Tailing Storage** – not applicable.
- **Water (inputs/outputs)** – The proposed project would alter the flow regime in the lower 4.5 km of McLymont Creek over the long term (BC EAO 2012a).
- **Employment –** 100 to 120 full-time and part-time jobs during construction and two to four full-time employment positions once operational (Government of BC 2012).

5.4.5.10 Schaft Creek Mine

The proposed Schaft Creek Mine is located 80 km southwest of Telegraph Creek and approximately 76 km west of Highway 37. The mineral claims of interest are situated near upper Schaft Creek, a tributary of Mess Creek, which flows into the Stikine River downstream of the community of Telegraph Creek.

The project is currently in the pre-application stage of the BC EA process that was launched in 2006. The closest major power source is located at Meziadin Junction. Consideration of on-site power generation may have serious implications on the financial viability of the project. It is assumed that power will be supplied by the provincial electrical grid through a transmission line from Highway 37 near Bob Quinn, along the selected access route.

Copper Fox plans to submit an Application for an EA Certificate for the project, and concurrent permit applications for road building, and expects to complete the environmental assessment process by the end of 2013 (Copper Fox Metals 2012). For the purposes of the KSM Project CEA, it is assumed that the three-year construction phase will begin in mid-2014 and finish in 2017.

Project Facts:

- **Production –** The project is expected to mine 150,000 tpd of ore, producing approximately 494,200 dry tonnes of concentrates per year (Copper Fox Metals 2010; BC EAO 2011).
- **Project Lifespan** – 15-year mine life (Copper Fox Metals 2010).
- **Footprint –** will include an open pit, tailing/PAG waste rock storage facility, camp, and mill (Copper Fox Metals Inc. 2006).
- **Access –** The mine site is currently accessible by helicopter from Bob Quinn. Road access to the site is proposed via the Mess Creek Access Route. The route extends north from More Creek along the upper Mess Creek, entering the mine site and Schaft Creek drainage near Snipe Lake (Bender and McCandish 2008).
- **Traffic Volume –** The project will involve trucking of concentrate from the mine-site to the deep sea Port of Stewart via Highway 37 and 37A (Bender and McCandish 2008). An estimated 54 concentrate trips per day will be required[2], and an additional 57 trips per day carrying other mine supplies.
- **Tailing Storage –** The tailing storage facility will be situated in the Skeeter Lake Valley north of the open pit. The tailing storage facility will store 812 Mt of tailing (Copper Fox Metals Inc. 2006; Bender and McCandish 2008).
- **Water (inputs/outputs) –** It is anticipated that excess water from the tailing area will be discharged via Schaft Creek into the Mess Creek drainage, a major tributary of the Stikine River (Copper Fox Metals Inc. 2006).
- **Employment** – The project is estimated to generate approximately 2,100 jobs during the construction phase and approximately 700 permanent jobs during mine operations (Copper Fox Metals 2010).

5.4.5.11 Snowfield Project

The Snowfield property is situated within the Sulphurets mining district in the Iskut River region, approximately 20 km northwest of Bowser Lake and 65 km north-northwest of Stewart. This project is immediately adjacent to the KSM Project such that the Snowfield property may be influenced by KSM Project access plans for the area (Snowden 2012).

In September 2010, a Preliminary Economic Assessment that explored the value of combining the Snowfield and Brucejack properties was completed (Wardrop 2010b). Pretivm subsequently

[2] This report is using the most current information available, which may not be consistent with the project descriptions filed with the EAO.

purchased the Snowfield and Brucejack properties from Silver Standard Resources and although the Preliminary Economic Assessment was reissued for Pretivm, the report is no longer valid (Snowden 2012).

In May 2011, Pretivm announced the signing of a Mutual Confidentiality and Cooperation Agreement and a Mutual Access Agreement with Seabridge Gold Inc. (Pretium Resources Inc. 2012). Pretivm considers the Snowfield property as a long-term gold opportunity. At present, there are no plans for further exploration of the property or activities to define how the project could be developed. The last exploration conducted on the property occurred in 2011. Pretivm will not have to expend any funds on the project until 2022 (Pretium Resources Inc. 2012).

While this project is not expected to enter the BC EA process in the near future, CEAs for the Project were completed at a time when development of Snowfield was being considered. Pretivm has no current plans to advance its development; therefore, CEAs are conservative and used Wardrop (2010b) to identify preliminary, conceptual assumptions about what this project may look like in the future, if developed.

Project Assumptions:

- **Production –** 120,000 tpd.
- **Project Lifespan** – 27-year mine life, with construction beginning in 2027.
- **Footprint –** Assumed to include a pit and crusher, and a tailing facility in the Scott Creek watershed.
- **Access –** The properties are currently accessible by helicopter only.
- **Traffic** – Concentrate will be hauled along Highway 37 and 37A to Stewart. It is estimated that 83 trips per day will be needed to haul concentrate, and cargo.
- **Tailing Storage** – Assumed to be located in the Scott Creek watershed.
- **Water (inputs/outputs)** – The project is located in the upper Sulphurets Creek watershed. Adjacent and downstream water bodies include Bowser River, Todedada Creek, Wildfire Creek, Sulphurets Creek, and Mitchell Creek.
- **Employment** – Not available.

5.4.5.12 Storie Moly Mine

The Storie molybdenum deposit is located approximately 6 km southwest of Cassiar and 100 km north of Dease Lake (Yukon Explorations Inc. 2006). A report by Purcell and Wheeler (2008) estimates a project milling capacity of 20,000 tpd. It is expected that concentrates would be transported by truck from the mine site to the bulk terminal facility in Stewart, about 300 km away (CHF Investor Relations 2009).

Although, Columbia Yukon submitted a Draft Project Description to provincial and federal EA regulators on June 3, 2010 (Marketwire 2010b), public information on the project is limited. Plans for both a pre-feasibility study and Environmental Assessment study are underway (CHF Investor Relations 2009).

For the purposes of the CEA, it is assumed that the project would take approximately 15 months to construct with construction beginning sometime in 2019.

Project Facts:

- **Production –** Assumed mill feed rate of 20,000 tpd (Purcell and Wheeler 2008).
- **Project Lifespan** – 20-year mine life (Purcell and Wheeler 2008).
- **Footprint** – Possible use of existing infrastructure from the former Cassiar Mining camp, plus a new open pit and waste rock and tailing storage facilities.
- **Access** – Current access to the site is via Highway 37; the access road to the old Cassiar community and then a 5 km dirt road (Yukon Explorations Inc. 2006).
- **Traffic Volume –** It is estimated that a total of nine trips per day will be needed to transport both concentrate and other cargo during operation.
- **Tailing Storage** – Not available.
- **Water (inputs/outputs)** – Not available.
- **Employment** – Not available.

5.4.5.13 Treaty Creek Hydroelectric Project

The Treaty Creek Hydroelectric Project is anticipated to be located immediately south of the proposed KSM Project's Processing and Tailing Management Area. The project is still in the very early planning stages and is considered in the KSM Project CEA because of its potential of being in close proximity to the Project.

The only indication that this project may be proposed is that Northern Hydro Limited has applied for water licences for both Treaty Creek and Todedada Creek, as well as another unnamed creek (HydroWatchBC 2012). Northern Hydro Limited is a developer of run-of-river hydro projects and has undertaken active exploration of renewable energy opportunities within the northern and coastal regions of BC (Northern Hydro 2012). The project is expected to be small-scale and generally involves the use of run-of-river (i.e., small hydro) technology (Northern Hydro 2012). Considering this project is in the very early planning stages, it is assumed for the purposes of the CEA that this project would not be constructed until 2017.

5.4.5.14 Turnagain Mine

The Turnagain Mine is a proposed nickel and cobalt open pit mine located approximately 70 km east of Dease Lake (Wardrop 2010c). Although this project does not appear to have entered the environmental assessment process, technical reports by Wardrop (2010c) and AMC Mining Consultants Ltd. (2011) provide details on the proposed project.

Originally the project included open pits at three mineralized zones, but the Hatzl zone underlies the Turnagain River, which is fish-bearing and considered a wildlife corridor. As such, underlying mineralized material has more recently been excluded as potentially mineable (AMC Mining Consultants Ltd. 2011). The original plans also included a refinery, which has since been removed from the scope of the project (AMC Mining Consultants Ltd. 2011).

Current plans involve mining at the two remaining zones. These zones will begin as two separate open pits, and merge into one over the 28-year mine life. The mine will feed the crusher at an average rate of 43,400 tpd during the first five years, and increase to an average of 84,600 tpd thereafter (AMC Mining Consultants Ltd. 2011). Shipments of concentrate would likely be transported by truck via Highway 37 to Prince Rupert, and delivered to Fairview Terminal for loading onto an ocean vessel (Wardrop 2010c).

The project is reviewable under both the BC EAA (2002) and CEAA (1992), and the proposed TMF location would require listing in Schedule 2 of the Metal Mine Effluent Regulations (MMER; SOR/2002-222) of the *Fisheries Act* (1985; AMC Mining Consultants Ltd. 2011). Construction of the NTL and Red Chris Mine have increased certainty of power supply for the project (Wardrop 2010c), and it is assumed for the purposes of the CEA that the project will begin the pre-application phase in 2013 with construction beginning in 2015 and operation in 2017.

Project Facts:

- **Production –** a maximum mill feed rate of 87,000 tpd (AMC Mining Consultants Ltd. 2011).
- **Project Lifespan –** 28-year life of mine (AMC Mining Consultants Ltd. 2011).
- **Footprint –** The ore body will be mined in two pit areas merging into one, with waste dumps located southwest of the pits, and a 23 km transmission line. A process plant, mine service buildings, a truck shop, explosives manufacturing facility, maintenance, and accommodation facilities and tailing and waste rock storage areas will also be required (Wardrop 2010c).
- **Access** – Current access to the property is by paved road to Dease Lake, then by aircraft to the mine site. A historic dirt road along the Turnagain River Valley provides seasonal access (Wardrop 2010c).
- **Traffic Volume** – It is assumed that approximately 46 trips per day will be needed to transport nickel metal and cobalt hydroxide, as well as other cargo during operation (Wardrop 2010c).
- **Tailing Storage –** The tailing storage facility would ultimately be designed to store 757 Mt of tailing over the mine life. The proposed location for this facility is Flat Creek Valley (Wardrop 2010c).
- **Water (inputs/outputs) –** Freshwater inputs for the project will be collected from alluvial groundwater wells just north of the plant site in the vicinity of the Turnagain River. Water will be diverted around the tailing storage facility and released downstream of the tailing storage facility directly to Flat Creek. The project plans to discharge water directly to the Turnagain River if discharge water quality criteria are being met (Wardrop 2010c).
- **Employment** – The mine workforce will be between 61 and 240 staff, depending on the year and quantity of material mined (AMC Mining Consultants Ltd. 2011).

5.4.6 Land Use Activities

Land use activities that may interact cumulatively with the KSM Project were identified through their inclusion in the Cassiar Iskut-Stikine Land and Resource Management Plan (CIS LRMP; BC ILMB 2000), the Nass South Sustainable Resource Management Plan (BC MFLNRO 2012), BC Statistics for the Regional District of Kitimat-Stikine, and Traditional Knowledge studies. The main economic activities in the Regional District of Kitimat-Stikine include forestry, mining, energy, and fishing (BC Stats 2010).

Land use activities selected for the KSM Project CEA are summarized in Table 5.4-4. All of the activities have occurred in the past and are anticipated to occur in the future. In order to capture potential interactions between the Project and land use activities where little information exists, it is anticipated that some activities will increase in the future.

Table 5.4-4. Summary of Land Use Activities

Activity	Summary
Agriculture	There is no agricultural production near the KSM Project. Land used for agriculture that is closest to the KSM Project includes very small areas along the Stikine River south of Telegraph Creek.[1]
Fishing (commercial, and recreational)	The Unuk, Stikine, and Nass rivers support commercial fisheries[2], and recreational fishing in the US and Canada, with two identified angling guides within close proximity to the Project.[3]
Guide Outfitting	Three guide-outfitting tenures exist within close proximity to the Project (see Appendix 23-A, Non-traditional Land Use Baseline Report). Species targeted include stone sheep, grizzly bear, black bear, mountain goat, moose, and wolf.[3]
Aboriginal Harvest (fishing, hunting/ trapping, and plant harvest)	Members of Nisga'a Nation, Tahltan Nation, Gitanyow First Nation, and Gitxsan Nation (including the Skii km Lax Ha) harvest a variety of fish, wildlife, and vegetation for subsistence and economic purposes within their asserted traditional territories or under treaty rights (see Appendices 30-A, B, C, and D).
Trapping	The Project footprint directly overlaps three trapping tenures, and three others are in vicinity of the Project.[3]
Mineral, Oil and Gas Exploration	There is a substantial amount of mineral exploration activity across northwestern BC[4]. There is currently a ban on oil and gas exploration in northwestern BC[5].
Recreation and Tourism (parks and commercial tenures for heli-skiing, rafting, etc.)	Potential recreation and tourism activities for both locals and visitors include hiking, snowmobiling, and ATVing, backcountry and heli-skiing; rafting and canoeing; hunting, fishing, and backcountry camping. These activities occur on an informal and non-registered basis[3] as well as through commercial operators. There are three parks within 30 km of the Project, and seven commercial-recreation tenures that intersect or lie within close proximity to the Project that provide heli-skiing, river rafting, and backcountry expeditions services.[3]
Forestry	The Project is within 10 km of the northwestern part of the Nass Timber Supply Area, parts of which have been historically clear-cut. Most forestry activities in the past have been largely restricted to the Bob Quinn area or south of Bell II. Although there has been no recent logging activity within two registered forest tenures in the vicinity of the Project, plans for future timber harvest exist.[3]
Transportation	Project proposals include plans for new resource access routes in a region that has been relatively remote and difficult to access. Future traffic is expected to increase.

Data Sources: [1] Rescan (2006); [2] BC ILMB (2000); [3] Rescan (2010b); [4] BC MEMPR (2009b); [5] CBC News (2012)

5.4.6.1 Agriculture

There is limited agricultural production in the proximity of the Project due to the short growing season and distance to markets (BC ILMB 2000). A small amount of agriculture land reserve, where agriculture is recognized as the priority use, exists in areas along the Stikine River, south of Telegraph Creek. Other agricultural activity in the region is primarily horse grazing pasture used by guide outfitters (Rescan 2006).

- **Activity Timeline** – Ongoing.
- **Areas Used** – A small amount of agriculture land reserve exists south of Telegraph Creek.
- **Access** – Not available.
- **Traffic Volume** – Not available.
- **Water (inputs/outputs)** – Not available.
- **Employment** – Not available.

5.4.6.2 Commercial and Guided Fishing

The closest commercial fishing to the KSM Project takes place in the Unuk, Nass, and Stikine rivers. There are about 12 commercial fishing licences allocated to the Stikine River (BC ILMB 2000).

Within the CIS LRMP, there are 18 to 20 fishing guides who offer a range of fishing opportunities (BC ILMB 2000). Two angling guides operating closest to the Project use the Upper Bell-Irving River and its tributaries, such as Teigen Creek. Anglers mainly catch and release steelhead, as well as coho salmon, rainbow trout, Dolly Varden, and chinook (Rescan 2010b).

- **Activity Timeline** – Fishing is assumed to be ongoing, with increases coinciding with the salmon runs.
- **Areas Used** – Both commercial and sport fishing occurs in the Unuk, Nass, and Stikine rivers. Sport fishing is also known to occur in the Upper Bell-Irving River and its tributaries, such as Teigen Creek.
- **Access** – not available.
- **Traffic Volume** – not available.
- **Water (inputs/outputs)** – not applicable.
- **Employment** – not available.

5.4.6.3 Guide Outfitting (Hunting)

The CIS LRMP area is considered to have some of the best big-game hunting in North America because of its diverse and abundant wildlife species and extensive backcountry areas (BC ILMB 2000). Five guide-outfitting tenures exist within close proximity to the KSM Project each with varying degrees of use (Appendix 23-A, Non-traditional Land Use Baseline Report). With some tenure owners planning to expand their businesses, it is anticipated that there will be a future increase in guide-outfitting activity. Species targeted include stone sheep, grizzly bear, black bear, mountain goat, moose, and wolf (Appendix 23-A, Non-traditional Land Use Baseline Report).

- **Activity Timeline –** Guide outfitting happens mostly in the summer season (Appendix 23-A, Non-traditional Land Use Baseline Report).
- **Areas Used –** Areas identified as important by tenure holders include: Teigen Creek area; the Unuk and South Unuk rivers; Meziadin Lake; Bowser Lake and Mt. Anderson; and Bowser River (Appendix 23-A, Non-traditional Land Use Baseline Report).
- **Access –** Hunting guide tenures are accessed by aircraft (on floats and wheels), jet boat, horse, and on foot. Aircraft typically depart from Telegraph Creek, Tatogga Lake, Burrage Creek strip, or Bob Quinn airstrip, while jet boat access is from Bell II crossing or Treaty crossing (Appendix 23-A, Non-traditional Land Use Baseline Report).
- **Traffic Volume –** Not available.
- **Water (inputs/outputs)** – Not applicable.
- **Employment**– Misty Mountain Outfitters employs between 7 and 10 people; Northwest Ranching and Outfitting employs two seasonal workers; and Coastal Mountain Outfitters employs four full-time employees and six part-time staff (Appendix 23-A Non-traditional Land Use Baseline Report).

5.4.6.4 Aboriginal Harvest

5.4.6.4.1 Nisga'a Nation

The proposed Project falls within the Nass Area and is upstream from the Nass Wildlife Area, both of which surround Nisga'a Lands as defined in the Nisga'a Final Agreement (NLG, Province of BC, and Government of Canada 1998). Nisga'a people continue to carry out traditional activities such as fishing, hunting, trapping, and trade (NTC 1992), and hold certain rights with respect to trade in fish, wildlife, and plant resources within these areas (NLG, Province of BC, and Government of Canada 1998).

5.4.6.4.2 Tahltan Nation

The area claimed by the Tahltan Nation includes the areas surrounding the Stikine River drainage basin in the Coast and Cassiar mountains. The southern boundary of the territory follows the Unuk River drainage from the Alaska/Canada border and along Treaty Creek, where it overlaps the Processing and Tailing Management Area. The closest Tahltan community to the Project is the Iskut First Nation located in the village of Iskut found along Highway 37 north of the Bob Quinn area. The Tahltan harvest wildlife, fish, plants and berries throughout their traditional territory (Rescan 2010a).

5.4.6.4.3 Skii km Lax Ha

Skii km Lax Ha, deemed by the BC EAO to be a wilp of Gitxsan Nation, have an asserted territorial boundary that extends from the north side of Cranberry River to Ningunsaw Pass, along the Nass and Bell-Irving rivers. Within this boundary, Skii km Lax Ha actively engage in hunting; trapping; plant, berry, and mushroom harvesting; fishing; and camping (see Appendix 30-B, Skii km Lax Ha Traditional Knowledge and Use Research Report).

5.4.6.4.4 Gitanyow and Wilp Wii'litsxw

The Gitanyow First Nation asserted traditional territory is found within the Skeena and Nass watersheds. The territory follows the Nass southward from its confluence with Bell-Irving River and includes portions of Cranberry and Kispiox rivers. Wilp Wii'litsxw is a house of the Gitanyow First Nation, whose traditional territory is located along the Bell-Irving and Nass watersheds encompassing the Hanna and Tintina drainages in the Meziadin Lake area.

Traditional food and harvesting activities in the territory include wildlife harvesting, trapping, medicinal, and food plant gathering (see Appendix 30-C, Gitanyow First Nation Traditional Knowledge and Use Desk-based Research Report).

Gitanyow huwilp including Wilp Wii'litsxw continue to rely on traditional resources within their traditional territories. This includes subsistence harvesting for economic and cultural uses of fish and wildlife.

5.4.6.4.5 Gitxsan Nation

Gitxsan Nation asserted traditional territories overlap a total of nine watersheds: Upper Skeena, Middle Skeena, Lower Bulkley, Suu Wii Ax (Amazay and Thutade lakes), Babine, Kispiox, Xsi Teemsim (Nass), Gitsegukla, and Sxi Tax (Lower Skeena; Gwaans 2007; Gitxsan Chiefs' Office 2010). There are five Gitxsan communities (Gitwangak, Gitsegukla, Gitanmaax, Kispiox, and Glen Vowell) in the Upper Skeena River area ('Ksan Historical Village and Museum n.d.). Gitxsan people continue to rely on the land and natural resources for a number of reasons, including food, culture, and economy. Under an agreement with Fisheries and Oceans Canada, the Gitxsan have undertaken inland commercial fisheries (GWA 2004). Activities follow a seasonal cycle that focuses on salmon fishing sites within the Nass watershed. Salmon, in particular, have been and continue to be a particularly important resource and are embedded in Gitxsan cultural identity (see Appendix 30-D, Gitxsan Nation Traditional Knowledge and Use Desk-based Research Report).

5.4.6.5 Trapping

The Project footprint directly overlaps three trapping tenures, and three others are in the vicinity of the Project. Species harvested in these traplines include marten, squirrel, beaver, lynx, weasel, mink, and wolverine (Appendix 23-A, Non-traditional Land Use Baseline Report). Trapline owners have noted that access for trapping is gained along the Eskay Creek Mine road, by helicopter, and by foot (Rescan 2010b).

- **Activity Timeline** – Year-round.
- **Areas Used** – Trapping tenures overlap the proposed pit, TMF, plant site, and tunnel locations (Rescan 2010b).
- **Access**– One trapline owner noted that his tenure was accessed by Eskay Creek Mine road, by helicopter, and/or by foot (Rescan 2010b).
- **Traffic Volume** – Not available.
- **Water (inputs/outputs)** – Not applicable.

- **Employment** – Trapping is for domestic and economic purposes, typically providing intermittent employment for one or two people per trapline.

5.4.6.6 Mineral, Oil, and Gas Exploration

Significant mineral, oil, and gas resources with high economic potential are known to exist within northwestern BC (BC ILMB 2000). While there is currently a ban on oil and gas exploration in northwestern BC (CBC News 2012), in 2009, northwestern BC had the highest expenditures on mineral exploration of all the BC regions. Expenditures were over three times higher than that of northeastern BC, which had the second highest expenditures (BC MEMPR 2009b). This resurgence in exploration and mining activities continued through 2010 (BC MEMPR 2010a).

- **Activity Timeline** – Seasonal during the summer; increases in exploration are expected to continue into the future.
- **Areas Used –** See Figure 5.4-2.
- **Access** – Access is by road and helicopter.
- **Traffic Volume –** Some helicopter traffic.
- **Water (inputs/outputs) –** There is the potential for mineral and energy resource exploration to interact with water, soil and terrain, and riparian resources (BC MEMPR 2009a).
- **Employment –** There are three to four diamond drilling companies based out of Stewart, three companies providing expediting services, an assay company prep lab, and backhoe and excavator rentals. These companies provide direct employment and generate indirect employment in the service industry (Rescan 2009).

5.4.6.7 Recreation and Tourism

Northwestern BC is in an area that provides a number of recreational opportunities with revenues from tourism in the region increasing between 2005 and 2008 (BC Stats 2010). However, there are no formal hiking trails, snowmobile routes, or other recreational sites in proximity to the Project. Any non-commercial recreational activities that may take place occur on an informal and non-registered basis.

- **Activity Timeline –** Mainly during the summer, with the exception of heli-skiing and snowmobiling in the winter. With commercial tenure owners' plans to expand their businesses, an increase in recreational and tourism activities is assumed.
- **Areas Used –** Ningunsaw Provincial Park, Border Lake Provincial Park, and the Unuk River RMZ, Lava Forks Provincial Park, areas near Bell 2 Lodge, Knipple Glacier, Teigen Creek, and Hodkin Lake.
- **Access –** Highway 37; helicopters; the Unuk River; and other transportation infrastructure from Smithers, Terrace, and Alaska are used.
- **Traffic Volume –** Some vehicle and helicopter traffic.

- **Water –** Unuk River (from Storie Creek into Alaska), Teigen Creek, and Hodkin Lake are mentioned by tenure holders.
- **Employment –** Tourism is the largest private sector local employer in the CIS LRMP area and is growing (BC ILMB 2000), although most jobs are seasonal.

5.4.6.7.1 Parks

With Ningunsaw Provincial Park, Border Lake Provincial Park, and Lava Forks Provincial Park all within 30 km of the Project, wilderness recreation is likely to occur in the Project's vicinity. These parks support recreation activities including backcountry skiing, rafting and canoeing, hunting, fishing, and backcountry camping.

Although no information on park visitation rates is currently available, Ningunsaw Provincial Park does support low levels of recreational use (Rescan 2010b).

5.4.6.7.2 Commercial - Recreation Tenures

There are six commercial recreation licences that intersect or lie within close proximity to the Project (see Appendix 23-A, Non-traditional Land Use Baseline Report). Among these are:

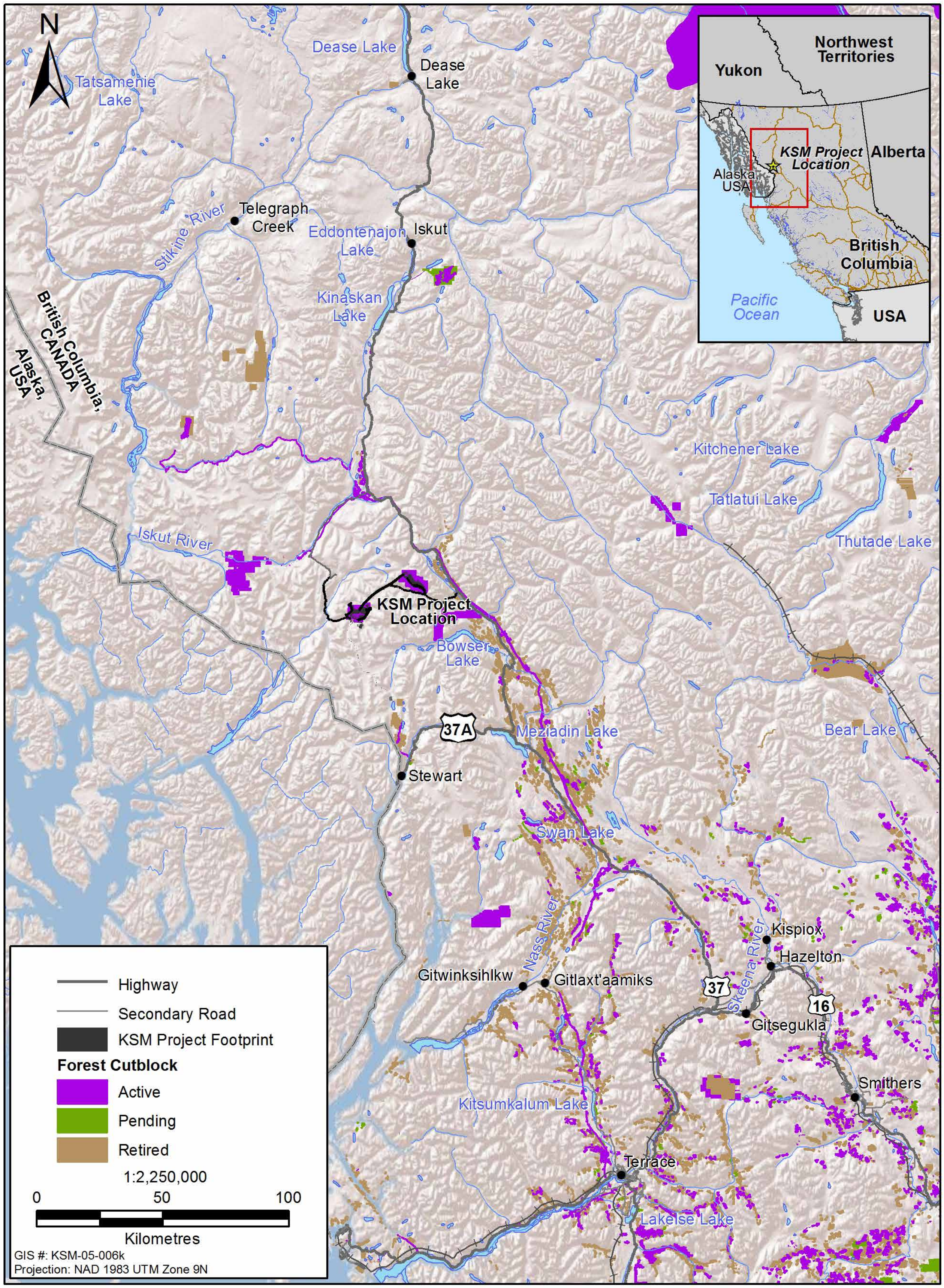
- Last Frontier Heliskiing's highest use areas are those closest to Bell 2 Lodge.
- Bear Enterprises takes clients between Bell II and Hyder, Alaska, along routes including parts of the Knipple Glacier, Teigen Creek, and Hodkin Lake depending on the chosen route. Access to the tenure area is typically gained from Highway 37. Occasionally a helicopter is chartered for a short trip from Bell II.
- Explorers League takes their clients rafting down Unuk River from Storie Creek into Alaska. Transportation infrastructure from Smithers, Terrace, and Alaska are used to bring clients to the tenure area.

5.4.6.8 Forestry

The KSM Project is within 10 km of the northwestern part of Nass Timber Supply Area (TSA), parts of which have historically been clear-cut; and close to the Cassiar TSA, where commercial forestry activities in the past have been largely restricted to the Bob Quinn area (C. Rygaard, pers. comm. cited in Rescan 2006). The closest historical logging activity to the Project is located along Highway 37 approximately 8 km east of the proposed Tailing Management Facility.

Figure 5.4-4 shows the location of cutblocks (active, pending, and retired) considered in the KSM Project CEA. Cutblocks are defined as areas of land identified on a forest development plan, or in a licence to cut, road permit, or Christmas tree permit, within which timber is to be or has been harvested (Mongabay.com 2010).

Highway 37 traverses the central and eastern portions of the Cassiar TSA, which is located north of the Project. The BC Ministry of Forests has indicated that limited economic opportunities exist in the TSA because of the climate and small scattered population, as well as lack of transportation networks and electricity (BC MOF 1999). The annual allowable cuts in the region have fallen over the past decade in general (BC Stats 2010) and there has been no recent logging activity in the Bob Quinn area.



SEABRIDGE GOLD
KSM PROJECT

Forest Cutblocks Considered in the KSM Project Cumulative Effects Assessment

Figure 5.4-4

Rescan Engineers & Scientists

There are two registered forest tenures in the vicinity of the Project, one in the Nass TSA from Meziadin to Bell II, and the other in the Cassiar TSA near Bob Quinn. Plans for future timber harvest exist (Calbraith 2008, pers. comm. cited in Rescan 2010b).

- **Activity Timeline –** There is presently no forestry activity in the vicinity of the Project, although it has occurred in the region in the past and is expected to occur again in the future.
- **Areas Used –** Bob Quinn and Meziadin to Bell II.
- **Access –** Access costs are a limiting factor to forest harvesting activities. However, there are plans for future timber harvest in the region. Access costs could decline and the timber harvesting land base could expand as a result of roads developed for new mines (BC ILMB 2000).
- **Traffic Volume –** Historically forestry caused higher volumes of traffic in northwestern BC. Historical forestry traffic peaked in the 1990s, when between 10,000 and 16,000 loads were shipped each year along Highway 37 and 37A to various sites, travelling from the Brown Bear Forestry Service Road, north of Meziadin Junction, into Stewart. Past logging traffic along Highway 37 and 37A, travelling between the Yukon border and Smithers, may have accounted for up to 30 to 40 truckloads per year (Appendix 22-C, Highways 37 and 37A Traffic Effects Assessment).
- **Water –** Forestry activities have the potential to affect surface water quantity (Rescan 2006).
- **Employment** – Employment in the forestry sector has slowed. Northwestern BC was previously home to nine sawmills, two operating pulp mills, and remanufacturing plants. There are currently only two sawmills and one pulp mill left, and the remanufacturing plants are closing (Rescan 2009).

5.4.6.9 Road Access and Traffic

The Project area is remote and has a limited number of roads. Highway 37 is the main access corridor. Highway 37 and the Eskay Creek Mine road built between 1991 and 1994, just south of Bob Quinn, will provide the access points for access road development to the Project.

In recent years, new roads to access resource developments have been constructed. New roads include partial access to the proposed Galore Creek Mine, an access road to the Red Chris Mine site, and a new 8 km gravel road constructed for access to the Forrest Kerr Hydroelectric Project. Other new resource access routes are proposed, as described above in each project summary.

Traffic at Meziadin Junction (i.e., highways 37 and 37A) amounted to 420 annual average daily trips in 1980. This number rose to the recorded high of 964 in 1992; decreased to around 500 in 2000; and subsequently fell to 224 in 2008 (MOT 2008 cited in Rescan 2010b). This decrease in traffic corresponds with the population decline in Stewart over the past decade, and the decline in logging traffic.

Forestry hauling that occurred along this route between Brown Bear Forest Service Road and Stewart, primarily representing wood export, peaked in the late 1990s when between 10,000 and 16,000 truckloads were shipped each year (an average of between 55 to 88 trips per day).

By 2001, a downturn in the regional forestry industry resulted in significantly lower haul traffic, a trend that has since continued (Appendix 22-C, Highways 37 and 37A Traffic Effects Assessment). There is also currently no regular forestry traffic north of Bell II.

With a number of proposed projects in the region (including the KSM Project), there is an expected overall increase in the volume of development-related traffic. The KSM Project may share overlapping transportation routes (Figure 5.4-5) along the Eskay Creek Mine road and Highway 37 and 37A to the Port of Stewart, as well as along Highway 16. Projects that will potentially share these routes include Forrest Kerr Hydroelectric, Red Chris Mine, Wolverine Mine, Bronson Slope Mine, Brucejack Mine, Galore Creek Mine, Kitsault Mine, Kutcho Mine, McLymont Creek Hydroelectric, Schaft Creek Mine, Snowfield Project, Storie Moly Mine, and Turnagain Mine. The location of each project and the overlapping transportation routes are illustrated in Figure 5.4-5.

The traffic volumes in Table 5.4-5 are estimates calculated using available information and are representative of a snapshot in time using the best available data at the time of the analysis. Wherever possible, traffic estimates provided in technical reports or project EAs were used. Where this information was not available, estimates of product (concentrate or other) traffic were calculated based on available production rates, ore grades, concentrate grades and the assumption that 50-tonne trucks are used. Estimates made for cargo traffic were calculated based on the ratio of KSM Project one-way trips per day to the KSM Project production rate. This ratio considers grinding media, liners, parts and machinery, major mine equipment, personnel, diesel fuel, reagents, lubricants, camp supplies, and explosives. Estimates for the hydroelectric projects were based on expected employment.

Figures 5.4-6 and 5.4-7 further illustrate how the KSM Project and cumulative traffic volumes are divided along transportation routes.

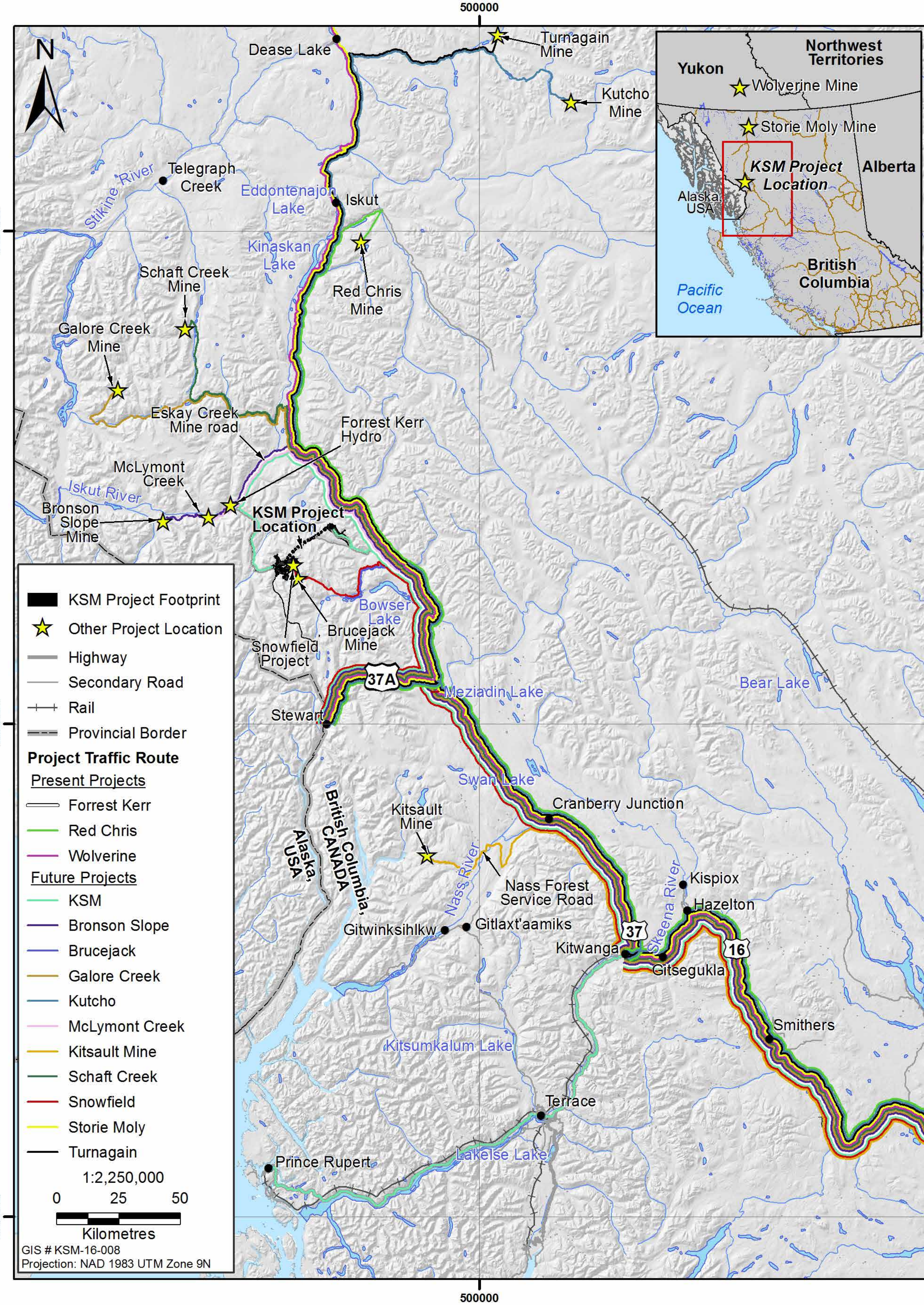


Figure 5.4-5

Present and Future Project Traffic Routes

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Table 5.4-5. Potential Cumulative One-way Trips per Day as a Result of KSM and Other Projects during Operation

	Project	Estimated Timing of Operation	Production Rate (tpd)	Type of Traffic	Trips/Day by Route: Coulter Creek Access Road	Eskay Creek Mine Road	Highway 37: Eskay Creek Mine Road to Treaty Creek Access Road	Treaty Creek Access Road	Highway 37: Treaty Creek Access Road to Newhawk Access Road	Highway 37: Newhawk Access Road to Meziadin Junction	Highway 37A	Highway 37: Meziadin Junction to Cranberry Junction	Highway 37: Cranberry Junction to Kitwanga	Highway 16: Kitwanga to Prince Rupert	Highway 16: South of Kitwanga
Present	Forrest Kerr Hydroelectric	2014-2074	n/a	Haul Traffic	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
				Cargo Traffic	-	1	1	-	1	1	-	1	1	-	1
				Total	0	1	1	0	1	1	0	1	1	0	1
	Red Chris Mine	2014-2042	30,000	Haul Traffic	-	-	28[1]	-	28[1]	28[1]	28[1]	-	-	-	-
				Cargo Traffic	-	-	11	-	11	11	-	11	11	-	11
				Total	0	0	39	0	39	39	28	11	11	0	11
	Wolverine Mine	2010-2019	1,400	Haul Traffic	-	-	18[2]	-	18[2]	18[2]	18[2]	-	-	-	-
				Cargo Traffic	-	-	1	-	1	1	-	1	-	-	1
				Total	0	0	19	0	19	19	18	1	0	0	1
Reasonably Foreseeable Future	Bronson Slope Mine*	2022-2042	15,000	Haul Traffic	-	3	3	-	3	3	3	-	-	-	-
				Cargo Traffic	-	6	6	-	6	6	-	6	6	-	6
				Total	0	9	9	0	9	9	3	6	6	0	6
	Brucejack Mine*	2016-2040	1,500	Haul Traffic	-	-	-	-	-	11	11	-	-	-	-
				Cargo Traffic	-	-	-	-	-	1	-	1	1	-	1
				Total	0	0	0	0	0	12	11	1	1	0	1
	Galore Creek Mine*	2023-2033	95,000	Haul Traffic	-	-	34	-	34	34	34	-	-	-	-
				Cargo Traffic	-	-	36	-	36	36	-	36	36	-	36
				Total	0	0	70	0	70	70	34	36	36	0	36
	Kitsault Mine*	2016-2030	50,000	Haul Traffic	-	-	-	-	-	-	-	-	54[4]	-	54[4]
				Cargo Traffic	-	-	-	-	-	-	-	-	19	-	19
				Total	0	0	0	0	0	0	0	0	73	0	73
	Kutcho Mine*	2015-2027	2,500	Haul Traffic	-	-	12	-	12	12	12	-	-	-	-
				Cargo Traffic	-	-	1	-	1	1	-	1	1	-	1
				Total	0	0	13	0	13	13	12	1	1	0	1
	McLymont Creek Hydroelectric	2016-2056	n/a	Haul Traffic	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
				Cargo Traffic	-	1	1	-	1	1	-	1	1	-	1
				Total	0	1	1	0	1	1	0	1	1	0	1

(continued)

Table 5.4-5. Potential Cumulative One-way Trips per Day as a Result of KSM and Other Projects during Operation (completed)

	Project	Estimated Timing of Operation	Production Rate (tpd)	Type of Traffic	Trips/Day by Route: Coulter Creek Access Road	Eskay Creek Mine Road	Highway 37: Eskay Creek Mine Road to Treaty Creek Access Road	Treaty Creek Access Road	Highway 37: Treaty Creek Access Road to Newhawk Access Road	Highway 37: Newhawk Access Road to Meziadin Junction	Highway 37A	Highway 37: Meziadin Junction to Cranberry Junction	Highway 37: Cranberry Junction to Kitwanga	Highway 16: Kitwanga to Prince Rupert	Highway 16: South of Kitwanga
Reasonably Foreseeable Future	Schaft Creek Mine*	2017-2032	150,000	Haul Traffic	-	-	54	-	54	54	54	-	-	-	-
				Cargo Traffic	-	-	57	-	57	57		57	57	-	57
				Total	0	0	111	0	111	111	54	57	57	0	57
	Snowfield Project*	2030-2057	120,000	Haul Traffic	-	-	-	-	-	38	38	-	-	-	-
				Cargo Traffic	-	-	-	-	-	45	-	45	45	-	45
				Total	0	0	0	0	0	83	38	45	45	0	45
	Storie Moly Mine*	2020-2040	20,000	Haul Traffic	-	-	1	-	1	1	1	-	-	-	-
				Cargo Traffic	-	-	8	-	8	8	-	8	8	-	8
				Total	0	0	9	0	9	9	1	8	8	0	8
	Turnagain Mine*	2017-2045	87,000	Haul Traffic	-	-	13	-	13	13	13	-	-	-	-
				Cargo Traffic	-	-	33	-	33	33	-	33	33	-	33
				Total	0	0	46	0	46	46	13	33	33	0	33
KSM Project[3]		2019-2071	130,000	Haul Traffic	-	-	-	36.25	36.25	36.25	36	0.25	0.25	0.25	-
				Cargo Traffic	3	3	3	45.75	48.75	48.75	-	48.75	48.75	-	48.75
				Total	3	3	3	82	85	85	36	49	49	0.25	48.75
TOTAL CUMULATIVE TRAFFIC BY ROUTE					3	14	321	82	403	498	248	250	322	0.25	322.75

n/a = not applicable to the project
- = not an applicable route
*** = Unless otherwise referenced, estimates of product-related haul traffic were calculated based on available concentrate production amounts or production rates, ore grades, and/or concentrate grades and on the assumption that 50-tonne trucks are used. Estimates of cargo traffic were calculated based on ratios of trips per day to production rate for KSM Project and assuming travel along Highway 37 south to Highway 16 rather than through Stewart.**
**** = Estimates were calculated based on the assumption that employees would stay in camp.**
Note: NTL is not included as only a limited amount (e.g., 0.05 trips per day) is expected.
Data sources: [1] BC EAO (2005a); [2] Tobin (2009); [3] Wardrop (2010a); [4] Avanti Mining Inc. (2012b).

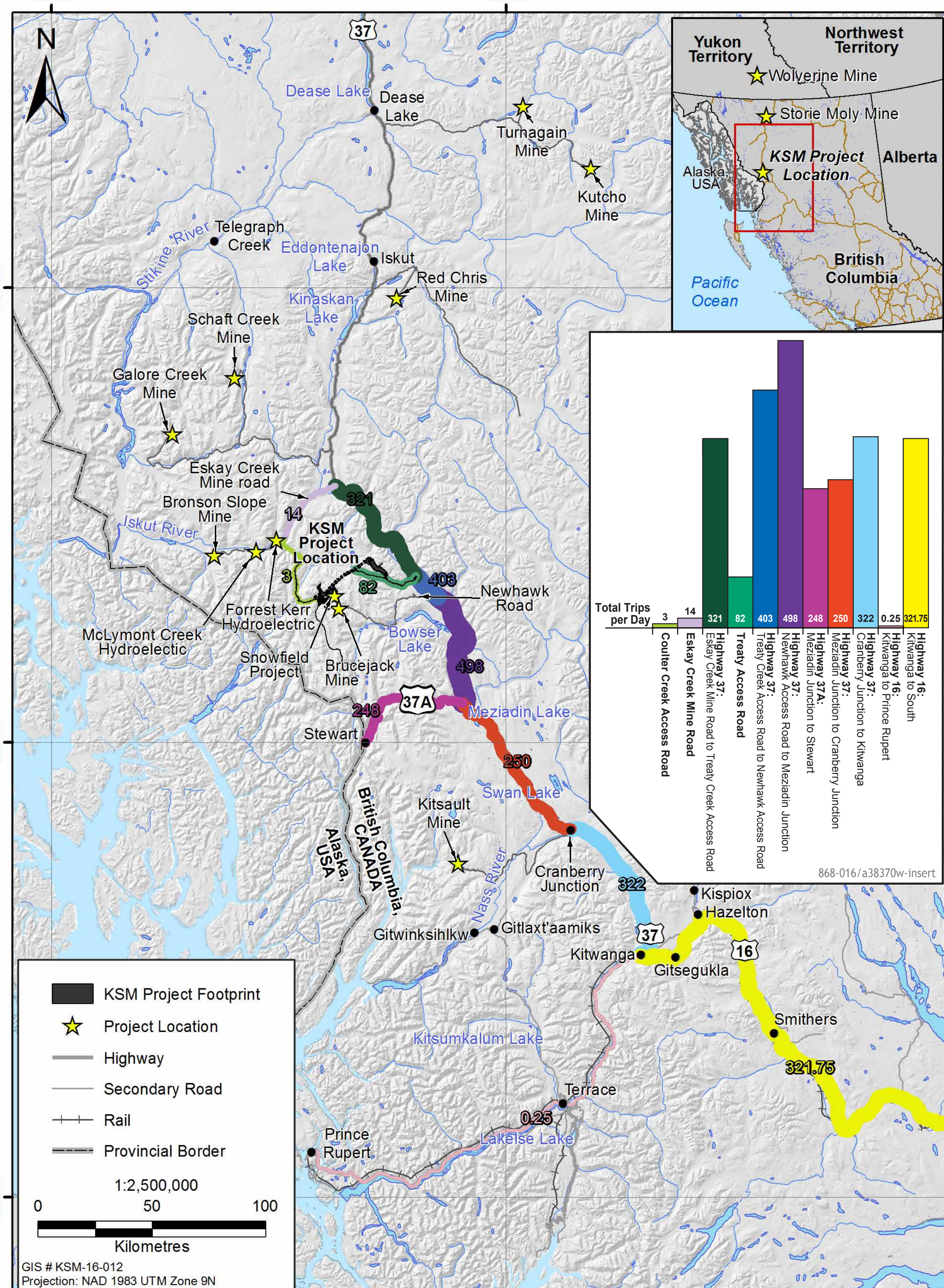

Figure 5.4-6

Potential Cumulative One-way Trips per Day as a Result of KSM and Other Projects

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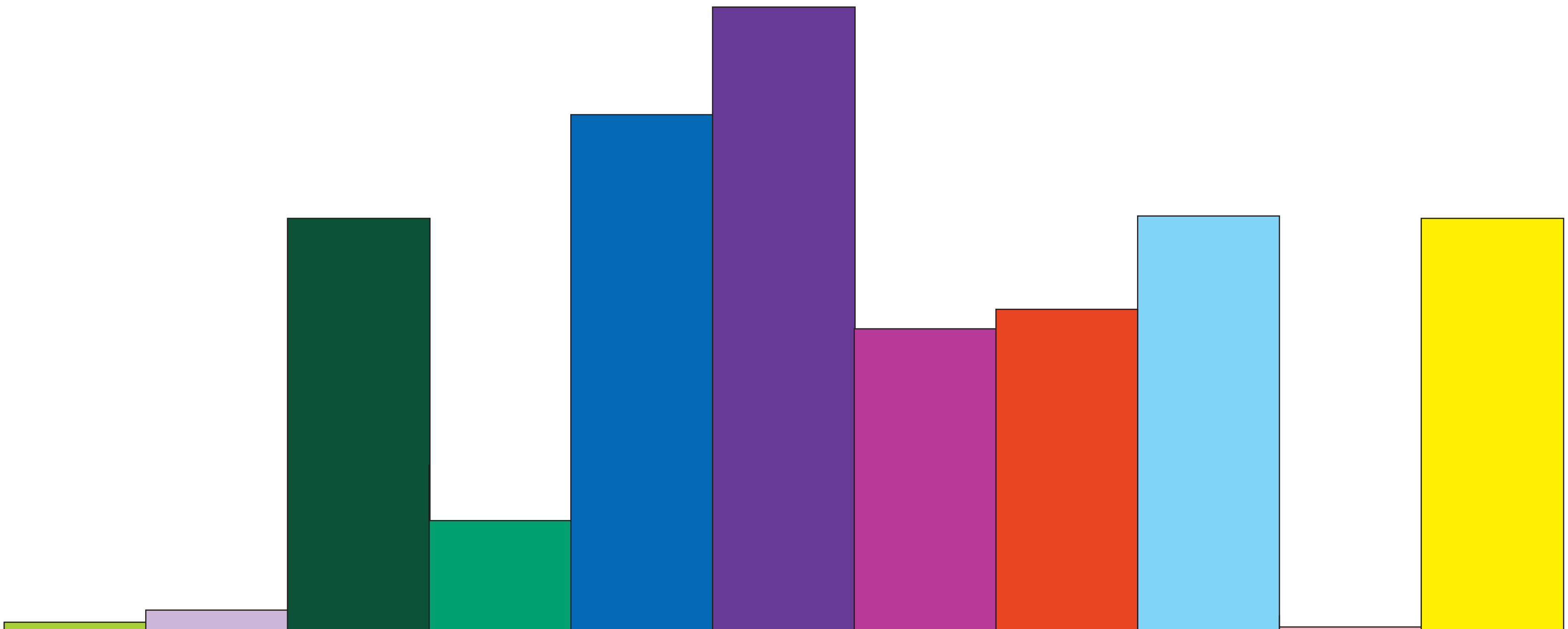
PROJECT # 868-016-16 ILLUSTRATION # a38370w January 26, 2013



Total Trips per Day	**3**	**14**	**321**	**82**	**403**	**498**	**248**	**250**	**322**	**0.25**	**321.75**
Projects Included	**KSM** *(Some cargo traffic)*	Bronson Slope Mine McLymont Creek Hydro Forrest Kerr Hydro **KSM** *(Some cargo traffic)*	Forrest Kerr Hydro Red Chris Mine Wolverine Mine Bronson Slope Mine Galore Creek Mine Kutcho Mine McLymont Creek Hydro Arctos Anthracite Mine Schaft Creek Mine Storie Moly Mine Turnagain Mine **KSM** *(Some cargo traffic)*	**KSM** *(Cargo and Concentrate traffic)*	Forrest Kerr Hydro Red Chris Mine Wolverine Mine Bronson Slope Mine Galore Creek Mine Kutcho Mine McLymont Creek Hydro Schaft Creek Mine Storie Moly Mine Turnagain Mine **KSM**	Forrest Kerr Hydro Red Chris Mine Wolverine Mine Bronson Slope Mine Brucejack Mine Galore Creek Mine Kutcho Mine McLymont Creek Hydro Schaft Creek Mine Snowfield Project Storie Moly Mine Turnagain Mine **KSM**	Red Chris Mine Wolverine Mine Bronson Slope Mine Brucejack Mine Galore Creek Mine Kutcho Mine Schaft Creek Mine Snowfield Project Storie Moly Mine Turnagain Mine **KSM** *(Copper Concentrate traffic)*	Red Chris Mine* Wolverine Mine* Bronson Slope Mine* Brucejack Mine* Galore Creek Mine* Kutcho Mine* Schaft Creek Mine* Snowfield Project* Storie Moly Mine* Turnagain Mine* **KSM** *(Cargo and Molybdenum traffic)*	Red Chris Mine* Wolverine Mine* Bronson Slope Mine* Brucejack Mine* Galore Creek Mine* Kitsault Mine Kutcho Mine* Schaft Creek Mine* Snowfield Project* Storie Moly Mine* Turnagain Mine* **KSM** *(Cargo and Molybdenum traffic)*	**KSM** *(Molybdenum traffic)*	Forrest Kerr Hydro Red Chris Mine* Wolverine Mine* Bronson Slope Mine* Brucejack Mine* Galore Creek Mine* Kitsault Mine Kutcho Mine* McLymont Creek Hydro Storie Moly Mine* Turnagain Mine* **KSM** *
Section of Road	**Coulter Creek Access Road**	**Eskay Creek Mine Road**	**Highway 37:** Eskay Creek Mine Road to Treaty Creek Access Road	**Treaty Creek Access Road**	**Highway 37:** Treaty Access Road to Newhawk Access Road	**Highway 37:** Newhawk Access Road to Meziadin Junction	**Highway 37A:** Meziadin Junction to Stewart	**Highway 37:** Meziadin Junction to Cranberry Junction	**Highway 37:** Cranberry Junction to Kitwanga	**Highway 16:** Kitwanga to Prince Rupert	**Highway 16:** Kitwanga, South

* Cargo traffic only

Figure 5.4-7

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KSM Project

Potential Cumulative One-way Trips per Day

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