RED MOUNTAIN UNDERGROUND GOLD PROJECT
VOLUME 3 | CHAPTER 6
EFFECTS ASSESSMENT METHODOLOGY

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6 EFFECTS ASSESSMENT METHODOLOGY

6.1 Approach and Issues Scoping

6.1.1 Approach and Regulatory Context

This chapter of the Application for an Environmental Assessment Certificate / Environmental Impact Statement (the Application/EIS) outlines the standardized methodology that IDM Mining Ltd. (IDM) used for the assessment of potential effects of the Red Mountain Underground Gold Project (the Project) on the biophysical, economic, social, heritage, and health aspects of the environment. The effects assessment methodology follows relevant provincial and federal guidance materials and legislation, specifically, the British Columbia *Environmental Assessment Act* (BCEAA; 2002), as administered by the BC Environmental Assessment Office (EAO) and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), administered by the Canadian Environmental Assessment Agency (the Agency).

The Project is also within the Nass Wildlife Area and the Nass Area, as defined under the Nisga'a Final Agreement (NFA), and is therefore subject to the terms of the NFA, particularly Chapter 10 (Environmental Assessment and Protection), paragraphs 8(e) and 8(f).

The following is a list of guidance materials that informed the standardized effects assessment methodology applied for all effects assessment chapters in the Application/EIS:

- Application Information Requirements Template (EAO 2015);
- Guideline for the Selection of Valued Components and Assessment of Potential Effects (EAO's Guidelines) (EAO 2013);
- Guidelines for the Preparation of an Environmental Impact Statement, Red Mountain Gold Mine Project, IDM Mining Ltd. (Agency 2016);
- Procedures for Mitigating Impacts on Environmental Values (BC MOE 2012).
- Environmental Assessment Office User Guide (EAO 2011); and
- Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects (Agency 1994).

The effects assessment methodology outlined in this chapter provides a structured framework that is consistently applied to all assessment topics throughout this document. The specific methodology used for the effects assessment of each of the selected Valued Components (VCs) and Intermediate Components (ICs) is provided in the relevant chapters within this Application.

Figure 6.1-1 provides an overview of the key steps of the effects assessment methodology per EAO guidelines (EAO 2013). Each of these steps has been undertaken for each VC and IC. Additionally, the regulatory and policy framework relating to each VC and IC has been summarized.

Figure 6.1-1: Overview of Key Steps in Effects Assessment

6.1.2 Issues Scoping

Issues, as defined in EAO's (2013)[1] Guidelines, are the broad range of environmental, economic, social, heritage, and health interests of government, Aboriginal Groups, and the public with respect to the proposed Project. Issues scoping[1] is intended to ensure that the Application focuses on the issues of greatest importance to government regulators, Aboriginal Groups, and the public and with the greatest potential to cause significant adverse effects. IDM's has gathered a list of issues through research, literature review, and consultation with interested parties. Based on this list, as well as through consultation with the technical Working Group and Nisga'a Nation, as represented by the Nisga'a Lisims Government (NLG), IDM has scoped the key issues based on the following steps:

- Review of the Project Description, including a review of the proposed Project components, works, and activities that will be undertaken and a consideration of the spatial and temporal boundaries over which they will be conducted;
- Research and review of available information about the existing environmental conditions in areas that may interact with the Project;

[1] As per EAO (2013), "Issues scoping is a process of compiling and analyzing available information to identify environmental, economic, social, heritage, and health issues that may be related to a reviewable project. These project-specific issues are generally indicative of the local and regional values held by the public, Aboriginal Groups, and other stakeholders in the area within which the project is proposed. They may also reflect issues of concern to the scientific community or to government. The issues identified through issues scoping are used to inform the selection of VCs and ICs for the assessment, as described in the next section."

- Identification of potential interactions between Project activities and environmental, economic, social, heritage, and health interests, as well as potential pathways for environmental effects, based on literature review, consultation, and professional experience;
- Consultation with NLG; and
- Review of existing regulatory guidance documents.

6.2 Selection of Intermediate and Valued Components and Intermediate Components

The selected VCs are representative of the important features of the natural and human environment that are likely to interact with the Project. VCs are selected based on the guidance outlined in the Guideline for the Selection of Valued Components and Assessment of Potential Effects (EAO 2013).

The selected ICs represent the pathway of potential effects between a Project component or activity and a VC. For example, Air Quality is an intermediate component to the VC, Wildlife and Wildlife Habitat.

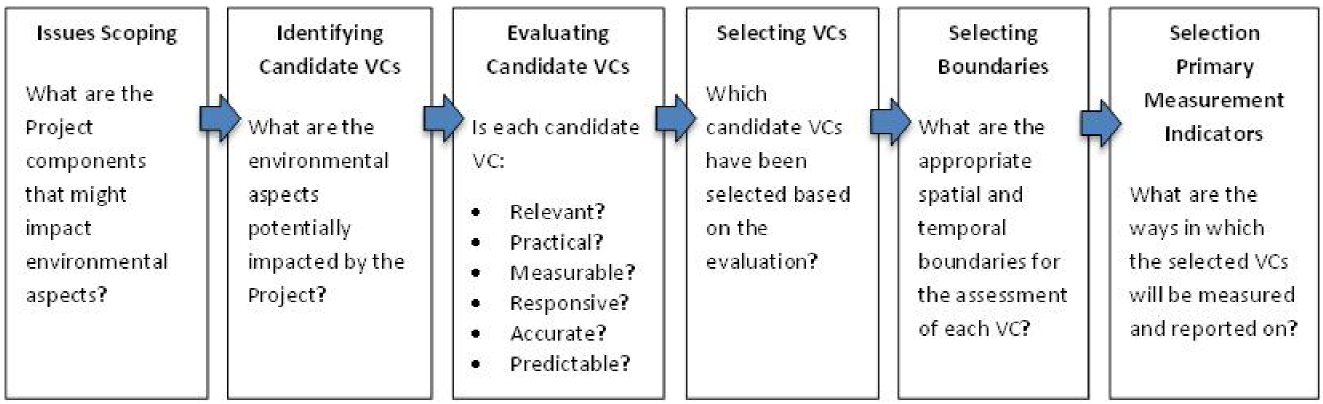
As per EAO guidance (2013) the selected VC or IC should have the following attributes:

- Relevant to at least one of the five pillars and clearly linked to the values reflected in the issues raised in respect of the Project;
- Comprehensive, so that taken together, the VCs selected for an assessment should enable a full understanding of the important potential effects of the Project (including all five pillars);
- Representative of the important features of the natural and human environment likely to be affected by the Project;
- Responsive to the potential effects of the Project; and
- Concise, so that the nature of the Project-VC/IC interaction and the resulting effect pathway can be clearly articulated and understood, and redundant analysis is avoided.

6.2.1 Selection of Valued Components and Intermediate Components by Assessment Chapter

This section summarizes the process and methodologies used to identify and select the VCs and ICs for the assessment. The VC selection process is described graphically in Figure 6.2-1, below.

Figure 6.2-1: VC Selection Process



Candidate VCs and ICs were identified based on a consideration of the following:

- Presence of the VC or IC in the local or regional Project area;
- Potential for Project interaction with, and effect on, the candidate VC or IC;
- Particular concern expressed by NLG, the government, or the public;
- Feedback from the Working Group;
- Relevance to legislative or regulatory requirement or government management priority (e.g., species at risk);
- Policy guidance;
- Relevance to Aboriginal Treaty rights or Interests, including title;
- Sensitivity or vulnerability to disturbance;
- Measurability of parameters related to the candidate VC or IC;
- Avoidance of similarity of potential effects for more than one candidate VC or IC; and
- Avoidance of similarity of mitigation measures, best management practices, and/or standard operating procedures for more than one candidate VC or IC.

IDM's evaluation of candidate components included whether the environmental aspect was better represented as an IC or VC, i.e., whether the candidate component represents a pathway of potential effect or an ultimate receptor at the end of an effect pathway for which an effects assessment and significance determination will be made.

VCs and ICs selected for the purpose of the assessment are identified in Table 6.2-1. Candidate VCs that were considered but ultimately not selected are summarized in Table 6.2-2.

Table 6.2-1: Selected Valued Components and Intermediate Components

Pillar	Selected Component[1]	VC	IC
Environment	Landforms and Natural Landscapes represented by: • Terrain Stability and Geohazards • Soil Quantity and Quality		✓
	Hydrology	✓	
	Hydrogeology		✓
	Groundwater Quality		✓
	Sediment Quality	✓	
	Surface Water Quality	✓	
	Vegetation and Ecosystems represented by: • BC CDC Listed Ecosystems • Old Growth and Mature Forested Ecosystems • Floodplain and Wetland Ecosystems (including Cottonwood Forest) • Alpine and Parkland Ecosystems • Ecologically Viable Soil • Rare Plants, Lichens, and Associated Habitat	✓	
	Wildlife represented by: • Mountain Goat • Grizzly Bear • Moose • Furbearers (Marten, Wolverine, Hoary Marmot) • Bats (Little Brown Myotis and Northern Myotis) • Migratory Breeding Birds (including MacGillivray's Warbler) • Listed Bird Species (including Common Nighthawk, Marbled Murrelet, and Olive-Sided Flycatcher) • Raptors (Northern Goshawk and Western Screech Owl) • Non-migratory Game Birds (Ptarmigan and Sooty Grouse) • Western Toad	✓	
	Aquatic Resources, represented by: • Periphyton • Benthic Invertebrates	✓	

Pillar	Selected Component[1]	VC	IC
	Fish, represented by: • Dolly Varden • Bull Trout • Eulachon • Salmonid Species	✓	
	Fish Habitat	✓	
Health	Air Quality		✓
	Noise		✓
	Human Health	✓	
Economic	Commercial, Recreational, and Aboriginal (CRA) Fisheries	✓	
	Contemporary Land and Resource Use	✓	
	Project-related Employment (Direct and Indirect)		✓
	Revenue to the Local Economy		✓
Social	Social and Health Services	✓	
	Housing	✓	
	Infrastructure	✓	
	Recreational Values	✓	
	Potential Social Issues Related to Project and Project Workforce	✓	
	Current Use of Lands and Resources for Traditional Purposes	✓	
	Project-Related Traffic		✓
	Visual Quality		✓
Heritage	Cultural and Heritage Resources	✓	

[1] The methodology and rationale for the selection of VCs and ICs is provided in each effects assessment chapter.

Table 6.2-2: Candidate Valued Components – Not Selected

Candidate VC	Evaluation / Rationale
Wildlife (Amphibians): Tailed Frog	Though Tailed Frogs are provincially blue-listed species, baseline studies revealed no sightings of individuals and little suitable habitat in the local study area.
Archaeological Resources	IDM recognizes the importance of archaeological resources to Aboriginal Groups and to regional stakeholders. In recognition of that importance, IDM engaged a qualified professional to conduct an Archaeological Impact Assessment (AIA) and subsequent Preliminary Field Reconnaissance (PFR) of the Project area. The AIA and supporting PFR conclude that due to steeply sloping terrain, absence of old growth tree stands, and significant previous land alterations from historic land use and natural processes, the archaeological potential is low. Also, there are no identified archaeological sites within the Project area. For these reasons, IDM is proposing to not include archaeological resources as a VC. Should previously unidentified archaeological resources be located during Project construction, operation, or reclamation and closure, IDM will abide by a chance find procedure.
Paleontological Resources	There is a very low likelihood of disturbing paleontological resources during Project construction, operation, and reclamation and closure. IDM will develop a paleontological 'chance find' procedure to protect paleontological resources, in the event that previously unidentified paleontological resources are discovered at the Project.
Light	The proposed Project is located in a remote area, is relatively small in nature and much of the operation is underground. Therefore, excessive light that could have a potential adverse effect on VCs is not anticipated.

IDM did not receive any feedback from EAO, Aboriginal Groups, stakeholders, or the public on the exclusion of these candidate VCs.

IDM initiated discussions with NLG regarding VC selection during a meeting on November 7, 2014. At the meeting, IDM and NLG conducted an initial issue scoping exercise for potential VCs and ICs and NLG provided direction to IDM for VC selection. A preliminary draft VC Selection Document was provided to NLG in December 2015 for review and comment. On January 5, 2016, IDM offered a meeting between IDM and NLG's technical specialists to discuss the proposed VCs. On February 4, 2016, NLG provided IDM with comments on the preliminary draft VC Selection Document. IDM provided NLG with responses to their comments by email on February 24, 2016, and informed NLG that the document had been revised in response to their comments.

IDM provided NLG with the revised draft VC Selection Document on March 9, 2016, and offered an in-person meeting to further discuss NLG's comments. On April 12, 2016, IDM received NLG's comments on the draft VC Selection Document through the EAO. IDM provided NLG with responses to their comments on May 24, 2016, and offered to arrange a technical discussion regarding the responses. The proposed technical meeting was held June

8, 2016. At EAO's direction, the VC Selection Document was not to be finalized and was superseded by the draft Application Information Requirements (dAIR).

On July 4, 2016, a version of the dAIR was provided to the Working Group, including NLG, for review and feedback. On July 12, 2016, IDM extended an offer to meet with NLG representatives to discuss the dAIR in advance of the Working Group meeting, which NLG declined. NLG participated in the July 28, 2016, Working Group meeting to discuss the dAIR. On August 17, 2016, NLG provided comments on the dAIR through the Working Group.

As recommended by EAO, consultation on the selection of VCs and ICs for the Project continued during the dAIR review process. The selection of VCs and ICs was finalized with the conclusion of the AIR review process and issuance of the AIR on March 30, 2017 (EAO, 2017).

Each effects assessment chapter includes a summary of how the issues raised and feedback received during the VC and IC selection process were incorporated into the assessment, as in Table 6.2-3.

Table 6.2-3: Summary of Consultation Feedback on <Subject Area/VC/IC>

Topic	Feedback by*				Consultation Feedback	Response
	NLG	G	P/S	O		

Template adapted from Aurico (2016)
*NLG = Nisga'a Lisims Government;
G = Government - Provincial or Federal;
P/S = Public/Stakeholder - Local government, interest groups, tenure and license holders, members of the public;
O = Other

6.2.2 Selection of Measurement Indicators

Measurement indicators are used to characterize both existing conditions and changes to VCs and ICs along effect pathways. Measurement indicators may be quantitative (e.g., concentrations of metals in surface water, changes in wildlife habitat quality) or qualitative (e.g., a discussion of anticipated changes in movement and behaviour of wildlife from disturbance to habitat, based on literature and external data).

For ICs and VCs, there may be several measurement indicators that are changed by a Project, either in series or in parallel. Accuracy and precision of measurement indicators are also used to discuss uncertainty around effects assessments for each VC and, consequently, often represent key variables for study as part of follow-up and monitoring programs that may be used to confirm EA predictions and the success of mitigation measures.

Measurement indicators have been selected for each VC and IC that generate useful data to inform the understanding of the potential effects of the Project on the selected VCs. ‘Measurement indicators’ are used to measure and evaluate the interaction of a Project impact with a particular VC, being relevant, practical, measurable, responsive, accurate, and predictable (EAO 2013).

Selected measurement indicators have been used to develop a baseline against which:

- Potential Project effects can be measured;
- The significance of effects can be determined; and
- Mitigation and/or compliance can be evaluated.

Measurement indicators were selected using the following criteria:

- An effects pathway must link the measurement indicator to the selected VC either directly or indirectly;
- The measurement indicator must be able to be evaluated in a practical and safe manner;
- The measurement indicator must be empirically and accurately measurable;
- The measurement indicator must generate data that is useful to the assessment of the potential impact of the Project on the selected VC;
- The measurement indicator must be responsive to the potential impacts of the Project; and
- The measurement indicator must be predictable in terms of its response to the Project.

VC- and IC-specific measurement indicators are identified in each effects assessment chapter.

6.3 Assessment Boundaries

Assessment boundaries define the maximum limit within which the effects assessment and supporting technical studies are conducted. Boundaries encompass areas and periods of time during which interactions between the Project and selected VCs and ICs are anticipated. The assessment boundaries account for constraints due to temporal, political, social, and economic circumstances and technical limitations (i.e., known limitations in predicting or measuring changes to each VC). Each effects assessment chapter describes the selected spatial and temporal boundaries, the rationale for their selection, and any administrative or technical boundaries that may be applicable. Maps outlining the spatial extent of each LSA and RSA will also be provided. Any difference in assessment boundary from that presented in the AIR is explained.

6.3.1 Spatial Boundaries

Spatial boundaries encompass the areas within which the proposed Project is expected to interact with a VC or IC. Factors considered in defining the spatial boundaries for each selected component include:

- Scope of the proposed Project and scope of the assessment, as defined in the Section 11 Order;
- Spatial characteristics of each VC or IC;
- Available environmental, social, heritage, and health information; and
- Technical or scientific information.

6.3.1.1 Project Footprint

The Project footprint (247 ha) is the spatial area within which development of infrastructure is expected to occur, and it includes the temporary and permanent physical works associated with the proposed Project (Figure 6.3-1).

6.3.1.2 Local Study Area

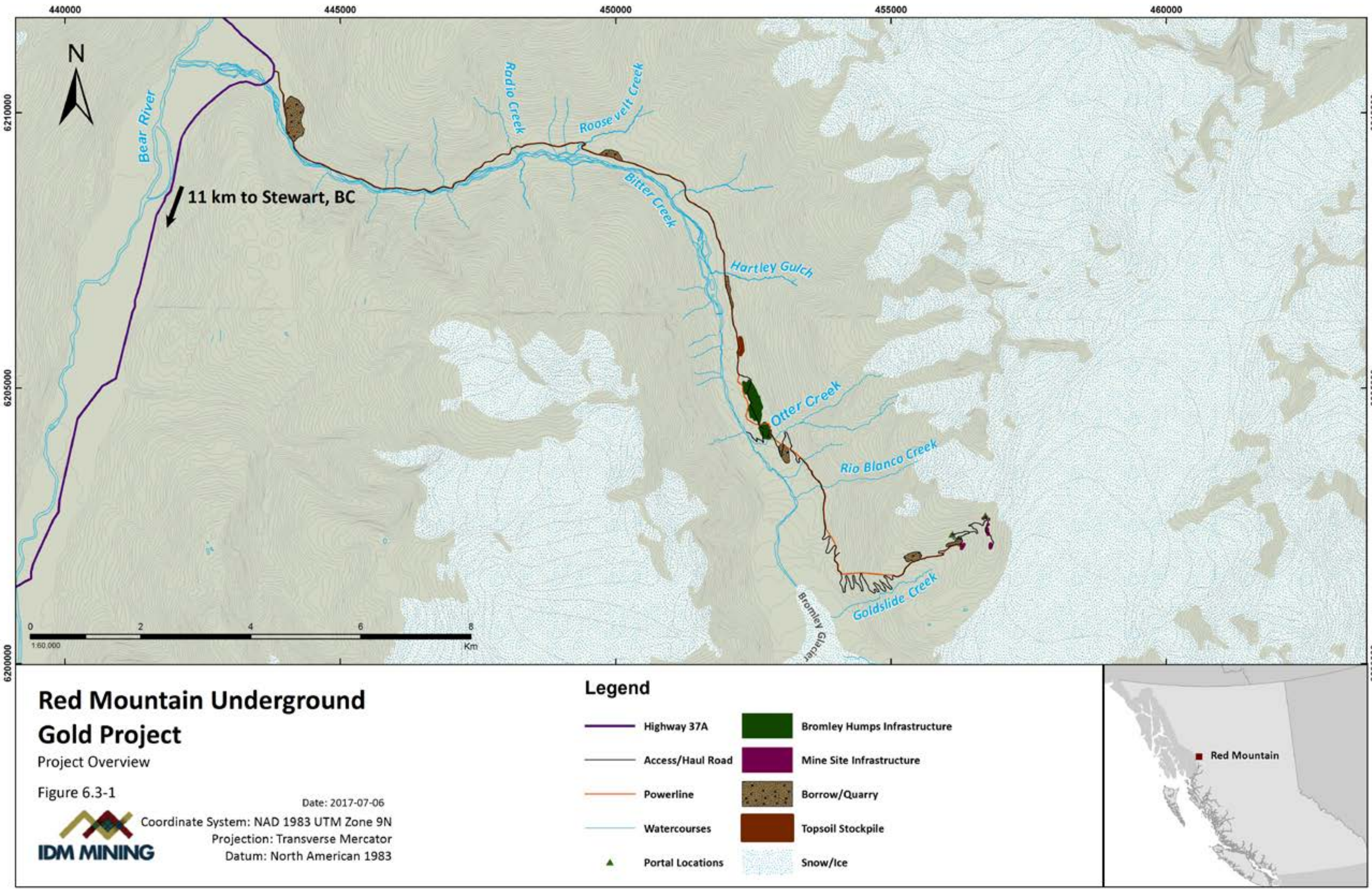
The Local Study Area (LSA) for each selected VC or IC encompasses the Project footprint and typically extends beyond it to include the surrounding area where there is a reasonable potential for adverse Project-specific effects to occur. The LSA boundary and associated rationale is provided within each assessment chapter.

The LSAs for some VCs are slightly different than those presented in the Project's AIR. The spatial boundary changes and the rationale for the change are as follows:

- Hydrogeology and Groundwater Quality: The LSA for Hydrogeology and Groundwater Quality has been slightly modified to better contour proposed Project components.
- CRA Fisheries: The LSA for CRA Fisheries has been reduced to be consistent with the LSA for Fish and Fish Habitat.
- Cultural and Heritage Resources: The LSA is slightly different to account for the refinement of Project component locations.

If not mentioned in this list, the spatial boundary presented in the AIR matches the one used in the final effects assessment.

Figure 6.3-1: Project Footprint including Temporary and Permanent Physical Works



6.3.1.3 Regional Study Area

The Regional Study Area (RSA) for each selected IC or VC encompasses an area larger than the LSA and provides context for the potential Project-related effects on VCs or ICs anticipated within the LSA. The RSA also represents the area within which cumulative effects on VCs or ICs could occur. The RSA boundary and associated rationale is provided within each assessment chapter. Direct Project effects are not likely to occur in the RSA, outside the LSA boundary.

6.3.2 Temporal Boundaries

Temporal boundaries encompass the periods during which the proposed Project is expected to interact with a VC or IC. Temporal boundaries should reflect those periods during which planned Project activities are reasonably expected to potentially affect a VC. These boundaries are adjusted as appropriate to reflect seasonal and annual variations or biophysical constraints related to a VC. Proposed temporal boundaries are based on the timing of the different phases of the proposed Project, as described in Table 6.3-1.

Table 6.3-1: Temporal Boundaries for the Effects Assessment

Phase	Project Year	Length of Phase	Description of Activities
Construction	Year -2 to Year -1	18 months	Construction activities and construction of: Access Road, Haul Road, Powerline, declines, power supply to the underground, water management features, water treatment facilities, Tailings Management Facility (TMF), Process Plant, ancillary buildings and facilities; underground lateral development and underground dewatering; ore stockpile and ore processing start-up; and receiving environmental monitoring.
Operation	Year 1 to Year 6	6 years	Ramp up to commercial ore production and maintain a steady state of production, underground dewatering, tailings storage, water treatment, gold dore shipping, environmental monitoring, and progressive reclamation.
Reclamation and Closure	Year 7 to Year 11	5 years	Underground decommissioning and flooding; decommissioning of infrastructure at portals, Process Plant, TMF, ancillary buildings and facilities; reclamation, water treatment; removal of water treatment facilities.
Post-Closure	Year 12 - 21	10 years	Receiving environment monitoring.

Temporal boundaries for VCs and ICs are presented by assessment chapter and incorporate consideration of the temporal characteristics associated with each component (e.g., timing and duration of sensitive or critical life stages of biological VC or IC). For many VCs and ICs, the temporal boundary has been defined as "Life of Project", which includes the Construction, Operation, Reclamation and Closure, and Post-Closure Phases of the Project.

6.3.3 Administrative and Technical Boundaries

Administrative boundaries refer to the limitations imposed on an environmental assessment by political, economic, or social constraints. Factors considered in defining the administrative boundaries for each selected VC or IC were:

- Scope of the proposed Project and scope of the assessment, as defined in the Section 11 Order;
- Spatial characteristics of each VC or IC;
- Available environmental, social, heritage, and health information; and
- Technical or scientific information.

Technical boundaries refer to the constraints imposed on an environmental assessment by limitations in the ability to predict the effects of a Project. Factors considered in defining the technical boundaries for each selected VC and IC were:

- Scope of the proposed Project and scope of the assessment, as defined in the Section 11 Order;
- Spatial characteristics of each VC or IC;
- Available environmental, social, heritage, and health information, and
- Technical or scientific information.

Where relevant and applicable to a particular VC or IC, administrative and/or technical boundaries are identified and discussed by assessment chapter.

6.4 Existing Conditions

Within each effects assessment chapter, the Application includes the following information:

- A description of the existing (or baseline) conditions within the study area in sufficient detail to enable potential Project-VC or -IC interactions to be identified, understood, and assessed;

- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies, and uncertainties, particularly for monitoring activities;
- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage, and health setting, irrespective of the changes that may occur as a result of the proposed Project or other project and/or activities in the area;
- An explanation of if and how other past and present projects and activities in the study area have affected or are currently affecting each VC or IC;
- Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed;
- Where additional Project and VC- or IC-specific field studies were conducted, the scope and methods used. Including a description of where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application; and
- Description of how Aboriginal knowledge that was consulted or used in the assessment (including its use in describing baseline conditions), the source of such information including how it was obtained, and how it is incorporated into the assessment.

Existing (or baseline) technical reports are provided as Appendices to the Application/EIS. Key findings contained in these technical reports are summarized directly in the main body of each effects assessment chapter within the Application/EIS, to facilitate the reader’s understanding of each VC and IC effects assessment.

6.4.1 Regional Overview and Historical Activities

Available or collected regional data is used to inform the assessment framework and to characterize Project- related and cumulative effects. Each VC and IC assessment chapter provides:

- A relevant regional overview and description of historical activities related to the environmental, social, economic, heritage, and health conditions, where available.
- A description of the Project components and activities in relation to the VC or IC.

6.4.2 Baseline Studies

Baseline for the purposes of this effects assessment refers to the reasonably relevant existing, or current, state of conditions for the environmental, social, heritage, economic, and health conditions at the time of submission of the Application/EIS. The following is provided in each VC or IC assessment chapter:

- An overview of the baseline studies undertaken to support each VC or IC effects assessment;

- The baseline study area;
- When the data were collected;
- Methodology and guidelines followed;
- Analysis results; and
- Known limitations.

A summary of field baseline data collection programs undertaken for each subject area is provided in Table 6.4-1.

Table 6.4-1: Summary of Field Baseline Studies for the Red Mountain Underground Gold Project (completed)

Topic	Years of Available Data		
	1990s	2000s	2013 - present
Hydrology	✓	None	✓
Hydrogeology	✓	Limited	✓
Water Quality	✓	Limited	✓
Fish and Fish Habitat	✓	Limited	✓
Aquatic Resources	None	None	✓
Wildlife (Birds, Mammals, Amphibians)	✓	Limited	✓
Geohazards	None	None	✓
Vegetation and Ecosystems	Limited	None	✓
Climate	✓	Limited	✓
Geochemistry	✓	Limited	✓
Socio-Economic (interviews of community groups, local and regional government representatives)	None	None	✓

Note:
The assessment of potential effects to Health, Economic, Social, and Heritage VCs and to Aboriginal and Treaty Interests is informed by baseline studies.

6.4.3 Data Sources

Each effects assessment chapter provides the data sources used to compile baseline information, including:

- Scientific field or study data collected and references to supporting literature and documents, such as annual baseline data reports, engineering, and technical reports (included as appendices to the Application/EIS);

- Desktop research such as other EA reports, regional studies, government publicly available data or thresholds, etc.; and
- Whether field baseline data was not available or found to be unsuitable for the assessment and what available published data were used to support the assessment in the absence of field baseline data.

IDM has not conducted primary traditional use or traditional ecological knowledge (TEK) surveys in support of the Project. It is IDM's understanding that Nisga'a Nation, as represented by NLG, does not feel that traditional use or TEK surveys are appropriate as Nisga'a Nation holds Treaty rights that are outlined in the Nisga'a Final Agreement.

EAO and the Agency have directed IDM to engage with the other Aboriginal Groups potentially affected by the proposed Project, Tsetsaut Skii km Lax Ha and Métis Nation BC, at relatively low levels such that traditional use or TEK surveys would be inappropriate.

IDM has committed to using TEK where that information is publically available. Each chapter contains a clarification of whether TEK relevant to that effects assessment was publically available and whether it was used to inform the effects assessment.

6.4.4 Methods

Methodology used to collect baseline data is described within each effects assessment chapter, which includes:

- References to appropriate standards and guidance documents followed for data collection and analyses;
- Assumptions and limitations; and
- How available information on Aboriginal or Treaty Interests was incorporated.

6.4.5 Current Conditions

The effects assessment chapters provide relevant current conditions in the LSA and RSA derived from baseline study results. These conditions inform the effects assessment where applicable. The effects assessments refer to potential changes to the current conditions influenced from the Project where appropriate, with reference to baseline data, reports, and maps. The discussions identify any known limitations and uncertainties.

6.5 Potential Effects

For each VC and IC, a summary of the overall process and methodologies used to identify and assess the potential effects of the proposed Project on the identified VCs and ICs is developed and presented in each effects assessment chapter. A matrix to identify Project scope, key Project-related interactions, and effects pathways with VCs and ICs for all phases of the Project is provided in Table 6.5-1 (interactions are indicated with an "X" and no interaction with a dash "-"). The Project interaction matrix identifies the physical works and activities to be implemented during the Project as it relates to each VC or IC. The interaction matrix applies a likelihood of interaction to filter the Project components and activities that will or will not result in potential effects. To populate the interaction matrix, the following questions or criteria are considered for each VC/IC:

- Based on the information available, is the Project component/activity expected to interact with the VC/IC?
- What are the types of effects that result from the interaction of the Project's components and activities with the VC/IC over different Project phases? Is the interaction expected to lead to potential effects on the VC/IC to a degree that would require mitigation?
- Which interactions have potential to cause adverse residual effects?
- Which interactions are of particular concern to government, Aboriginal Groups, public or stakeholders?

These questions assist to focus the assessment for Project-VC and -IC interactions that have higher likelihood of occurring and higher risk.

A description of the potential effects identified (including identification of key interactions), along with consultation feedback from Aboriginal Groups, the public, stakeholders, and government agencies (as applicable) is provided in each effects assessment chapter for each VC/IC. All Project components and activities that did not interact with a VC or IC and will not result in potential effect and are not considered further in the assessment. Where interaction is identified as possible, a potential effect is identified and considered in the assessment. Assumptions regarding the potential effects are documented in each effects assessment chapter and margins of error or degrees of uncertainty are provided. For any Project activity-VC or -IC interactions that were identified but excluded from further assessment, this will be clearly identified in the potential effects section of the VC or IC chapter, and will include the methods and criteria used to justify the exclusion and input received from EAO, government agencies, Aboriginal Groups, and the public regarding the exclusion.

6.6 Mitigation Measures

Within each assessment chapter, the Application describes the following:

- The approach to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent that will be implemented to address potential effects;

- The mitigation measures incorporated into the design of Project, including site and route selection, Project scheduling, Project design (e.g. equipment selection, placement, emissions abatement measures), and construction and operation procedures and practices;

- Any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices;

- How the mitigation measures will mitigate the potential adverse effects on the VC or IC;

- The rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible and the need for and scope of any proposed compensation or offset;

- An evaluation of the anticipated success of each mitigation measure and rationale and analysis for these evaluations. If there is little relevant/applicable experience with a proposed mitigation measure, and there may be some question as to its effectiveness, the potential risks and uncertainties associated with use of the mitigation is described;

- Consideration of other technically and economically feasible mitigation measures that were considered and an explanation, as necessary, of why they were rejected;

- Identification of who is responsible for the implementation of the mitigation measures as well as the system of accountability;

- The time required for mitigation to become effective to enable understanding of the duration of residual effects and the temporal characteristics of reversibility; and

- A summary of the mitigation measures for potential Project effects by Project phase.

Any mitigation measures that are contained in management or compensation plans are also identified.

Chapter 31 of the Application/EIS includes a table that summarizes the proposed mitigation measures. This includes an identification of whether the proposed mitigation is a legal requirement and which regulatory agency is responsible.

Table 6.5-1: Project Interaction Matrix

Project Component / Activity	Pillar, Valued Component and Intermediate Components																																													
	Landforms and Natural Landscapes		Hydrology and Water and Sediment Quality					Fish and Fish Habitat							Vegetation and Ecosystems						Wildlife and Wildlife Habitat											Air and Noise		Human Health	Economic				Social								Heritage
	Terrain Stability and Geohazards	Soil Quantity and Quality	Surface Water Quantity	Groundwater Quantity	Groundwater Quality	Surface Water Quality	Sediment Quality	Periphyton	Benthic Invertebrates	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	BC CDC Listed Ecosystems	Old Growth / Mature Forested Ecosystems	Floodplain and Wetland Ecosystems	Alpine and Parkland Ecosystems	Ecologically Viable Soil	Rare Plants, Lichens and Associated Habitat	Mountain Goat	Grizzly Bear	Moose	Furbearers	Hoary marmot	Bats	Migratory Breeding Birds	Migratory Bird Species at Risk	Raptors	Non-Migratory Game Birds	Western Toad	Noise	Air Quality	Human Health	Commercial, Recreational, & Aboriginal (CRA) Fisheries	Contemporary Land and Resource Use	Project-related Employment (Direct and Indirect)	Revenue to the Local Economy	Social and Health Services	Housing	Infrastructure	Recreational Values	Potential Social Issues Re: Project and Project Workforce	Project-Related Traffic	Visual Quality	Current Use of Land and Resources for Traditional Purposes	Cultural and Heritage Resources
Construction Phase																																															
Workforce (including employment of staff and contractors)	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X		X	-
Construct Access Road and Haul Road from Hwy 37A to the Upper Portal	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Install powerline from substation tie-in to the Lower Portal laydown area	X	X	-	-	-	X	X	X	X	X	X	-	-	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Excavate and secure Lower Portal entrance and access tunnel	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	-	X	-	X	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Construct Mine Site water management infrastructure including talus quarries and the portal collection pond, dewatering systems, and water diversion, collection and discharge ditches and swales.	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-	X	X	-	-	-	-	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Install and fill Fuel Tanks at Mine Site	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	x	X
Construct Explosives Magazine	X	X	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-	-	-	X	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	x	X
Construct other Mine Site ancillary buildings and facilities	X	X	X	X	-	X	X	X	X	-	-	-	-	-	-	-	-	X	-	X	X	X	-	X	X	-	-	-	-	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Discharge of water from underground workings at the Mine Site	-	X	X	X	-	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-	x	-

Project Component / Activity	Pillar, Valued Component and Intermediate Components																																													
	Landforms and Natural Landscapes		Hydrology and Water and Sediment Quality					Fish and Fish Habitat							Vegetation and Ecosystems						Wildlife and Wildlife Habitat											Air and Noise		Human Health	Economic				Social								Heritage
	Terrain Stability and Geohazards	Soil Quantity and Quality	Surface Water Quantity	Groundwater Quantity	Groundwater Quality	Surface Water Quality	Sediment Quality	Periphyton	Benthic Invertebrates	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	BC CDC Listed Ecosystems	Old Growth / Mature Forested Ecosystems	Floodplain and Wetland Ecosystems	Alpine and Parkland Ecosystems	Ecologically Viable Soil	Rare Plants, Lichens and Associated Habitat	Mountain Goat	Grizzly Bear	Moose	Furbearers	Hoary marmot	Bats	Migratory Breeding Birds	Migratory Bird Species at Risk	Raptors	Non-Migratory Game Birds	Western Toad	Noise	Air Quality	Human Health	Commercial, Recreational, & Aboriginal (CRA) Fisheries	Contemporary Land and Resource Use	Project-related Employment (Direct and Indirect)	Revenue to the Local Economy	Social and Health Services	Housing	Infrastructure	Recreational Values	Potential Social Issues Re: Project and Project Workforce	Project-Related Traffic	Visual Quality	Current Use of Land and Resources for Traditional Purposes	Cultural and Heritage Resources
Initiate underground lateral development and cave gallery excavation	-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	x	X
Temporarily stockpile ore at the Mine Site	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	X	-	-	-	-	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Install construction and permanent ventilation systems and underground water pumps	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X
Transport and deposit waste rock to the Waste Rock Storage Area	-	X	-	X	X	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	X	-	-	-	-	X	-	X	X	X	X	X	-	-	-	-	-	X	-	-	-	x	X
Water withdrawal for the purposes of dust suppression and construction use (primarily contact water management ponds; secondarily Bitter Creek, Goldslide Creek, and Otter Creek) and to meet freshwater needs (Otter Creek, Goldslide Creek)	-	-	X	-	-	-	-	X	X	X	X	-	-	X	-	-	-	-	-	-	-	X	X	-	-	-	X	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Clear and prepare the TMF basin and Process Plant site pad	X	X	X	X	-	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Excavate rock and till from the TMF basin and local borrows / quarries for construction activities (e.g. dam construction for the TMF)	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	X	X	-	X	X	X	X	X	-	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Establish water management facilities including diversion ditches for the TMF and Process Plant	X	X	X	X	X	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X

Project Component / Activity	Pillar, Valued Component and Intermediate Components: Landforms and Natural Landscapes		Hydrology and Water and Sediment Quality					Fish and Fish Habitat							Vegetation and Ecosystems						Wildlife and Wildlife Habitat											Air and Noise		Human Health	Economic				Social								Heritage
	Terrain Stability and Geohazards	Soil Quantity and Quality	Surface Water Quantity	Groundwater Quantity	Groundwater Quality	Surface Water Quality	Sediment Quality	Periphyton	Benthic Invertebrates	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	BC CDC Listed Ecosystems	Old Growth / Mature Forested Ecosystems	Floodplain and Wetland Ecosystems	Alpine and Parkland Ecosystems	Ecologically Viable Soil	Rare Plants, Lichens and Associated Habitat	Mountain Goat	Grizzly Bear	Moose	Furbearers	Hoary marmot	Bats	Migratory Breeding Birds	Migratory Bird Species at Risk	Raptors	Non-Migratory Game Birds	Western Toad	Noise	Air Quality	Human Health	Commercial, Recreational, & Aboriginal (CRA) Fisheries	Contemporary Land and Resource Use	Project-related Employment (Direct and Indirect)	Revenue to the Local Economy	Social and Health Services	Housing	Infrastructure	Recreational Values	Potential Social Issues Re: Project and Project Workforce	Project-Related Traffic	Visual Quality	Current Use of Land and Resources for Traditional Purposes	Cultural and Heritage Resources
Construct the TMF	X	X	X	X	X	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Construct the Process Plant and Run of Mine Stockpile location	X	X	X	X	X	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Construct water treatment facilities and test facilities at Bromley Humps	X	X	X	X	-	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	X
Construct Bromley Humps ancillary buildings and facilities, the Fuel Tank, Waste Storage Area, and Hazardous Materials Storage Area	X	X	X	X	X	X	X	X	X	X	X	-	-	X	-	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	x	x	X
Commence milling to ramp up to full production	-	X	X	-	-	X	X	X	X	X	X	-	-	X	-	-	-	-		X	X	X	X	X	-	X	X	X	X	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	x	X
Operation Phase																																															
Workforce (including employment of staff and contractors)	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X	-	X	-
Use Access Road for personnel transport, haulage, and delivery of goods	-	X	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-		-	-	-	-	-	-	x	X
Maintain Access Road and Haul Road, including grading and plowing as necessary	-	X	X	-	-	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	X	X	X	X	X	X	-	-	-		-	-	-	-	-	-	x	X
Maintain powerline right-of-way from substation tie-in to portal entrance, including brushing activities as necessary	-	-	-	-	-	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	X	-	-	x	x	-
Continue underground lateral development, including dewatering	-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	x	X	X	X	-	-	-		-	-	-	-	-	-	x	X

Project Component / Activity	Pillar, Valued Component and Intermediate Components: Landforms and Natural Landscapes		Hydrology and Water and Sediment Quality					Fish and Fish Habitat							Vegetation and Ecosystems						Wildlife and Wildlife Habitat											Air and Noise		Human Health	Economic				Social								Heritage
	Terrain Stability and Geohazards	Soil Quantity and Quality	Surface Water Quantity	Groundwater Quantity	Groundwater Quality	Surface Water Quality	Sediment Quality	Periphyton	Benthic Invertebrates	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	BC CDC Listed Ecosystems	Old Growth / Mature Forested Ecosystems	Floodplain and Wetland Ecosystems	Alpine and Parkland Ecosystems	Ecologically Viable Soil	Rare Plants, Lichens and Associated Habitat	Mountain Goat	Grizzly Bear	Moose	Furbearers	Hoary marmot	Bats	Migratory Breeding Birds	Migratory Bird Species at Risk	Raptors	Non-Migratory Game Birds	Western Toad	Noise	Air Quality	Human Health	Commercial, Recreational, & Aboriginal (CRA) Fisheries	Contemporary Land and Resource Use	Project-related Employment (Direct and Indirect)	Revenue to the Local Economy	Social and Health Services	Housing	Infrastructure	Recreational Values	Potential Social Issues Re: Project and Project Workforce	Project-Related Traffic	Visual Quality	Current Use of Land and Resources for Traditional Purposes	Cultural and Heritage Resources
Discharge of water from underground facilities	-	X	X	X	-	X	X	X	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Haul waste rock from the declines to the Waste Rock Storage Area for disposal (waste rock transport and storage)	-	X	-	X	X	X	X	X	X	-	-	-	-	-	-	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-		-	-	-	-	-	-	x	X
Extract ore from the underground load-haul-dump and transport to Bromley Humps to Run of Mine Stockpile (ore transport and storage)	X	-	-	X	X	X	X	X	X	X	X	-	-	X	-	X	-	X	-	-	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	-	-	-		-	-	-	-	-	-	x	X
Process ore to gold doré	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-		-	-	-	-	-	-	x	X
Pump process water from the TMF (reclaim water) to supply the Process Plant	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	-	-	-		-	-	-	-	-	-	x	X
Excess process water for the Process Plant will be obtained through water withdrawal from contact water management ponds, treated effluent water, and/or Otter Creek	-	-	X	-	-	-	-	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Water withdrawal for the purposes of dust suppression along Project roads and to meet freshwater needs (Otter Creek, Goldslide Creek)	-	-	X	-	-	-	-	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Pump tailings and waste water to the TMF for disposal	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	-	-	-		-	-	-	-	-	-	x	X

Project Component / Activity	Pillar, Valued Component and Intermediate Components																																													
	Landforms and Natural Landscapes		Hydrology and Water and Sediment Quality					Fish and Fish Habitat							Vegetation and Ecosystems						Wildlife and Wildlife Habitat											Air and Noise		Human Health	Economic				Social								Heritage
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Treat and discharge, as necessary, excess water from the TMF	-	-	X	-	-	X	X	X	X	X	X	X	X	X	-	-	X	-	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Temporarily store hazardous substances including fuel, explosives, and mine supplies	-	X	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	-	X	X	-	-	-	-		-	-	-	-	-	-	x	-
Progressively reclaim disturbed areas no longer required for the Project	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	-	-	X	X	X	-	-	-		-	-	-	-	-	x	x	-
Closure and Reclamation Phase																																															
Workforce (including employment of staff and contractors)	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	X	-	-	-	-	X	X	X	X	X	X	X	X	X	X	-	X	-
Use and maintain Access Road for personnel transport, haulage, and removal of decommissioned components until road is decommissioned and reclaimed.	-	X	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	-	-	-		-	-	-	-	-	-	x	X
Decommission underground infrastructure	X	X	-	-	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X	-	X	X	X	X	X	-	-	X	X	X	-	-	-		-	-	-	-	-	-	x	-
Install bulkhead(s) in the declines and ventilation exhaust raise	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	-	X	-	-	-	-		-	-	-	-	-	-	x	X
Flood underground	-	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Decommission and reclaim Lower Portal area and Powerline	X	X	X	X	-	X	X	X	X	X	X	-	-	X	-	-	-	X	-	X	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	X	-	-		-	-	X	-	-	x	x	X
Decommission and reclaim Haul Road	X	X	X	X	-	X	X	X	X	X	X	-	-	X	-	X	X	X	-	X	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	X	-	-		-	-	X	-	-	x	x	X

Project Component / Activity	Pillar, Valued Component and Intermediate Components																																													
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Decommission and reclaim all remaining mine infrastructure (Mine Site and Bromley Humps, except TMF) in accordance with the Closure and Reclamation Chapter (Volume 2, Chapter 5)	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	-	-	-		-	-	-	-	-	x	x	X
Construct the closure spillway	X	X	X	-	-	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	-	-	-		-	-	-	-	-	x	x	X
Treat and discharge water from the TMF	-	-	X	-	-	X	X	X	X	X	X	X	X	X	-	-	X	-	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Conduct maintenance of mine drainage, seepage, and discharge	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Remove discharge water line and water treatment plant	X	X	X	X	-	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	X	X	X	X	-	-	X	X	X	X	-	X	X	X	X	-	-	-		-	-	-	-	-	-	x	-
Decommission and reclaim Access Road	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	-	-	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	-	-		-	-	X	-	-	x	x	X
Post-Closure Phase																																															
Flood underground	-	-	X	X	X	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	X	X	-	-	-		-	-	-	-	-	-	x	-
Post-Closure Monitoring	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	X	-	-	-	-	X	X	X	X	X	X	X	-	X	X	-	-	-

Notes:
*The potential interactions identified between the Project components / activities and two VC's (Salmonid Species and Eulachon) only relate to the Access Road (construction, use, maintenance, decommissioning) and to discharges from the Tailings Management Facility.

6.6.1 Key Mitigation Approaches

The selection of appropriate mitigation measures considers the guidance outlined in the Procedures for Mitigating Impacts on Environmental Values (BC MOE 2012). Results from the review of best management practices, guidance documents, and mitigation measures conducted for similar projects, as well as professional judgment for the Project-specific effects and most suitable management measures, were considered in determining the mitigation measures. The approach to the identification of mitigation measures subscribed to the mitigation hierarchy, as described in the Environmental Mitigation Policy for British Columbia (http://www.env.gov.bc.ca/emop/). Technical and economic feasibility constraints dictated the highest level on the hierarchy that could be achieved for each potential effect and the identification of mitigation measures for managing these effects.

Comments received from Aboriginal Groups related to proposed environmental management, mitigation, and/or monitoring programs are discussed in the assessment chapters.

Each effects assessment chapter considered ways to manage, mitigate, and/or monitor potential effects, particularly for mitigating key potential effects, following a hierarchical approach:

- Optimizing Alternatives: Avoiding/preventing, controlling, or minimizing adverse effects by changing the location or method of a Project component or activity (e.g., selecting an alternative site location of infrastructure);

- Design Mitigation: Avoiding/preventing, controlling, or minimizing adverse effects by changing he design of the Project or one component of the Project (e.g., engineering design changes, scheduling an activity to avoid an interaction with a VC).;

- Best Available Technology (BAT): Avoiding/preventing, controlling, or minimizing adverse effects by eliminating, minimizing, controlling, or reducing adverse effects using technological applications;

- Best Management Practices (BMPs): Avoiding/preventing, controlling, or minimizing adverse effects by through management practices (e.g., adhering to buffers to key identified VC or IC components parameters);

- Restoration: Where an adverse effect is unavoidable, restoration is considered, which aims to establish the ecological processes needed to make systems sustainable, resilient, and healthy under current and future conditions; and

- Offsetting: Where an adverse effect is unavoidable, and restoration is not practicable, offsetting is considered, which reduces the effects through compensatory actions, resulting in a neutral or beneficial net effect on the community or ecosystem.

6.6.2 Environmental Management and Monitoring Plans

Environmental Management Plans (EMPs) applicable to a VC or IC are identified in the effects assessment chapters. IDM proposes to implement the following EMPs, which are summarized in conceptual plans provided in Volume 5, Chapter 29 of the Application/EIS:

- Adaptive Management Plan;
- Access Management Plan;
- Air Quality and Dust Management Plan;
- Aquatic Effects Management and Response Plan;
- Community Involvement Plan;
- Cultural and Heritage Resources Protection Plan;
- Emergency Response Plan;
- Erosion and Sediment Control Plan;
- Explosives Management Plan;
- Fuel Management Plan;
- Hazardous Materials Management Plan;
- Health and Social Services Plan;
- Local Procurement Plan;
- Material Handling and ML / ARD Management Plan;
- Noise Abatement Plan;
- Occupational Health and Safety Plan;
- Site Water Management Plan;
- Skills, Training and Employment Plan;
- Social and Economic Management Plan;
- Spill Contingency Plan;
- Tailings Management Plan;
- Terrain and Soil Management Plan;
- Vegetation and Ecosystems Management Plan;
- Waste Management Plan; and
- Wildlife Management Plan.

Six EMPs were listed in the AIR that are no longer stand-alone EMPs, having been incorporated into other EMPs as follows, the:

- Ore Storage Management Plan and Waste Rock Management Plan are included in the Materials Handling and ML/ARD Management Plan (which also addresses borrow it and quarry management);

- Groundwater Monitoring Plan is included in the Site Water Management Plan;

- Human Resources Plan is addressed in the Local Procurement Plan.

- Environmental Management Plan is replaced with the Environmental Management System which provides the framework and approach for all the Environmental Management Plans; and

- Traffic Control Plan is addressed in the Access Management Plan.

Each effects assessment chapter will identify any proposed monitoring and follow-up programs required to verify the accuracy of the EA conclusions and/or determine the effectiveness of any mitigation measures, in accordance with CEAA 2012. In addition, environmental monitoring is included in each management plan as appropriate, and the conceptual monitoring and follow-up programs for VC and ICs are included in Chapter 30, if applicable. Each of the EMP and monitoring and follow up plans will roles and responsibilities and reporting as appropriate. All management plans include defined roles and responsibilities for implementation.

6.6.3 Effectiveness and Timing of Mitigation Measures

Each mitigation measure is evaluated and classified as Low, Moderate, High, and Unknown effectiveness within each effects assessment chapter:

- Low effectiveness: Once the mitigation measure is implemented, the effect is relatively unchanged (i.e., little to no improvement in the condition of the VC, IC, or indicator).
- Moderate effectiveness: Once the mitigation measure is implemented, the effect is moderately changed (i.e., a moderate improvement in the condition of the VC, IC, or indicator).
- High effectiveness: Once the mitigation measure is implemented, the effect is significantly improved (i.e., major improvement in the condition of the VC, IC, or indicator), or the effect is eliminated.
- Unknown effectiveness: The mitigation measure has unknown effectiveness because it has not been implemented elsewhere in a comparable project or environment.

Each effects assessment considers the effectiveness of proposed mitigation measures to determine the residual Project effects. If the implementation of mitigation measures will eliminate a potential effect and no residual effect is identified on that VC or IC, the effect is not carried forward for further analysis. If a mitigation measure is not expected to eliminate an effect, a residual effect is identified and carried forward for further analysis (i.e., characterization and a significance determination).

The timing of effectiveness of the mitigation measures varies depending on the type of mitigation. Mitigation measures that are part of the project design or that rely on avoidance or prevention of effect through BMPs or Regulatory Requirements are effective immediately. Mitigation measures that are based on monitoring are dependent on the monitoring schedule. The implementation of all the mitigation measures as a whole will generally provide close to immediate effectiveness.

A summary of the potential effects, proposed mitigation measures and corresponding effectiveness, and the residual effects carried forward in the analysis, is provided in each effects assessment chapter using Table 6.6-1.

Table 6.6-2: Proposed Mitigation Measures and Their Effectiveness

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect

[1]Effectiveness: Low = measure unlikely to result in effect reduction; Moderate = measure has a proven track record of partially reducing effects; High = measure has documented success (e.g., industry standard; use in similar projects) in substantial effect reduction

[2]Uncertainty: High = proposed measure is experimental, or has not been applied in similar circumstances; Moderate = proposed measure has been successfully implemented, but perhaps not in a directly comparable situation; Low = proposed measure has been successfully applied in similar situations

6.7 Characterization of Residual Effects

6.7.1 Residual Project Effects Analyses

Residual effects on a VC or IC are those that remain once mitigation measures are implemented and are analyzed to predict the nature and extent of effects and changes in the condition of a VC or IC that could result from the Project. Each effects assessment chapter provides the residual effects analyses used, which describes the methods used and data and information considered to determine residual effects, with model descriptions and calculations described where applicable and references to the scientific and engineering studies used. In addition, feedback from local community members and Aboriginal Groups considered are provided.

6.7.2 Characterizing Residual Effects

The residual effects are characterized in each assessment chapter using the following criteria and general definitions, which are based on the Guidelines for the Selection of Valued Components and Assessment of Potential Effects (EAO 2013):

- **Context**: Context refers to the sensitivity and resilience of the VC or IC indicator to further changes in the environment that may be caused by the Project. For example, an ecologically sensitive site is likely to have little resilience to additional imposed stresses. Context draws heavily on an understanding of existing conditions that reflect cumulative effects of other projects, activities that have been carried out, and information about the effect of natural and human-caused trends on the condition of the VC or IC. Project effects may have a higher effect if they occur in areas or regions that have already been adversely affected by human activities or exhibit ecological fragility and have little resilience to imposed stresses.

- **Direction**: Direction indicates whether the residual effect on a VC or IC is negative (i.e., adverse), positive (i.e., beneficial), or neutral. Neutral and positive changes were not evaluated; therefore all discussed residual effects have a negative direction.

- **Magnitude**: Magnitude is a measure of the intensity of a residual effect or the degree of change caused by the proposed Project (and other developments, if applicable) relative to baseline conditions, guidelines, or threshold values. Depending on the VC or IC, the characterization of magnitude may be numerical (e.g., absolute or relative effect size) or qualitative (e.g., low, moderate, and high).

- **Geographic Extent**: This is the spatial scale of the effect and is different from the spatial boundary (i.e., study area) for the residual effects characterization. The spatial boundary for the residual effects characterization represents the maximum area used for the assessment and is related to the spatial distribution and movement of VCs and ICs. However, the geographic extent of residual effects can occur on several scales within the spatial boundary of the assessment. Geographic extent refers to the area affected and is characterized according to the scale of the effect and the properties of the component or the measurement indicator.

- **Duration**: Duration is defined as the length of time the residual effect persists (usually in years) and is expressed relative to Project phases. The duration of an effect will typically be described as short-term, long-term, or permanent; definitions of short- and long-term would vary by VC or IC and consider VC- or IC-specific temporal characteristics.

- **Frequency**: Frequency refers to how often a residual effect will occur. Frequency is explained more fully by identifying when the residual effect occurs (e.g., once at the beginning of the Project). If the frequency is sporadic or regular, then the length of time between occurrences and the seasonality of occurrences (if present) is discussed.

- **Reversibility**: After removal of the Project activity or stressor, reversibility is the likelihood that the Project will no longer influence a VC or IC in a future predicted period. The period is provided for reversibility (i.e., duration) if a residual effect is reversible. Permanent residual effects are considered irreversible.

Where feasible, these criteria are described quantitatively in the Application/EIS for each VC or IC. When residual effects cannot be characterized quantitatively, the Application/EIS characterizes these effects qualitatively. Definitions are provided when qualitative terms are used.

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

Predicted changes in measurement indicators along an effect pathway will allow for determination of the significance of residual Project effects on VCs. When residual effects on a VC or IC are determined, and it is also considered a pathway for other potential effects on other components, the Application/EIS will identify the linkages between them and the discipline-specific studies to which the information has been forwarded for further evaluation.

The criteria and the rationale for each residual effect rating is presented in each effects assessment chapter using the example layout in Table 6.7-1.

Table 6.7-1: Characterization of <Residual Effect> on <VC/IC>

Criteria	Characterization with VC/IC
Magnitude	What is the anticipated size or severity of the residual effect, and why? Identify whether the effect is of negligible, low, moderate, or high magnitude, for example: • **Negligible (N)**: no detectable change from baseline conditions; • **Low (L)**: differs from the average value for baseline conditions but remains within the range of natural variation and below a guideline or threshold value; • **Moderate (M)**: differs substantially from the average value for baseline conditions and approaches the limits of natural variation but equal to or slightly above a guideline or threshold value; and • **High (H)**: differs substantially from baseline conditions and is significantly beyond a guideline or threshold value, resulting in a detectable change beyond the range of natural variation.
Geographical Extent (Biophysical)	What is the spatial scale over which the Project residual effect is anticipated to occur? Identify whether the effect occurs over the Project footprint, local, regional, or beyond regional area, for example: • **Discrete (D):** effect is limited to the Project area; • **Local (L):** effect is limited to the LSA; • **Regional (R):** effect extends beyond the LSA but within the RSA; and • **Beyond regional (BR):** effect extends beyond the RSA.
Geographical Extent (Socio-Economic)	How far is the residual effect anticipated to extend and why? Identify whether the effect occurs at the individual, household, community, regional, or beyond regional scale, for example: • **Individual/ household (I)**: effect is limited to individuals, families and/or households. • **Community (C):** effect extends to the community level. • **Regional/Aboriginal peoples (RA)**: effect extends across the broader regional community/ economy, or across one or more Aboriginal Group(s)' traditional or Treaty territories. • **Beyond regional (BR)**: effect extends beyond the regional scale, and may extend across or beyond the province.
Duration	How long is the residual effect anticipated to last and why? Identify whether the effect will be short, medium, or long-term, or if it will continue into the far future, for example: • **Short term (ST):** effect lasts less than 18 months (during the Construction Phase of the Project). • **Long- term (LT):** effect lasts greater than 18 months and less than 22 years (encompassing Operation, Reclamation and Closure, and Post-Closure Phases). • **Permanent (P)**: effect lasts more than 22 years.

Criteria	Characterization with VC/IC
Frequency	How often is the residual effect anticipated to occur and why? Will the effect be a one-time event, occur sporadically, be regular, or continuous, for example: • **One time (O)**: effect is confined to one discrete event. • **Sporadic (S)**: effect occurs rarely and at sporadic intervals. • **Regular (R)**: effect occurs on a regular basis. • **Continuous (C)**: effect occurs constantly.
Reversibility	To what degree is the residual effect reversible once the Project activity ceases to occur and why? Identify whether the effect is anticipated to be reversible, partially reversible, or permanent, for example: • **Reversible (R)**: effect can be reversed. • **Partially reversible (PR)**: effect can be partially reversed. • **Irreversible (I)**: effect cannot be reversed, is of permanent duration.
Context	How sensitive or resilient is the VC to the residual effect caused by the Project, given the context of existing conditions, cumulative effects, and trends in the condition of the VC? Identify whether the VC has high, neutral, or low context, for example: • **High (H)**: the receiving environment or population has a high natural resilience to imposed stresses and can respond and adapt to the effect. • **Neutral (N)**: the receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect. • **Low (L)**: the receiving environment or population has a low resilience to imposed stresses and will not easily adapt to the effect.

Source: Template adapted from Aurico (2016)

6.8 Likelihood

The Application/EIS assesses the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as ‘low’, ‘moderate’, or ‘high’ probability, are provided.

Likelihood of residual effects refers to the probability of the predicted residual effect occurring. The likelihood of residual effects occurring is discussed after the residual effects characterization and is assessed prior to the determination of significance. This method follows EAO guidance (EAO 2013) which differs from the recommended Agency (1994) approach to evaluate likelihood following the determination of significance. While this Application/EIS follows the most recent guidance from EAO (2013), likelihood has not been considered in the determination of significance in order to satisfy both provincial and federal approaches. Significance was therefore assessed for all residual effects with the assumption that the residual effects would occur and does not assume a lower level of significance based on a low probability of occurrence. This approach is consistent with the Agency guidance (1994), providing an objective consideration of significance.

The Likelihood of a residual effect occurring is determined in each assessment per the attributes in Table 6.8-1. Descriptions and justifications for the likelihood assessment are provided along with the valuation of these attributes in each VC chapter.

Table 6.8-1: Attributes of Likelihood

Likelihood Rating	Quantitative Threshold[1]
High	> P80 (effect has > 80% chance of effect occurring)
Moderate	P40 - P80 (effect has 40-80% chance of effect occurring)
Low	< P40 (effect has < 40% chance of effect occurring)

Source: Likelihood ratings and thresholds obtained from Aurico (2016).
[1]These definitions will be changed to qualitative descriptors for socio-economic VCs.

6.9 Proponent's Determination of Significance

The conclusion of significance of each Project residual effect is included for each VC. The approach to significance determination includes a comparison of the current state of the VC as if the Project does not proceed, with the predicted state of the VC if the Project proceeds. The significance determination considers the residual effects, i.e., once mitigation measures described in Section 6.6 are applied.

The significance determination for each residual effect relies on the Application/EIS residual effects assessment (as per Section 6.7), which is based on detailed information including quantitative analysis, statistical analysis, and/or predictive model results. The characterization criteria thresholds and ratings are considered when determining the significance of residual effects.

Magnitude, context, geographic extent, and duration are the primary criteria used to determine significance. For example, determining the magnitude of an effect from changes in habitat availability and connectivity on a fish or wildlife VC depends on the current resilience (context), spatial extent (e.g., amount of area or proportion of the population), and duration of the changes in habitat (e.g., how long the population is adversely affected).

Duration includes consideration of reversibility; a reversible effect does not result in a permanent adverse effect and therefore may be considered to be of lower magnitude. The duration of residual effects to VCs with high resilience (ability to recover from disturbance) would be expected to be shorter relative to VCs with lower resilience to disturbance.

Frequency and likelihood are considered as modifiers when determining significance, where applicable. For example, the magnitude of the effect from wildlife mortality due to collisions with vehicles will depend partially on how often animal-vehicle collisions occur over the life of the Project. For some effects, such as the physical loss of habitat from the Project footprint, the likelihood is high and has little influence on the significance of effects (i.e., the decline in habitat is certain and significance depends on the amount of change over space and time).

Likelihood is not used to determine significance (Section 6.8). The significance of an effect is not altered by the likelihood of it occurring. As much as possible, residual adverse effects will be characterized and significance determined using established guidelines, thresholds, screening values, resource management plans, and scientific principles. The evaluation will be complemented by the environmental assessment practitioners' experience and understanding of the VC, as well as input received from the members of the Working Group.

Residual effects will be determined as being significant or not significant. Justifications will be provided and will be based on combinations of residual effect criteria ratings as outlined in each effects assessment chapter, based on best professional judgment.

Where available and possible, threshold criteria or management standards (e.g., government or industry regulations and objectives, standards, scientific literature, etc.) have been used to determine significance. Combinations of criteria that best fit the needs of each residual effects assessment have been also been considered to determine significance where appropriate. Each assessment chapter clearly defines how the significance determination is defined specific to the VC and provides a detailed rationale for the significance determination. Significance will not be determined for ICs; the results of an IC's effects assessment will be referred to relevant VCs to facilitate its respective evaluation of significance.

6.10 Confidence and Risk

Confidence is a measure of how well residual effects are understood and the quality of the input data. It considers the level of uncertainty associated with the residual effects assessment, including the significance determination.

Studies that support each effects assessment will use quantitative methods (e.g., sensitivity analyses) or qualitative discussions to assess prediction confidence to the extent reasonable. Assumptions for statistical tests, as well as details on models used as part of the Application, will be discussed within applicable disciplines. Where appropriate, uncertainty may also be addressed by additional mitigation, as required, or through monitoring programs designed to verify the effects predictions and/or the effectiveness of mitigation.

In summary, the following are considered in the determination of confidence in the residual effects assessment for each VC:

- Reliability of data inputs and analytical methods used to predict Project effects;
- Confidence regarding the effectiveness of mitigation measures; and
- Certainty of the predicted outcome.

The results of the prediction confidence allow the decision-maker to evaluate risk associated with the Project. Confidence definitions are defined as High, Moderate, and Low (Table 6.10-1) and may be adjusted in some VC assessment chapters where quantitative data and methods are available to derive reliability of predictions. Where effects are not well understood due to scientific uncertainty or because of the use of unproven mitigation technology, it may be necessary to conduct risk analyses, in which case the Application/EIS will summarize the process and methodology used.

Table 6.10-1: Confidence Ratings and Definitions

Confidence Rating	Quantitative Threshold
High	There is a good understanding of the cause-effect relationship between the Project and a VC, and all necessary data are available to support the assessment. The effectiveness of the selected mitigation measures is moderate to high. There is a low degree of uncertainty associated with data inputs and/or modeling techniques and variation from the predicted effect is expected to be low. Given the above, there is high confidence in the conclusions of the assessment.
Moderate	The cause-effect relationships between the Project and a VC are not fully understood (e.g., there are several unknown external variables or data for the Project area are incomplete). The effectiveness of mitigation measures may be moderate or high. Modeling predictions are relatively confident. Based on the above, there is a moderate confidence in the assessment conclusions
Low	Cause-effect relationships between the Project and a VC are poorly understood. There may be several unknown external variables and/or data for the Project area is incomplete. The effectiveness of the mitigation measures may not yet be proven. Modeling results may vary considerably given the data inputs. There is a high degree of uncertainty in the conclusions of the assessment.

Source: Thresholds obtained from Aurico (2016).

6.11 Summary of Residual Effects Assessment

Residual effects, the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence evaluations are summarized in each effects assessment chapter, using the example layout shown in Table 6.11-1.

Table 6.11-1: Summary of the Residual Effects Assessment for <Subject Area / VC / IC>

Residual Effect	Valued Components / Intermediate Components	Project Phase(s)	Mitigation Measures	Summary of Residual Effects Characterization Criteria *(context, magnitude, geographic extent, duration, frequency, reversibility)*	Likelihood *(High, Moderate, Low)*	Significance *(Significant, Not Significant)*	Confidence *(High, Moderate, Low)*

6.12 Cumulative Effects Assessment

Cumulative effects are the result of Project residual effects interacting with residual effects of other physical activities (i.e., anthropogenic developments, projects, or activities) that have been or will be carried out (Agency 2014a). The cumulative effects methodology follows guidance documents and standards:

- Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012*, Operational Policy Statement (Agency 2015a);
- Practitioners Glossary for the Environmental Assessment of Designated Projects under the Canadian Environmental Assessment Act, 2012 (Agency 2015b);
- Draft Technical Guidance for Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act, 2012* (Agency, 2014);
- Reference Guide: Addressing Cumulative Environmental Effects (Agency 1994); and
- Guidelines for the Selection of Valued Components and Assessment of Potential Effects. British Columbia Environmental Assessment Office: Victoria, BC. (EAO 2013).

For most VCs and ICs, where negligible potential adverse residual effects were identified, the residual effect was not carried forward for assessment of cumulative effects. For some VCs (e.g., Hydrology), the Qualified Professional (QP) conducting the assessment may have determined that negligible residual effects were important to carry forward into the cumulative effects assessment. Whether or not to carry forward negligible residual effects was left up to the judgement of the QP conducting the assessment.

6.12.1 Cumulative Effects Assessment Boundaries

The cumulative effects assessment boundaries are defined as the maximum spatial and temporal scales over which there is a potential for residual Project effects to interact with the residual effects of other past, present, and reasonably foreseeable future projects and activities.

6.12.1.1 Spatial Boundaries

The cumulative effects assessment spatial boundary for each VC and IC is dependent on the residual effects identified for each identified VC or IC. These boundaries are defined in each assessment chapter with spatial extent provided in maps.

6.12.1.2 Temporal Boundaries

Temporal boundaries considered in each cumulative effects assessment include:

1. Past: 1988 to 2014;

2. Present: 2014 to 2017, from the start of the Red Mountain Underground Gold Project's detailed baseline studies to the completion of the effects assessment; and

3. Reasonably Foreseeable Future: stated in each effects assessment chapter and varying according to the time estimated for VCs and ICs to recover to baseline conditions (taking into account natural cycles of ecosystem change). In general, the proposed cut-off date for incorporating any new future developments in the cumulative effects assessment in the Application/EIS is 2029. This represents the final anticipated year of the mine life after the Reclamation and Closure Phase is complete.

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

The list of past, present, and reasonably foreseeable projects and/or activities for consideration in the cumulative effects assessment was compiled from a variety of information sources, including municipal, regional, provincial, and federal government agencies and company websites.

For identified cumulative effects, the following development categories will be considered in the Application/EIS:

1. Certain (past and present): Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project; and

2. Reasonably foreseeable: Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project.

A list of past, present, and reasonably foreseeable projects and activities is provided below in Table 6.12-1 and is shown on Figure 6.12-1, Figure 6.12-2, and Figure 6.12-3. This list has been tailored for each discipline-specific cumulative effects assessment in the assessment report chapters. For many VCs and ICs, a much shorter list of projects and activities is considered for the cumulative effects assessment; this is dependent upon the VC- or IC-specific residual effects and associated spatial and temporal boundaries. A description of each project considered for the cumulative effects assessment is provided immediately following Table 6.12-1.

Table 6.12-1: List of Projects and Activities Included in the Cumulative Effects Assessment

Project/Activity	Temporal	Project Life	Location	Proponent
Eskay Creek Copper-Gold Mine	Past (Certain)	Complete (2008)	70 km north of Stewart	Barrick Gold Corporation
Snip Mine	Past (Certain)	Complete (1999)	120 km northwest of Stewart	Barrick Gold Corporation

Project/Activity	Temporal	Project Life	Location	Proponent
Johnny Mountain Mine	Past (Certain)	Complete (1993)	110 km northwest of Stewart	Skyline Gold Corp.
Silbak Premier Mine	Past (Certain)	Complete (1996)	11 km north of Stewart	Westmin Resources
Forrest Kerr Hydroelectric Project	Present (Certain)	Currently Operating	Bell ll	AltaGas Ltd.
Kitimat Smelter Modernization Project	Present (Certain)	Currently Operating	Kitimat	Rio Tinto
Long Lake Hydroelectric Project	Present (Certain)	Currently Operating	25km east of Stewart	Long Lake Hydro Inc.
McLymont Creek Hydroelectric Project	Present (Certain)	Currently Operating	100 km northwest of Stewart	AltaGas Ltd.
Northwest Transmission Line	Present (Certain)	Currently Operating	Between Skeena Substation (near Terrace) and a new substation to be built near Bob Quinn Lake	BC Hydro
Red Chris Mine Project	Present (Certain)	Currently Operating	18 km southeast of Iskut	Imperial Metals
Stewart Bulk Terminals	Present (Certain)	Currently Operating	Stewart	Stewart Bulk Terminals Ltd.
Stewart World Port	Present (Certain)	Currently Operating	Stewart	Stewart World Port
Volcano Creek Hydroelectric Project	Present (Certain)	Currently Operating	100 km northwest of Stewart	AltaGas Ltd.
Brucejack Gold Project	Present (Certain)	Under Construction	65 km north of Stewart	Pretium Resources Inc.
Bitter Creek Hydro Project	Reasonably Foreseeable Future	Proposed	15 km northeast of Stewart	Bridge Power
Coastal GasLink Pipeline Project	Reasonably Foreseeable Future	Proposed	Groundbirch to Kitimat	Coastal GasLink Pipeline Ltd.

Project/Activity	Temporal	Project Life	Location	Proponent
Galore Creek Copper-Gold Project	Reasonably Foreseeable Future	Proposed	150 km northwest of Stewart	Novagold/Teck
Kinskuch Hydro Project	Reasonably Foreseeable Future	Proposed	28 km Northeast of Alice Arm	Syntaris Power Corporation
Kitimat LNG	Reasonably Foreseeable Future	Proposed	Kitimat	Chevron Canada and Woodside Energy
Pacific Trails Pipeline	Reasonably Foreseeable Future	Proposed	Kitimat	Chevron Canada and Woodside Energy
Kitsault Mine Project	Reasonably Foreseeable Future	Proposed	Alice Arm	Alloycorp Mining Inc.
Kerr Sulphurets Mitchell (KSM) Project	Reasonably Foreseeable Future	Proposed	65 km northwest of Stewart	Seabridge Gold
Prince Rupert Gas Transmission Project	Reasonably Foreseeable Future	Proposed	Hudson's Hope to Prince Rupert	TransCanada
Swamp Point Aggregate Mine Project	Reasonably Foreseeable Future	Proposed	50 km south of Stewart	Ascot Resources Inc.
Westcoast Connector Gas Transmission Project	Reasonably Foreseeable Future	Proposed	Cypress, BC to Prince Rupert	Spectra Energy
Pacific Future Energy Refinery	Reasonably Foreseeable Future	Proposed	210 km southeast of Stewart	Pacific Future Energy Corporation
Kitimat Clean Refinery	Reasonably Foreseeable Future	Proposed	230 km southeast of Stewart	Kitimat Clean Ltd.
Pacific Northern Gas Looping	Reasonably Foreseeable Future	Proposed	Summit Lake to Kitimat (BC)	Pacific Northern Gas Ltd.
Terminal A Extension Project	Reasonably Foreseeable Future	Proposed	Kitimat	Rio Tinto Alcan
More Creek Hydroelectric Project	Reasonably Foreseeable Future	Proposed	130 km north of Stewart	Alaska Hydro Corporation

Project/Activity	Temporal	Project Life	Location	Proponent
LNG Canada Export Terminal Project	Reasonably Foreseeable Future	Proposed	Kitimat	Shell Canada Ltd., Korea Gas Corporation (KOGAS), Mitsubishi Corporation and PetroChina Company Limited
Aurora LNG Digby Island Project	Reasonably Foreseeable Future	Proposed	180 km south (southwest) of Stewart	Nexen Energy ULC
Pacific Northwest LNG Project	Reasonably Foreseeable Future	Proposed	195 km south (southwest) of Stewart	Pacific Northwest LNG Limited Partnership
WCC LNG Project	Reasonably Foreseeable Future	Proposed	175 km south (southwest)	WCC LNG Project Ltd.
Agriculture	Present (Certain)	Ongoing	Regional	Various
Commercial recreations	Present (Certain)	Ongoing	Regional	Various
Fishing	Present (Certain)	Ongoing	Regional	Various
Forestry	Present (Certain)	Ongoing	Regional	Various
Guide outfitting	Present (Certain)	Ongoing	Regional	Various
Mineral exploration	Present (Certain)	Ongoing	Regional	Various
Transportation	Present (Certain)	Ongoing	Regional	Various
Trapping	Present (Certain)	Ongoing	Regional	Various

The following projects were considered but not included for reasons outlined below:

- Granduc Mine is not included given there is no temporal overlap (closed in 1984);
- Nisga'a Nation LNG is not included because it has not entered into the provincial EA process;
- Crab / Europa Hydroelectric Development is not included because although it is in the BCEAA pre-application stage as of 2007, there has been no advancement of the EA since 2008 and the project status is unknown;

- Bear River Gravel is not included because as of July 2016, it is withdrawn from the EA process and is no longer a reasonably foreseeable future project;

Aurora LNG, Pacific Northwest LNG, and WCC LNG Project footprints fall outside of the Red Mountain Project RSAs, but will likely have effects to economic and social VCs within the Projects social RAA, therefore, they are considered for the cumulative effects.

This list above (Table 6.12-1) is slightly different than the one proposed in the AIR.

The following projects have been added since the list was compiled for the AIR:

- Pacific Trails Pipeline;
- Kitsault Mine Project;
- Kitimat Clean Refinery;
- Pacific Northern Gas Looping;
- Terminal A Extension Project;
- More Creek Hydroelectric Project;
- Pacific Northwest LNG Project; and
- WCC LNG Project.

The following projects were included in the list of projects to be considered for the cumulative effects assessment in the AIR but are not included here for the reasons stated below:

- Granduc Mine, for the reason stated above;
- Stewart Energy LNG, as it has not entered the provincial EA process;
- Tulsequah Chief Mine due to lack of development progress;
- Arctos Anthracite Project due to lack of development progress;
- Morrison Copper-Gold Project due to lack of development progress; and
- Northern Gateway due to lack of development progress.

Figure 6.12-1: Past, Present, and Reasonably Future Projects with Potential for Cumulative Effect

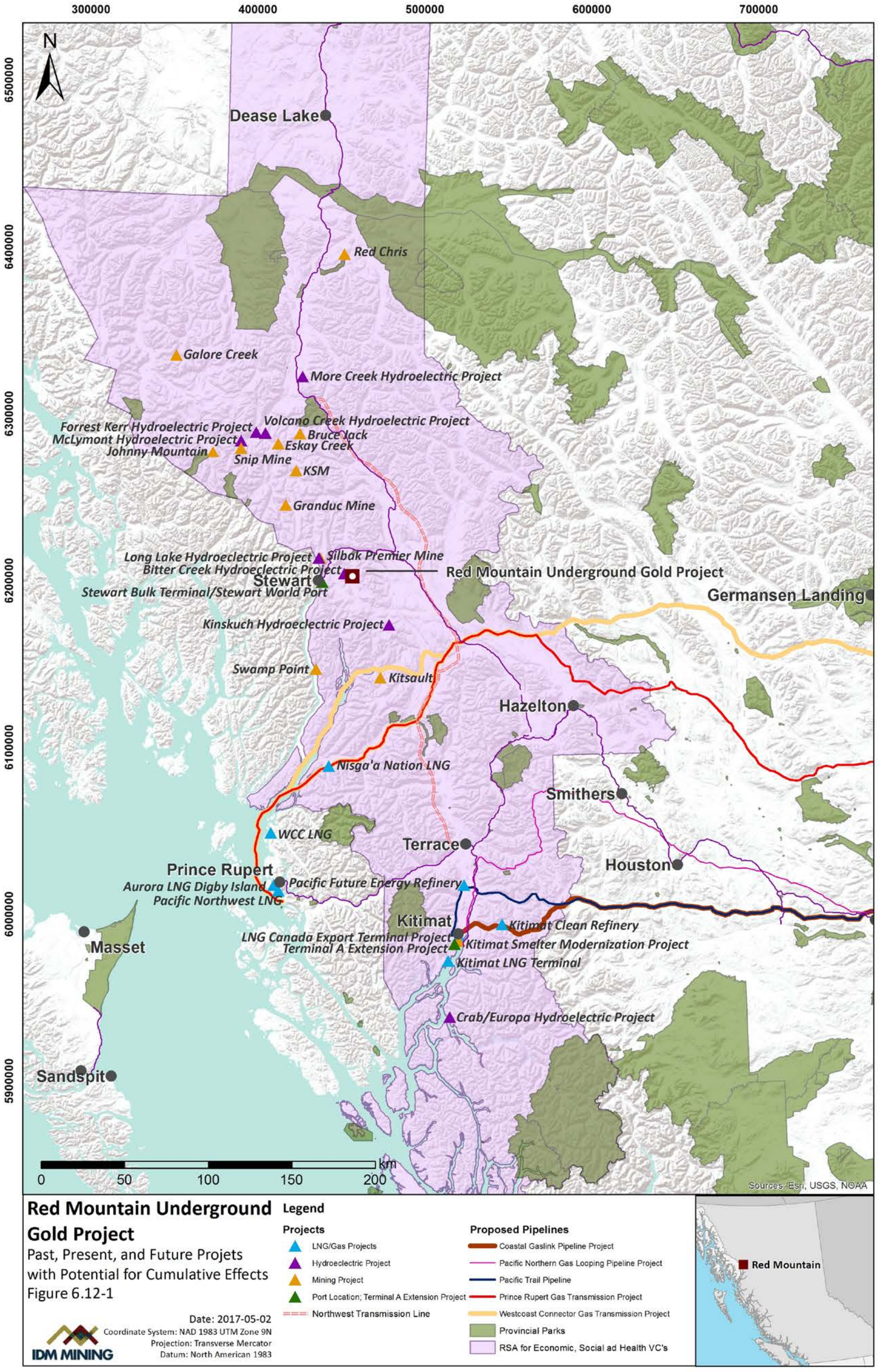


Figure 6.12-2: Past, Present, and Reasonably Future Activities with Potential for Cumulative Effects

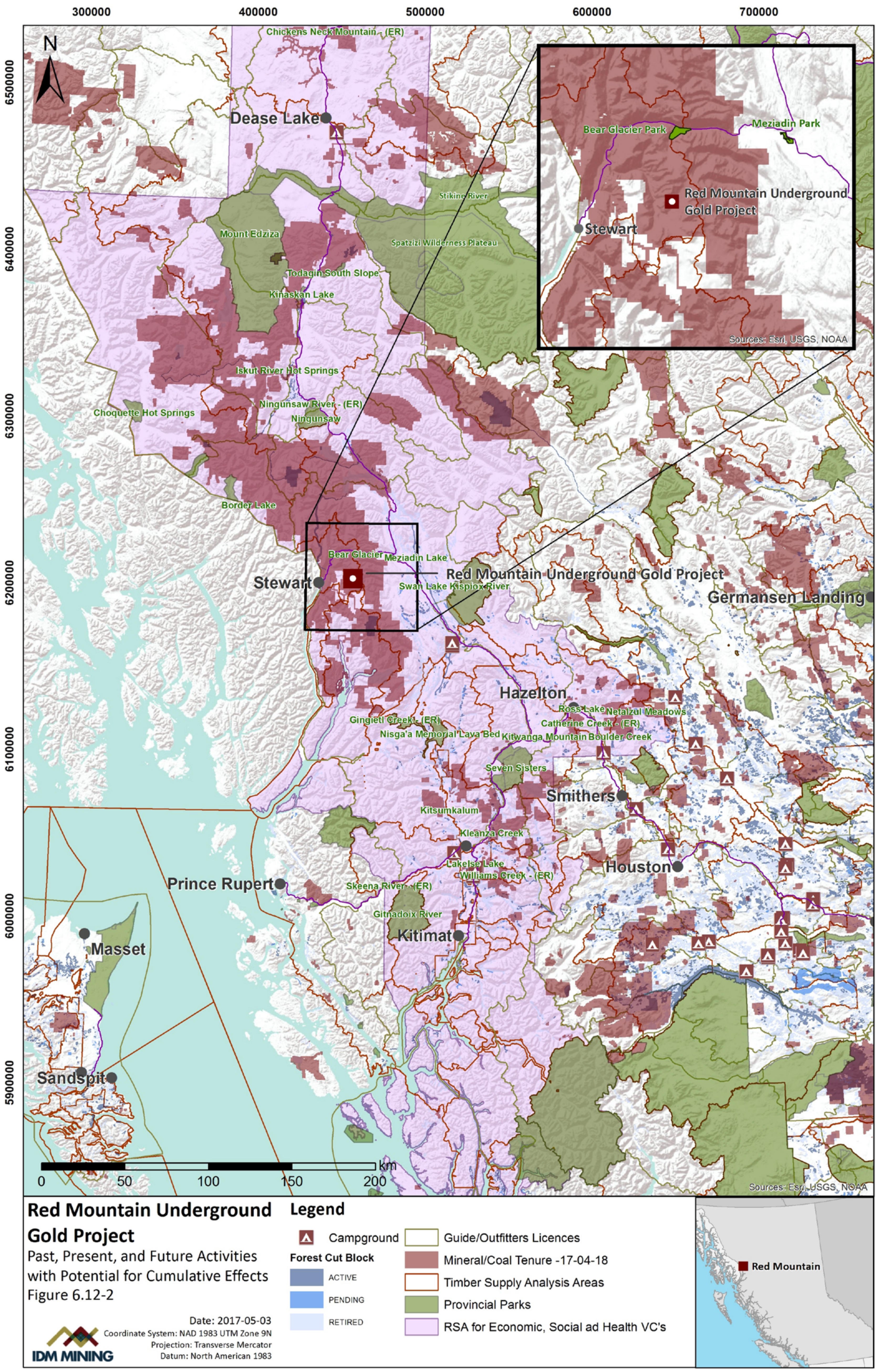
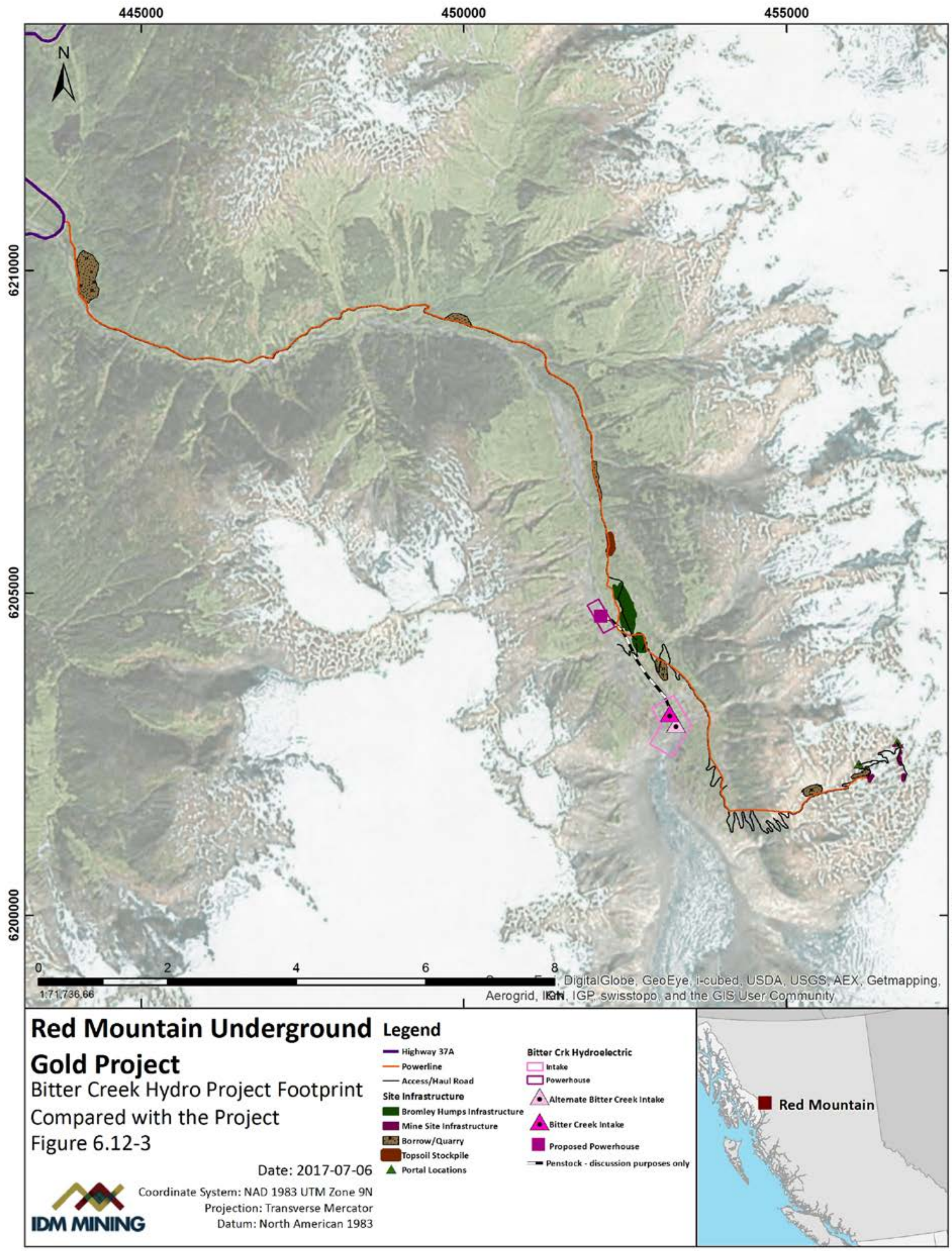


Figure 6.12-3: Bitter Creek Hydro Project Footprint Compared to the Project



6.12.2.1 Past and Current Projects

6.12.2.1.1 Eskay Creek Copper-Gold Mine

Eskay Creek Copper-Gold Mine was an underground gold-silver mine located 70 km north of Stewart, BC, operated by Barrick Gold Corporation for 14 years, from 1994 to 2008 (Eskay Mining Corp. 2017). Production rate was approximately 750 tonnes per day (tpd), yielding 320,784 ounces of gold and 15.5 million ounces of silver annually. Approximately 27 ha were cleared at the mine site (McGurk, Laudry, and MacGillvray 2005; Barrick. 2014). The mine restoration and monitoring of the site is ongoing. At full capacity, the mine directly employed 350 people (Mineral Resources Education Program of BC 2009 *in* Rescan 2014).

6.12.2.1.2 Snip Mine

Snip Mine was an underground gold-silver-copper mine located 120 km northwest of Stewart operated by Barrick Gold Corporation from 1991 and 1999 (8 years). Total production of ore was approximately 1.2 million tonnes (Mt; BC MEM 2015). The footprint consisted of underground workings, mill, tailings facility, and ancillary facilities. Information of the clearing area is not publically available. The mine was closed and reclaimed in 1999, but the property still offers exploration potential. On average, 122 people were employed by the mine (BC MEMPR 1993).

6.12.2.1.3 Johnny Mountain Mine

Johnny Mountain Mine was an underground gold mine operated by Skyline Gold Corporation from 1988 to 1990, and again in 1993 for 2 months. It is located 110 km northwest of Stewart, adjacent to the Snip Mine, and accessed by the Johnny Mountain airstrip or Bronson airstrip (located at the closed and reclaimed Snip Mine). Total production was approximately 196,850 tonnes. The property still offers exploration potential. The mine employed approximately 155 people (BC MEMPR 1989 *in* Rescan 2014).

6.12.2.1.4 Silbak Premier Mine

Silbak Premier Mine was an open pit and underground gold and silver mine operated by several operators from 1918 to 1953 (BC MEM 2013). It is located 11 km north of Stewart. Total production was approximately 4.7 Mt of ore in that time. From 1953 to 1996, the mine was in operation intermittently and produced approximately 26,000 tonnes of ore (Rescan 2014). Westmin Resources Ltd. was the last to operate the mine between 1989 and 1996 at a production rate of 550 tpd. A technical report and resource estimate for the property released in March 2013 by Ascot Resources Ltd. indicates future redevelopment of this project is possible (Rescan 2014). No information on employment is publicly available.

6.12.2.1.5 Forrest Kerr Hydroelectric Project

The Forrest Kerr Hydroelectric Project, located at Bell II, BC, is a run-of-river hydroelectric power facility owned by Atlagas Ltd. with a production capacity of 195 megawatts (MW; Northern Development Initiative Trust 2017). Construction occurred between 2011 and 2014, with operations beginning in late 2014, and with an anticipated project life of 60 years. Approximately 29 ha of land was cleared, accommodating a diversion weir, intake structure, desanding facility, power tunnel, underground powerhouse, and tailrace tunnel. Infrastructure includes a plant site, an 8 km access road, and approximately 40 km of a 287 kilovolt (kV) transmission line with a 68 m right of way clearing width that connects the underground powerhouse to Bob Quinn Lake substation, feeding into the Northwest transmission line. This project is one of three hydro plants built on the Iskut River. The project has the ability to act as an energy source for local development. The communities in the vicinity of this project that would likely benefit from this and other projects include Iskut, Dease Lake, Telegraph Creek, Smithers, and Terrace. In addition to providing jobs to local individuals and contractors, the project will create opportunities for local providers of goods and services during construction and ongoing operations. No further employment information is available.

6.12.2.1.6 Kitimat Smelter Modernization Project

The Kitimat Smelter Modernization Project modernized aluminum smelter is located in Kitimat, BC, and began operating in mid-2015 (District of Kitimat 2016). The modernization increased the smelter's production capacity by 48% to approximately 420,000 tonnes of aluminum ingot per year. Operation is estimated to run for the next 50 to 60 years. Construction labour at peak was in fall 2014 and was approximately 3,400 people, while approximately 1,000 people are employed during operations.

6.12.2.1.7 Long Lake Hydroelectric Project

The Long Lake Hydroelectric Project is a run-of-river hydroelectric power facility located approximately 17 km north of Stewart on Cascade Creek. It is owned and operated by Long Lake Joint Venture. Construction began July 2010, operations commenced in December 2013, and the anticipated project life is 80 years. The generation site includes a 20 m high rockfill dam, 7.2 km long penstock, powerhouse, tailrace, and a 10-km 138 kV transmission line that connects to BC Hydro's 138 kv line and runs into Stewart. Production capacity of the hydroelectric project is 31 MW (Agency 2012). The project employed up to 160 people during construction (NDIT 2012 *in* Rescan 2014). The project was predicted to create one or two full time jobs during operation.

6.12.2.1.8 McLymont Creek Hydroelectric Project

The McLymont Creek Hydroelectric Project is a run-of-river hydroelectric power facility located approximately 100 km northwest of Stewart (EAO 2012). It is owned and operated by AltaGas Ltd. Construction occurred between 2012 and 2015, with operations beginning in late 2015, and the anticipated project life is 60 years. The project includes two new access roads, 9.5 km and 6.2 km long, a diversion weir, a power tunnel, a powerhouse, and a 10 km, 69 kV transmission line connecting the generation site to the Forrest Kerr switchyard. Production capacity is 66 MW and it is one of three hydro plants built on the Iskut River. During the approximately three-year construction period, employment was predicted to average between 350 and 400 person years of direct employment, creating approximately 105 to 120 positions per annum. Indirect and induced employment is estimated at 630 and 260 jobs, respectively (EAO 2012). Operational employment was predicted to be two to four permanent jobs. Additional short-term positions would also be needed during specific site maintenance programs, for annual powerline maintenance clearing, and up to four office staff that would support the proposed Project on a part-time basis. The estimates decommissioning was approximately one-third that of the construction.

6.12.2.1.9 Northwest Transmission Line

The Northwest Transmission Line is a 344 km, 287 kV transmission line following the Highway 37 corridor, running from the Skeena substation near Terrace to the new substation near Bob Quinn Lake. The predicted lifespan is a minimum 50 years. Vegetation was cleared from the transmission line right-of-way to a total width of approximately 38 m. Construction of the line occurred between 2012 and 2014, and the project became operational mid-2014. During the three-year construction period, the project would generate approximately 860 person-years (or full time equivalent) of direct employment (EAO 2011). Total number of jobs is estimated at 550 direct suppliers, 260 indirect suppliers, and 670 induced jobs. During operations, employment estimate is 87 person-days per year. This estimate is based on operations and maintenance required for other BC Hydro transmission lines.

6.12.2.1.10 Red Chris Mine Project

The Red Chris Mine is an open pit copper and gold mine located 18 km southeast of Iskut, BC, and operated by Imperial Metals. Total production in 2016 was nearly 84 million pounds of copper, 47,088 ounces of gold, and 190,624 ounces of silver (Imperial Metals 2017). The exploration access road construction was completed in 2008, construction of the mine began mid-2012, was completed in late 2014, and commercial production achieved mid-2015. The mine life is 28 years. The mine footprint consists of two open pits, processing plant, waste rock dump, low grade ore stockpiles, tailings impoundment, runoff collection system, mine effluent treatment plant, a 23 km access road, and a parallel Powerline from Highway 37 to the mine site. The current workforce is approximately 350 workers (Rescan 2014; EAO 2005)

6.12.2.1.11 Stewart Bulk Terminals

The Stewart Bulk Terminals is an expansion project of an operating bulk storage and loading marine terminal located near the Salmon River delta at Stewart to provide the ability to load/unload containers and bulk cargo. It is owned by Stewart Bulk Terminals Ltd. A new wharf and a structure would provide servicing barges at all stages of the tide. The project includes a sheet pile, fill wharf and rip rap slope construction, dredging activities, modifications to the Stewart-Hyder road, traffic management on the Stewart-Hyder road, vessel management, and associated gravel extraction and rock quarrying activities. It is undetermined about employment and size of operation. The original terminal was 2 ha and, in 2002, the project received an environmental assessment certificate. The project would employ 74 human-years of total employment, including direct, indirect, and induced employment (EAO 2002).

6.12.2.1.12 Stewart World Port

The Stewart World Port is an upgrade project of dock lands and a bulk export log handling facility owned by Stewart World Port. The multipurpose port facility is located at the end of the Portland Canal, 2 km south of Stewart, BC (District of Stewart 2017). It is complete and became operational in 2015. It included a refurbishment of the existing dock and recreational boat launch, addition of a barge ramp, construction of a two boat loading dock, and a port handling facilities, including concentrate sheds, conveying systems, and shiploader for outbound bulk cargo. It is capable of receiving and shipping all manner of break bulk cargo. There is no publically available information on employment.

6.12.2.1.13 Volcano Creek Hydroelectric Project

The Volcano Creek Hydroelectric Project is run-of-river project located 100 km northwest of Stewart on a south bank tributary, Volcano Creek, which parallels the existing Eskay Creek Mine Road. It has a targeted output of 16 MW that will provide power to BC Hydro through the Forrest Kerr 287 kV transmission system to the BC Hydro Northwest Transmission Line substation at Bob Quinn (AltaGas Ltd. 2016; Rescan 2014). AltaGas Ltd. planned to commission the project in 2015 and states that the facility will generate enough power for approximately 4,000 homes (AltaGas Ltd. 2016). The project is estimated to produce 16 MW of energy. The project lifespan was not determined; however, Alta Gas signed a 60-year contract with BC Hydro. The footprint includes a 2.35-km penstock, powerhouse, weir and water intake facilities, 1.2-km 287-kV transmission line interconnection, and short spur roads. The project will be accessed from the Eskay Creek Mine Road via short spur roads. There is no publically available information found on employment.

6.12.2.1.14 Brucejack Gold Project

Pretium Resources Inc. has begun construction to develop the Brucejack Gold Mine Project, 65 km north of Stewart, as a 2,700 tpd underground gold/silver mine (Rescan 2014). It is located on provincial Crown land within the Regional District of Kitimat-Stikine and would be a minimum 16-year mine life. The proposed mine site footprint is approximately 10.5 ha. The Project components and physical activities include, but are not limited to, a mine portal, shafts, waste rock transfer pad, subaqueous disposal of waste rock and tailings, backfill of waste rock and tailings underground, transmission line, sewage treatment plant, incinerator, landfill, haul roads, etc. The underground operation will be based on conventional rubber-tired, diesel and electric powered mobile equipment, with loader mucking and truck haulage via a decline ramp system. Mining will be done using the long hole open stopping method with a combination of rock and paste backfill. The paste fill will be sourced from thickened flotation plant tailings, and the rock fill will be sourced from underground development muck. An existing 75 km exploration road west from Highway 37 will be upgraded and used to access the mine site and will be used year-round. The project will support an estimated 500 person-years of employment during construction and at least 4,800 person-years of employment during operations. Indirect employment opportunities will increase (Rescan 2014).

6.12.2.2 Reasonably Foreseeable Future Projects

6.12.2.2.1 Bitter Creek Hydro Project

The Bridge Power Hydro Developments Ltd. (Bridge Power) is seeking to obtain a long-term lease over the area that is currently identified under an Investigative License (Bridge Power 2016). The Project is located 15 km northeast of Stewart in the same vicinity as the Red

Mountain Underground Gold Project and with nearly the same footprint. The Bitter Creek Hydro Project was originally perceived as a 30 MW project, designed for an open bidding process with BC Hydro. In 2015, it was decided to progress the Project on a reduced scale as a 15 MW project as part of the BC Hydro Standing Offer Program. Assuming the Red Mountain Project proceeds, the Bitter Creek Hydro Project will include an additional generator to provide power for the Red Mountain Project, for up to 5 MW. The Bitter Creek Hydro Project is therefore a potential 20 MW project on a river that could cope with up to 30 MW of power production. Bridge Power expects to provide full-time and seasonal employment for up 70 person-years during the construction phase, which may be reduced if the Red Mountain Project begins construction before Bridge Power due to the overlap in construction area. During the 40-year operational phase, permanent and seasonal employment of up to 120 person-years is expected (Bridge Power 2016).

6.12.2.2.2 Coastal GasLink Pipeline Project

The Coastal Gaslink Pipeline Project Ltd. received an environmental assessment certificate in 2014 to construct and operate a 670 km long, 48 inch natural gas pipeline within an approximate 40 to 45 m wide right-of-way from the Groundbirch / Dawson Creek, BC, area to the Kitimat, BC, area. It would connect to the proposed LNG Canada export facility. The initial capacity would be 1.7 billion cubic feet per day (bcf/d) with the potential for expansion up to approximately 5 bcf/d. All major Oil and Gas Commission (OGC) permits were obtained by mid-2016, but the Project is currently on hold due to challenges of the current global energy market and its reliance on the LNG Canada Schedule.

Additional facilities to the pipeline include metering facilities, up to five compressor stations, temporary construction facilities, and may involve the construction and operation of a natural gas liquid injection facility and/or a hydrocarbon dew point control facility.

Construction would take approximately 3 years and the Project lifespan is anticipated to be a minimum of 30 years. Approximately 800 to 1,200 people would be employed during pipeline construction, 140 to 200 for the construction of the compressor station, and 16 people during operations (TransCanada 2014).

6.12.2.2.3 Galore Creek Copper-Gold Project

Galore Creek Copper-Gold Project is a proposed copper-gold-silver open pit mine that received an environmental assessment certificate in 2007, and construction on the access road from Highway 37 to the Calore Creek mill site began in mid-2007. The project halted later in 2007 after approximately 48 km of the road was built. The concentrate would be transported by truck to the Port of Stewart. The original mine life was estimated at 28 years, however, the most recent prefeasibility study has redesigned the project and increased the capacity to 95,000 tpd, or 34.6 million tonnes per annum(mpta) over 18 years (AMEC 2011). It is assumed that the project would not begin construction until 2020. Approximately 13 million direct and indirect person hours were projected to be associated with construction. Personnel requirements on the Project will peak at 1,800 people, including Galore Creek site, Smithers, and Stewart, based on total person hours, including direct and indirect person hours (AMEC 2011).

6.12.2.2.4 Kinskuch Hydro Project

The Kinskuch Hydro Project is a proposed 50 to 80 MW hydroelectric project located in the headwaters of the Kinskuch River system, approximately 28 km Northeast of Alice Arm and 150 km north of Terrace. The preliminary configuration includes a dam at the outlet of Kinskuch Lake and an intake structure near the outlet of Kinskuch Lake. The dam will create approximately 10 m of additional lake storage and the intake will enable a portion of the stored water to be diverted to a powerhouse located on Kinskuch River via an approximately 10 km water conveyance system consisting of a tunnel/penstock arrangement. Infrastructure will include a power transmission via a 60 km, 138 kV transmission line tying into BC Hydro’s Aiyansh substation. The targeted construction is to commence mid-2019 and will take 3 years to complete, with commercials operations to start in the fall of 2022. The lifetime of the project is expected to be at least 50 years. The project will provide approximately 400 person-years of local employment during the planning, assessment, and design phases (Rescan 2014). During construction, the project will employ approximately 120 persons for about three years and during operations approximately six permanent jobs will be created.

6.12.2.2.5 Kitimat LNG

The Kitimat LNG project is a proposed liquefaction facility located at Bish Cove near Kitimat, BC, that will cool natural gas into a liquid, ready for shipping overseas (Chevron Canada 2017). It depends on the development of a natural gas resource found in the Liard and Horn River Basins located in northeastern BC, which would then be transported as gas across northern BC via a third party, the Pacific Trail Pipeline (PTP), to the Kitimat LNG liquefaction facility. The project has a 20-year, 10 million tones annual export license from the National Energy Board and has obtained the major provincial and federal environmental assessment certificates. The initial capacity is to produce 700 million cubic feet of liquefied natural gas (LNG) per day or five mtpa. Chevron Canada Ltd. and Woodside Energy International (Canada) Ltd. own equal shares, and the project is subject to a final investment decision. Site preparation and other early works are ongoing, along with construction of temporary worker accommodation on the site of the former Eurocan Pulp & Paper Mill. It is estimated that the project would employ 3,000 to 5,000 jobs during construction and 100 to 200 permanent jobs upon completion.

6.12.2.2.6 Pacific Trails Pipeline

The Pacific Trails Pipeline (PTP) is a proposed 42", 48 km pipeline to supply gas from Summit Lake, BC (north of Prince George) to Kitimat LNG for export (Chevron Canada 2017). PTP is expected to move one bcf/d of natural gas. Provincial and federal environmental approvals were granted in 2008 and 2009, respectively, and the Front End Engineering and Design Study was undertaken in 2010. Chevron Canada Ltd. and Woodside Energy International (Canada) Ltd. own equal shares, and the project is subject to a final investment decision in conjunction with the Kitimat LNG Project. The First Nations Limited Partnership for the PTP project ensures all 16 First Nations whose traditional territory is located along the pipeline route will receive immediate and long-term benefits from the project. At the peak of construction, it is expected that more than 1,500 people will be employed (Chevron Canada 2017).

6.12.2.2.7 Kitsault Mine Project

The re-opening of the Kitsault molybdenum mine, which is located at the head of Alice Arm, BC, is proposed at a projected production rate of 40,000 to 50,000 tpd over a 15 to 16 year mine life. The environmental assessment certificate was granted in 2013 and all permits were obtained by end of 2014 (Avanti Mining Inc. 2012 *in* Rescan 2014). The project is owned by Alloycorp Mining Inc. (formerly Avanti Kitsault Mining Inc.). A camp was set up at the mine site in 2014, but lower metal prices and the inability to secure financing resulted in the project being put on hold. It is assumed for the Project assessment, that construction will begin 2018 and operations will commence in 2020. The new project infrastructure will include the Kitsault Pit, a conveyor material handling system, ore stockpile, process plant, camp accommodations, and a tailings management facility with an overall surface disturbance estimated at 664 ha. The molybdenum concentrates will be trucked to the Port of Vancouver. The proposed Project will employ up to 700 people during the construction phase, or an estimated 906 person years of direct employment plus 4,363 person years of supply contractor, indirect, and induced employment in BC (Avanti Mining Inc. 2012 *in* Rescan 2014, EAO 2013). During operations, the predicted employment is approximately 300 people in BC, plus 391 person years annually of supply contractor, indirect, and induced employment within BC. During decommissioning and closure (16 years), approximately 248 person years of employment would be required.

6.12.2.2.8 Kerr Sulphurets Mitchell Project

The Kerr Sulphurets Mitchell (KSM) project is a proposed open pit and underground copper, gold, and silver deposit located 65 km northwest of Stewart. It has an estimated production capacity of 130,000 tpd over the first 25 years of the 53-year mine life and 90,000 tpd for the remainder (Rescan 2012). Mine site infrastructure includes three large open pit mine and two underground block caves, ore processing facilities, a water treatment plant and water storage facility, rock storage facilities, diversion tunnels, access and mine roads, and a 23 km twinned tunnel for ore transport by conveyor. An additional 28.5 km, 287 kV transmission line extension will connect the Northwest Transmission Line to the mine site. Annual on-site employment is estimated at 1,100 people during construction and 930 people during operation (Rescan 2012).

6.12.2.2.9 Prince Rupert Gas Transmission Project

The Prince Rupert Gas Transmission Ltd., a subsidiary of TransCanada PipeLines Ltd., is proposing a 750 km, 48-inch diameter, sweet natural gas pipeline from the Hudson’s Hope, BC, area to the proposed Pacific NorthWest LNG export facility near Prince Rupert, BC, at Lelu Island. The project would have an initial capacity of approximately 2 bcf/d with the potential for expansion up to approximately 3.6 bcf/d (EAO 2014a). Additional infrastructure includes metering facilities, and up to six compressor stations, new access roads, bridges, stockpile sites, borrow sites, contractor yard, and construction camps. A 2 km wide conceptual corridor and two marine routing alternatives are being considered for the project. The right-of-way will be approximately 40 to 45 m wide for the majority of the pipeline. There may be more than 2 ha of foreshore disturbed by the pipeline shore crossings and the methods that will be used for the pipe to cross the land/sea interface have not been determined (TransCanada 2013). Prince Rupert Gas Transmission Ltd. received its environmental assessment certificate in early 2014. The proponent is seeking an Amendment to their environmental assessment certificate, as of 2017. Construction activities were intended to begin in early 2015 with commissioning of the pipeline in late 2018 (TransCanada 2013, EAO 2014a). For the purposes of this assessment, it is assumed that the construction activities will begin in 2018.

The project is expected to operate for a minimum of 40 years (EAO 2014a). Approximately 4,400 to 5,500 person years of work will be generated during the construction phase and 30 to 40 permanent field positions will be created during the operations and maintenance phase (TransCanada 2013 *in* Rescan 2014).

6.12.2.2.10 Swamp Point Aggregate Mine Project

The Swamp Point Aggregate Mine Project is an open pit aggregate (sand and gravel) mine and ship-loading facility, located on the Portland Canal, 50 km south of Stewart proposed by Ascot Resources Inc. Construction initiated in late 2006 with the first shipment of aggregates in April 2007 (Rescan 2014). Construction of the ship loading facility was suspended in 2008 due to the economic downturn, and the mine site camp was closed in 2011. The expected project life was 18 years; however, the project never went into full production (3.3 mtpa of aggregate. The project was expected to create 20 to 50 direct, non-seasonal jobs (BC MOE 2006 *in* Rescan 2014).

6.12.2.2.11 Westcoast Connector Gas Transmission Project

Enbridge Inc. acquired the Westcoast Connector Gas Transmission Project through its merger with Spectra Energy Corp. The proposed project includes a natural gas pipeline system from the Cypress area in northeast BC to Prince Rupert area on the west coast. It consists of either one or two adjacent pipelines approximately 851 to 872 km in length and having a diameter of 36 to 48 inches. The footprint would include a 45 to 55 m right-of-way, two metering stations, up to five compressor stations, access roads, lay-down areas, various temporary construction workspaces, and other ancillary facilities (Spectra Energy Corp. 2012). The project received an environmental assessment certificate in November 2014. The construction would be staggered, with the start of construction of the first pipeline to be completed before 2019, and the construction of the second pipeline to occur between 2020 and 2023, with additional compressor station completed by 2026. It is estimated that approximately 2.4 bcf/d of natural gas would be transported (Spectra Energy Corp. 2012), with two adjacent pipelines, each capable of transporting up to 4.2 bcf/d natural gas (BC Oil and Gas Commission 2017). According to Spectra Energy Corp (2012), the proposed pipeline would have an indeterminate life. As of March 2017, OGC permitting process is underway with a “to be determined” start date. Construction would create 13,400 person-years of direct employment in BC and during an approximate 50 years of operations, 120 full-time jobs would be created (EAO 2014b).

6.12.2.2.12 Pacific Future Energy Refinery

The Pacific Future Energy Refinery is a proposed project to build and operate a bitumen-to-fuels refinery at Dubose Flats (halfway between Kitimat and Terrace, or 210 km southeast of Stewart; District of Kitimat 2016). Pacific Future Energy Corporation submitted the proposal for assessment to First Nations governments and federal and provincial regulators in early

2016. The project would receive near-solid neatbit bitumen by rail from western Canada and refine it into diesel, gasoline, and other products for export to world markets. Pacific Future Energy plans to power the refinery with clean-energy sources that include biomass wood-waste from the regional forest industry. The project will create an estimated 3,500 direct jobs in construction and 1,000 in operation. Construction could begin in 2018 and production in 2021 (SNC-Lavalin Inc. 2016).

6.12.2.2.13 Kitimat Clean Refinery

The Kitimat Clean Refinery project is a proposed refinery located 230 km southeast of Stewart. Kitimat Clean Ltd. submitted a proposal in 2012 to build a large oil refinery in the Kitimat Valley to process heavy crude oil delivered by rail. An environmental assessment is in progress; EAO issued an order under section 10 of the BCEAA in May 2016. The proposed refinery will process 550,000 barrels of diluted bitumen per day, producing 240,000 barrels per day of diesel, 100,000 barrels per day of gasoline, and 50,000 barrels per day of aviation fuel. Approximately 6,000 workers will be required during the construction phase and 3,000 permanent full time jobs upon completion (District of Kitimat 2016).

6.12.2.2.14 Pacific Northern Gas Looping Project

Pacific Northern Gas Ltd. is proposing to upgrade its gas transmission capacity by looping (or twinning) its existing natural gas pipeline between Summit Lake, BC and Kitimat (Pacific Northern Gas Ltd. 2013). The new pipeline will increase the overall capacity of the Pacific Northern Gas transmission system in order to meet the requirements of its existing customers and new small-scale LNG projects proposed for construction in Kitimat. It involves construction of approximately 525 km of new 24" pipe operating in parallel with the existing 10" pipeline. It would also include replacement of four existing compressor stations and would have an initial capacity of 600 million cubic feet per day. The project description was filed with the federal and provincial environmental assessment agencies in 2013. The project will generate approximately 1,800 to 2,400 direct person years of employment during construction. Operations employment is not publically available (Pacific Northern Gas Ltd. 2013).

6.12.2.2.15 Terminal A Extension Project

The proposed Terminal A Extension marine port facility project is located 5 km from the closest residential areas located in the town of Kitimat and 4 km from the Haisla Nation’s Kitamaat Village. Rio Tinto Alcan is the proponent and the project would consist of three main infrastructure components: a wharf (Terminal A extension; Berth C); a barge berth and tug dock; laydown area replacement facilities; and associated infrastructure to replace existing facilities for the import and export of bulk materials. The project footprint would be approximately 30 ha in total, including approximately 15.5 ha for dredging. During the proposed three-year construction period, the project would employ an average of 120 persons and a total of 360 person-years. Peak person-power usage is expected to occur during the winters. Much of the summer season work will be related to concrete placement and a variety of onshore activities. No additional employment for operations will be required because there are no changes for Rio Tinto Alcan operations, thus, employment values and demographics associated with operations are not pertinent to the project (Rio Tinto Alcan 2015)

6.12.2.2.16 More Creek Hydroelectric Project

Alaska Hydro Corporation proposes the More Creek Hydroelectric Project located 130 km north of Stewart with a capacity of 75 MW with an average annual energy output of 348 giggwatt (GW) per hour with reservoir storage (Sigma Engineering Ltd. 2016). The proposed reservoir storage would flood an area of approximately 2,104 ha, extending 20 km upstream from the project intake, and create a reservoir with a total surface area of 2,680 ha in the More Creek drainage area basin. The life of the project would be approximately 100 years. The maximum project water diversion from More Creek will be 80 cubic metres per second (m^3/s). The footprint of the project area for water power investigation is approximately 4,795 ha. The Project components and physical activities include access roads, dam, reservoir, and other facilities. The construction phase is estimated to take two years, over which time approximately 290 person years of employment are expected to be generated. The operation phase is anticipated to create 16 full-time jobs and periodic maintenance and clearing jobs will require additional jobs throughout the life of plant operations (Sigma Engineering Ltd. 2016).

6.12.2.2.17 LNG Canada Export Terminal Project

LNG Canada’s proposed LNG Canada Export Terminal Project is located in Kitimat. It would receive natural gas and would produce 26 mpta of LNG (LNG Canada 2014). A marine terminal will be constructed with a materials offloading area and will accommodate two LNG carriers up to 345 m long. Footprint clearing of vegetation is approximately 430 ha at full build-out and would include shipping operation activities between Kitimat Harbour and the pilot boarding location at or near Triple Island. Supporting infrastructure and facilities include power supply and handling, water supply and handling, waste collection and treatment, and temporary infrastructure and facilities. The project would rely on a pipeline currently proposed by Coastal GasLink Pipeline Ltd. to deliver gas to the Kitimat area. The project was anticipated to be constructed in two or three phases with completion of the first phase in 2019/2020 and subsequent phase(s) developed as market demand requires. However, the project’s final investment decision is on hold until markets allow it to proceed. Construction employment is anticipated to create 4,500 to 7,500 jobs, operation of the first phase would create approximately 200 to 300 jobs and 150 to 250 contractors, and at full build-out, the project would require approximately 250 to 450 staff and 200 to 350 contractors. The project lifespan is expected to operate for a minimum of 25 years (LNG Canada 2014).

6.12.2.2.18 Aurora LNG Digby Island Project

Nexen Energy ULC, for and on behalf of Aurora LNG, a joint venture between Nexen Energy ULC and INPEX Gas British Columbia Ltd. (IGBC) (Aurora LNG), is proposing to construct and operate the Aurora LNG Project, a LNG facility and marine terminal near Prince Rupert, BC (Stantec 2016). The proposed Project will convert natural gas from northeast BC into LNG for shipment by LNG carriers to markets in Asia where it will be regasified and distributed. It will consist of a natural gas receiving and LNG production facility that will process approximately 24 million metric tonnes per year of LNG at full build-out, at which point, the LNG facility will require approximately 104 million cubic metres per day (Mm^3/d) of natural gas. Of this amount, it is estimated that approximately 97 Mm^3/d of natural gas will be processed into LNG and 7 Mm^3/d of natural gas will be required for facility operation. At full build-out, there will be three LNG storage tanks at the LNG facility with storage capacity of up to 585,000 m^3. A marine terminal and LNG loading facility capable of accommodating up to two LNG carriers with a capacity up to 217,000 m^3. It will also consist of supporting infrastructure and facilities (e.g., laydown areas, soils storage area, and access roads). Construction is anticipated to take place between 2020 and 2025. Operations would be for a minimum 25 years and decommissioning would take 2 to 5 years. The project is estimated to directly and indirectly create approximately 670,000 person-years of employment. The project development area is 785 ha, including 12 ha marine infrastructure (Stantec 2016).

6.12.2.2.19 Pacific Northwest LNG Project

Pacific Northwest LNG Limited Partnership proposes to construct and operate an LNG export facility on Lelu Island at the Port of Prince Rupert, BC, 195 km south (southwest) of Stewart (Stantec 2014). The project would be developed in two phases and would include a marine terminal and liquefaction plant with three trains (production units) and a storage capacity of 540,000 m^3 with a production capacity of up to 18 mtpa of LNG. The footprint size on Lelu Island is approximately 160 ha (including a marine terminal). It is estimated to export up to 22.2 mtpa of LNG for 25 to 30 years. Project construction was initially planned to occur over five years, from 2015 through 2019, but construction has not yet begun. Approximately 4,000 workers would be required during the peak construction season and about 13,000 person years of direct labour, of which 95% would consist of onsite construction labour and the other 5% would consist of the project management team. Construction employment in the Pacific Northwest project's regional assessment area is estimated at 1,700 person years including direct, indirect, and induced employment. Operations would directly employ 464 people, 334 of which will be located in the project's regional assessment area. Including direct, indirect, and induced jobs, the project would employ 800 people in its regional assessment area (Stantec 2014).

6.12.2.2.20 WCC LNG Project

WCC LNG Project Ltd. is proposing the development and operation of the WCC LNG Project, located at Tuck Inlet, within the city limits of Prince Rupert. The proposed Project will include production, storage, transfer, and loading of LNG onto LNG vessels for marine transportation to offshore markets. The estimated processing capacity is 30 mpta of natural gas (WCC LNG Project Ltd.). Infrastructure would include liquefaction and storage facilities, loading facilities, and third-party pipeline and facilities required to transport natural gas to the facility from existing pipeline systems. During the construction phase, approximately 1,000 and 6,000 workers will be required as on-site labour, depending on the final development plan. Employment levels could be in the range between 4,000 and 20,000 person-years. The operations phase would include 205-300 employees initially, and approximately 50 to 150 contract employees (WCC LNG Project Ltd.).

6.12.2.3 Other Activities with Potential to Interact with the Project Effects

Land use activities that may interact cumulatively with the proposed Project activities directly or indirectly that are not identified as projects in Sections 6.12.2.1 and 6.12.2.2 are identified in Table 6.12-2 and Figure 6.12-2 for activities that intersect with the two largest RSA boundaries; namely the Economic, Social and Health RSA and the RSA for Wildlife and Wildlife Habitat, Vegetation and Ecosystems, and Terrain and Soils (note: this RSA encompasses aquatic and fish / fish habitat RSAs). A separate cumulative effects assessment for each VC and IC has been conducted in the relevant separate effect assessment chapters. Each cumulative effects assessment identified which Project direct or indirect effects interact with other past, present, and reasonably foreseeable future activities that are presented Table 6.12-2. This table provides a high-level inventory of activities; further details on one or more activities are provided as necessary in each VC and IC effects assessment chapter (in tabular form, similar in structure to Table 6.12-2 below). Each of the activities listed has occurred in the past, is presently occurring, and/or is anticipated to occur in the future.

Table 6.12-2: Summary of Past, Present, and Reasonably Foreseeable Future Activities with Potential to Interact with Project Residual Effects

Activity	Description
Commercial recreation (including fishing)	Fishing is an important activity for sustenance, recreation, and the economy in the Nass South Sustainable Resource Management Plan (MFLNRO, 2012). Commercial recreation is relevant for the assessment of cumulative effects, including for heli-skiing, river rafting, fishing, lodging, guided mountaineering, guided freshwater recreation, multiple use, and backcountry expeditions (Rescan 2014).
Forestry	The Project falls within the Nass Timber Supply Area (TSA). The following TSAs intersect with the Economic, Social and Health RSA: Cassiar, Nass, Kalum, Kispiox, Bulkley, Kalum, Morice, Lakes, Prince George, Pacific, North Coast, Mid Coast, and Great Bear Rainforest North. The following TSAs intersect the Wildlife and Wildlife Habitat RSA: Cassiar, Nass, Kispiox, Cranberry, Bulkley, Kalum, Morice, and Lakes. There are 14 forest licences relevant to the assessment of cumulative effects.
Guide Outfitting	Targeted species include bear (black and grizzly), deer, caribou, moose, mountain sheep, mountain goat, and wolf (Rescan 2014). Guide outfitting is an important activity for sustenance, recreation, and the economy in the Nass South Sustainable Resource Management Plan (MFLNRO, 2012). There are 28 guide outfitting licences in the Economic, Social, and Health RSA and one in the Wildlife and Wildlife Habitat RSA.

Activity	Description
Hunting	Hunting is an important activity for sustenance, recreation, and the economy in the Nass South Sustainable Resource Management Plan (MFLNRO, 2012CIS. There are 21 Wildlife Management units that intersect the Economic, Social and Health RSA and one that intersects the Wildlife and Wildlife Habitat RSA. The key species hunted include deer, caribou, moose, mountain sheep, mountain goat, bear (black and grizzly), and wolf. The Project falls within the Nass Wildlife Area
Mineral exploration	There are 299 registrants (individuals or companies) holding mineral claims in the Economic, Social, and Health RSA and 44 in the Wildlife and Wildlife Habitat RSA.
Parks and Protected Area	Several projected parks and protected areas fall within the Economic, Social, and Health RSA. Two Class A provincial parks fall within 30 km the Project: Bear Glacier Provincial Park (542 ha in size) and the Meziadin Provincial Park (335 ha in size) are approximately 15 km and 18 km from the Project, respectively (BC MWLAP 2003a; BC MWLAP 2003b).
Trapping	Trapping is an important activity for sustenance, recreation, and the economy in the Nass South Sustainable Resource Management Plan (MFLNRO, 2012). There are 421 trapping licences that intersect the Economic, Social and Health RSA and 12 that intersect the Wildlife and Wildlife Habitat RSA.
Transportation	Highways 37 and 37A are located east of the proposed Project. Forest service roads are located near and off of Highway 37. The closest airstrips to the Project are in Stewart and Bob Quinn. A total of 23 airstrips occur within the Economic, Social, Health RSA, with the largest being in Terrace.

Note:
No known agricultural land reserves were identified in the largest RSA extents, i.e., the Economic, Social, and Health RSAs.

Traditional and cultural activities occur in the region, including hunting, fishing, trapping and gathering. It is IDM's understanding that Aboriginal Groups manage the potential effects of these activities on wildlife, vegetation and fish through traditional land and resource management structures. It is also IDM's understanding that traditional and cultural use of the Bitter Creek Valley is low based on lack of access and distance from the Nass Valley.

6.12.3 Conducting a Cumulative Effects Assessment

Cumulative effects are the result of a project-related residual effect interacting with the effects of other projects or activities to produce a combined effect. Cumulative effects are assessed in each of the assessment chapters, as required by EAO (2013). The method for assessing cumulative effects generally follows the same steps as the Project-specific effects assessment. The approach to assessing cumulative effects comprises the following steps:

1. Review the residual effects for each VC and IC.

2. Identify potential cumulative effects.

3. Identify any additional mitigation measures, beyond those identified for each VC and IC.
4. Prepare a Project activity / residual effect interaction matrix.
5. Determine if the interaction will result in a cumulative effect in addition to the residual, Project-specific effect.
6. If a cumulative effect is determined:
    a. the effect will be characterized by magnitude, geographic extent, duration, frequency, reversibility, and context;
    b. the significance of the cumulative effect will be determined; and
    c. the likelihood, confidence, and risk of the cumulative effect will be identified.

6.12.3.1 Review Residual Effects for Each VC and IC

According to Agency guidance (2014), a cumulative effects assessment is carried out only on VCs/ICs for which residual effects are predicted after consideration of mitigation measures, regardless of their significance. Each effects assessment chapter identifies the VCs/ICs and residual Project effects that are carried forward for consideration in the cumulative effects assessment, provides criteria used to determine whether the VC/IC should be carried forward, or provides a rationale as to why further analysis was not warranted.

A high-level overview of the types of potential cumulative effects that VCs/ICs may experience is provided within each assessment chapter to determine if VCs/ICs may be affected by cumulative interactions with other projects and activities.

The following questions are addressed:

- Is there any spatial or temporal overlap of Project-related residual effects with the effects from other past, present, or reasonably foreseeable projects or activities?
- Is there potential for Project-related residual effects to interact cumulatively with past, present, or reasonably foreseeable projects or activities?

6.12.3.2 Identify Potential Cumulative Effects

To determine how VCs/ICs may be affected by cumulative interactions with other projects and activities, a high-level overview of the types of potential cumulative effects that VCs/ICs may experience is provided within each effects assessment chapter.

The type of potential cumulative effects will be evaluated in relation to the definitions provided below:

- **Physical-chemical transport**: A physical or chemical constituent is transported away from the action under review where it then interacts with another action.

- **Nibbling loss**: The gradual disturbance and loss of land and habitat.
- **Spatial and temporal crowding**: Cumulative effects can occur when too much is happening within too small an area and in too brief a period of time. A threshold may be exceeded and the environment may not be able to recover to pre-disturbance conditions.
- **Synergistic:** Combined effects along a pathway that collectively result in an increased effect that may not have existed if the effect occurred in isolation.
- **Additive:** Combined effects along a pathway that equal the sum of the individual effects.
- **Growth inducing:** Each new action can induce further actions to occur.

Where potential cumulative effects are identified, an evaluation of these effects is conducted.

6.12.3.3 Identify Additional Mitigation Measures

Mitigation measures for cumulative effects involves taking further action, where possible, to avoid or minimize cumulative effects on VCs/ICs. Because cumulative effects typically result from the combined effects of multiple developments, responsibility for their prevention and management is shared among the various contributing proponents. It is usually beyond the responsibility or capability of any one party to implement all of the measures needed to reduce or eliminate cumulative effects; therefore, collaborative efforts are required. If applicable, additional measures to mitigate cumulative effects that may be implemented by IDM and/or other parties are provided in this section of the effects assessment chapters.

6.12.3.4 Prepare a Cumulative Effects Interaction Matrix

Where potential cumulative effects are identified, a cumulative effects interaction matrix is presented in the respective effects assessment chapter. To populate the potential cumulative effects interaction matrix, the following questions or criteria are considered:

1. A project/activity is within the zone of influence of a VC or IC with residual effects (typically within the RSA or potentially affected communities);
2. Residual effects of other projects and activities have affected the VC or IC that may also be affected by the Project; and/or
3. A high degree of confidence exists that the other project or activity would not interact with the residual effects of the Project.

Cumulative interactions identified are described for each VC and IC and the supporting rationale for the assigned interaction rankings are provided. Data gaps in available information for each effects assessment are clearly stated. Concerns related to cumulative effects that were raised by Aboriginal Groups, the public, stakeholders, and/or government agencies are summarized.

6.12.3.5 Residual Cumulative Effects Assessment

The results of any additional analyses undertaken to predict residual cumulative effects are described, along with the analytical techniques, methods, and assumptions. The residual cumulative effects are then characterized using the same criteria (magnitude, geographic extent, duration etc.) and thresholds (e.g., ambient air quality objectives) already established for the Project effects assessment (see Table 6.7-1). The likelihood of residual cumulative effects occurring is determined using the same criteria defined above in Section 6.8. Effects assessment chapters, where applicable, include a determination of the significance of residual cumulative effects using the same standards or thresholds established for residual Project effects on individual VCs and ICs, as described in Section 6.9. Once a significance determination is made, a discussion of the confidence in the cumulative effects assessment is provided based on a consideration of the parameters already described in Section 6.10.

6.12.3.6 Summary of Cumulative Effects Assessment

Each effects assessment chapter includes a table that summarizes the cumulative effects assessment, as shown in Table 6.12-3.

Table 6.12-3: Summary of Residual Cumulative Effects Assessment

Project Phase	VC	Residual Cumulative Effect	Characterization Criteria *(context, magnitude, geographic extent, duration, frequency, reversibility)*	Likelihood *(High, Moderate, Low)*	Significance *(Significant, Not Significant)*	Confidence *(High, Moderate, Low)*

6.13 Follow-up Strategy

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

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

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