RED MOUNTAIN UNDERGROUND GOLD PROJECT
VOLUME 3 | CHAPTER 20
SOCIAL EFFECTS ASSESSMENT

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20 SOCIAL EFFECTS ASSESSMENT

20.1 Introduction

IDM Mining Ltd. (IDM, the Proponent) proposes to develop and operate the Red Mountain Underground Gold Project (the Project) located in northwest British Columbia (BC), approximately 15 km northeast of Stewart in the Bitter Creek watershed, a tributary of the Bear River. The proposed Project will extract high-grade gold and silver ore from an underground facility in the high alpine. Ore will be processed at a separate facility, lower down in the middle of the valley at a place known as Bromley Humps. The mine will take approximately 18 months to construct and is currently planned to be in operation for six years. Figure 20.1-1, Figure 20.1-2, and Figure 20.1-3 provide an overview of the Project's components and their locations within the Bitter Creek valley.

This chapter provides an assessment of the potential social effects of the Project. The purpose of the Social Effects Assessment is to present the existing social conditions in the local study area (LSA) and evaluate how the Project may interact with and result in changes to a set of valued components (VCs) and intermediate components (ICs) identified during early scoping phases of the Pre-Application process and in response to feedback from provincial and federal regulators, Working Group members, Nisga'a Nation, and the public.

The BC Environmental Assessment Office (EAO) is primarily concerned with the assessment of potential adverse social effects. The Project is expected to have a net positive effect on the economy within the LSA (Volume 3, Chapter 19, Economic Effects Assessment), which in turn supports improvements in individual, family, and community wellbeing.

This chapter is structured in accordance with guidelines set out by EAO and established practices and includes:

- A summary of the regulatory and policy setting that informed the consideration of potential social effects resulting from the Project;
- Description of the overall scope of the Social Effects Assessment including information sources, definition of identified VCs and ICs, and the technical and administrative boundaries of the analysis;
- A summary of existing conditions with respect to the selected VCs and ICs based on findings presented in the Socio-Economic Baseline Report (Volume 8, Appendix 20-A);
- Discussion of the potential social effects of the Project on each of the identified VCs and ICs;
- Identification of mitigation measures proposed to offset or otherwise account for potential adverse social effects;

- Description of potential residual effects that are predicted to remain after mitigation and a determination of the significance of potential residual effects in accordance with established methodology defined by the Canadian Environmental Assessment Agency (the Agency);

- Discussion of potential cumulative social effects in relation to other projects and activities in the regional study area (RSA) of the Social Effects Assessment, including reasonably foreseeable future projects; and

- Description of proposed follow-up programs and relevant management plans.

This chapter is linked to the Economic Effects Assessment (Volume 3, Chapter 19), Tsetsaut Skii km Lax Ha (Volume 4, Part C, Chapter 25), Métis Nation BC (Volume 4, Part C, Chapter 26), and Nisga'a Nation (Volume 4, Part C, Chapter 27). Linkages are also made to potential effects of the Project on other related VCs, including:

- Air Quality Effects Assessment (Volume 3, Chapter 7);
- Noise Effects Assessment (Volume 3, Chapter 8);
- Vegetation and Ecosystems Effects Assessment (Volume 3, Chapter 15);
- Wildlife and Wildlife Habitat Effects Assessment (Volume 3, Chapter 16); and
- Fish and Fish Habitat Effects Assessment (Volume 3, Chapter 18).
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The socio-economic information contained in this Social Effects Assessment may be inclusive of Aboriginal Groups and individuals, including TSKLH members and Métis Nation BC citizens, and IDM has endeavoured to differentiate between Aboriginal and non-Aboriginal statistics and information wherever possible. A specific discussion of any effects on the socio-economic conditions of Aboriginal Groups resulting from a change in the environment and the effects of any change to the environment directly linked or necessarily incidental to federal decisions on overall socio-economic conditions (as required under Section 5(1)(c) of the *Canadian Environmental Assessment Act, 2012*, is provided in Volume 4, Chapters 25 (Tsetsaut Skii km Lax Ha) and 26 (Métis Nation BC).

At the request of the Agency, this chapter also describes existing information for the current use of lands and resources for traditional purposes (CULRTP) by Tsetsaut Skii km Lax Ha (TSKLH) and Métis Nation BC (MNBC) in the Bitter Creek valley and provides an assessment of the potential effects of the Project on TSKLH's and MNBC's CULRTP. This assessment is presented in Section 20.10.

Figure 20.1-1: Project Overview

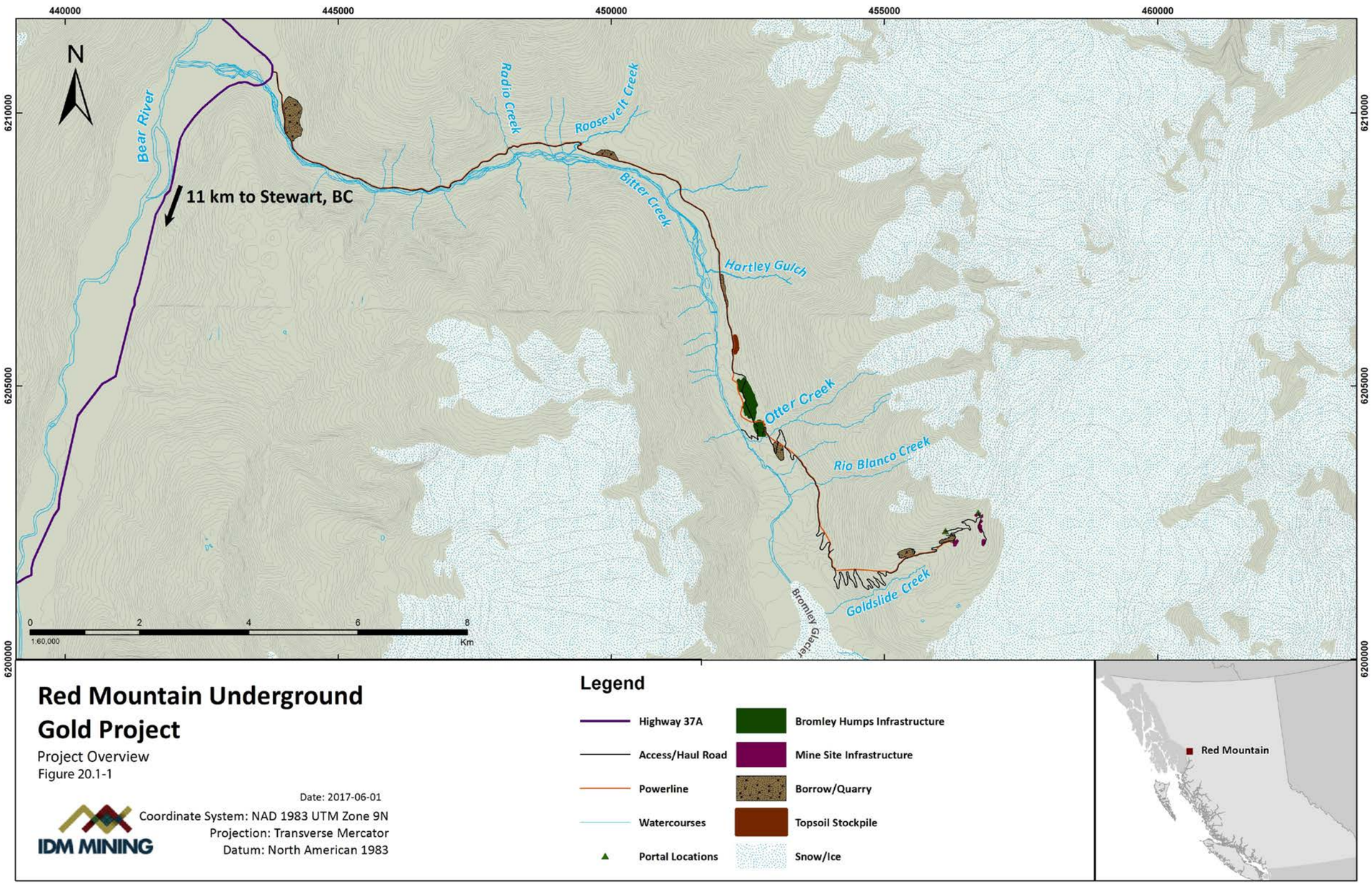


Figure 20.1-2: Project Footprint – Bromley Humps

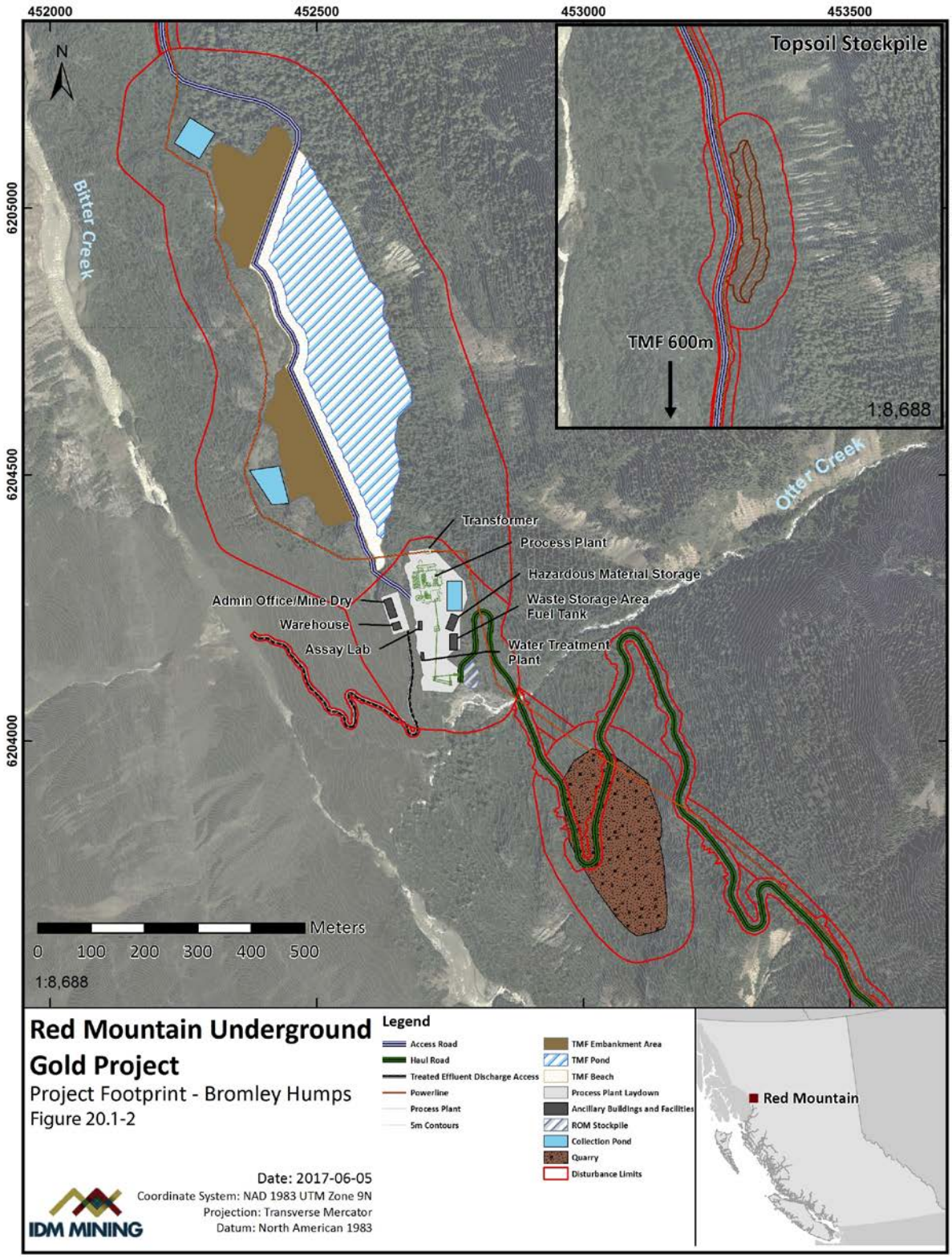
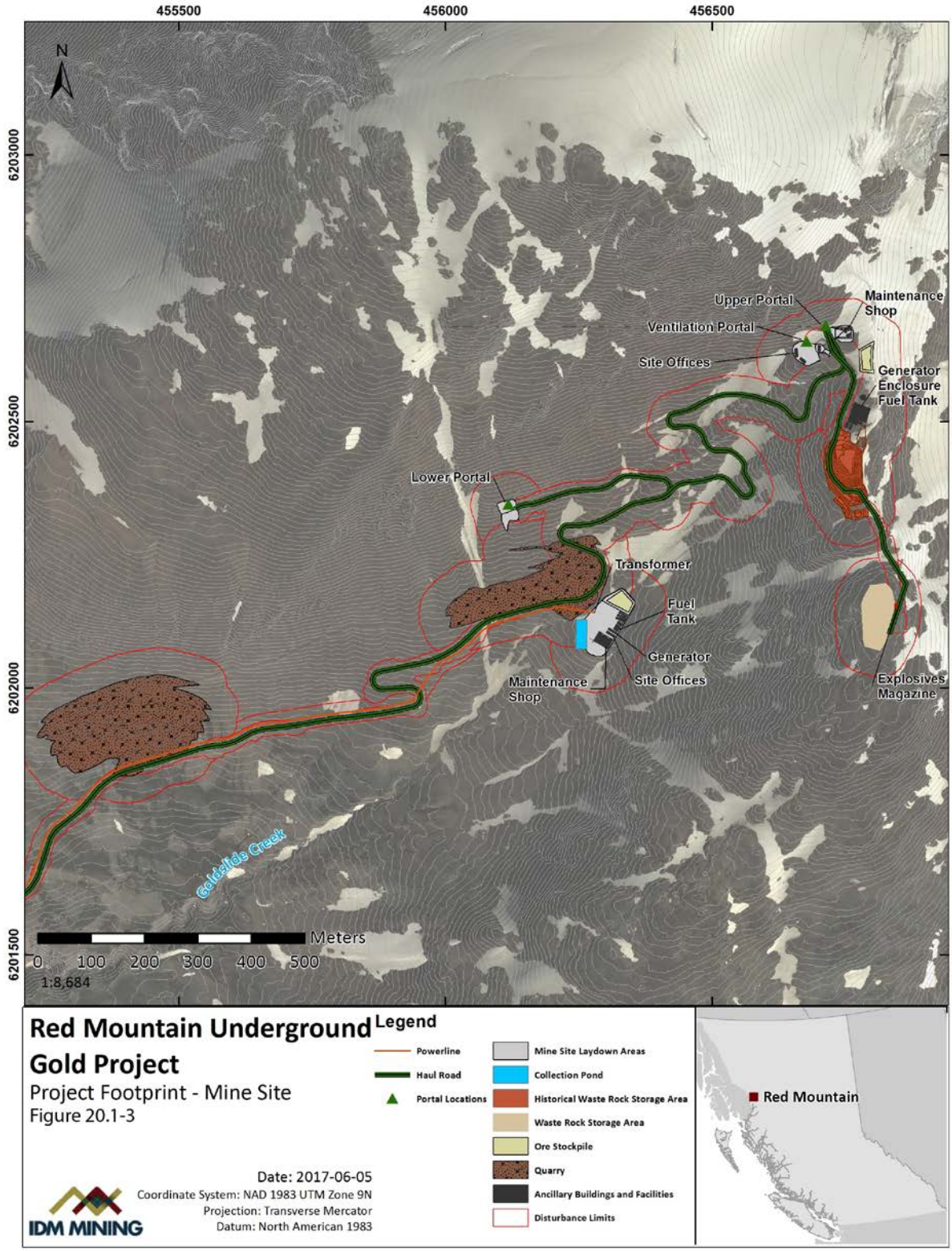


Figure 20.1-3: Project Footprint – Mine Site



20.2 Regulatory and Policy Setting

The Social Effects Assessment is written in accordance with federal and provincial requirements. Federal requirements to ensure the Project is compliant with the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) are set out in the Guidelines for the Preparation of an Environmental Impact Statement (the EIS Guidelines) issued for the Project, dated January 2016. Provincial requirements to ensure the Project is compliant with the *British Columbia Environmental Assessment Act* (2002) (BCEAA) are set out in the Application Information Requirements (AIR) issued for the Project by EAO, dated March 2017. This chapter also takes into consideration regional development and official community plans for the Regional District of Kitimat-Stikine (RDKS) and selected municipalities within the LSA and RSA.

The Project is consistent with sustainable and responsible resource development plans and objectives, such as BC's Mineral Exploration and Mining Strategy (BC MEM 2012), the BC Jobs Plan (Government of British Columbia 2012), and the Minerals and Metals Policy of the Government of Canada (Ministry of Public Works and Government Services Canada 1996).

At a regional scale, the Nass South Sustainable Resource Management Plan (NSSRMP) is a plan to promote and encourage long-term sustainable development in the southern parts of the Nass Timber Supply Area (TSA). The NSSRMP has five primary objectives (FLNRO 2012), including to:

- Assist in reaching a broad-based forestry accommodation agreement;
- Fulfill legal obligations of the Crown;
- Promote sustainable forest management in the Nass TSA;
- Assist in streamlining subsequent consultation processes; and
- Increase certainty for long-term access and sustainable development for Gitanyow, Nisga'a Nation (as represented by the Nisga'a Lisims Government (NLG)), and all resource sectors (e.g., forestry, fisheries, tourism, and mining).

The Project also aligns with regional development plans of the municipalities and communities within the RSA and LSA, such as overall socio-economic development goals of the District of Stewart (Stewart) and City of Terrace (Terrace; District of Stewart 2014; NDIT 2015a, no date).

The Project is within the Nass Wildlife Area, as set out in the Nisga'a Final Agreement (NFA). Under paragraph 8(f) of Chapter 10 of the NFA, IDM is required to conduct an assessment of the potential economic, social, and cultural effects of the Project on Nisga'a citizens. This 8(f) assessment is available in Volume 4, Part C, Chapter 27 (Nisga'a Nation).

20.3 Scope of the Assessment

Issues scoping and the selection of VCs and ICs for the Social Effects Assessment was guided by provincial and federal legislation (Section 20.2), review and consideration of comparable projects and related research, input from Nisga'a Nation, members of the EAO-led Working Group, and other stakeholders. Consideration of the scale and location of the Project components and activities also played a prominent role in establishing the scope of the assessment.

20.3.1 Information Sources

Information used in issues scoping and VC/IC selection processes for the Application/EIS included:

- Recent, comparable project environmental assessments and related research conducted for comparable projects in northwest BC, including (in particular) the Brucejack Underground Gold Project (Pretivm Resources Inc.), with additional review of environmental assessments conducted for the Kitsault Mine Project (Alloycorp Inc.), Kemess Underground (Aurico Metals Inc.), and the KSM Project (Seabridge Gold Inc.);
- Consultation with provincial and federal regulators, Working Group members and organizations, Nisga'a Nation, local and regional stakeholders, and the public;
- Federal and provincial requirements; and
- Publicly available reports, databases, and background technical reports.

Local and regional government documents referenced included: District of Stewart Official Community Plan; Nass South Sustainable Resource Management Plan; District of Stewart: Investment Ready Community Profile: District of Kitimat Housing Action Plan; and City of Terrace: Investment Ready Community Profile.

Sources of spatial data for the figures are noted on the figures. Additional spatial data for traplines, parks, and commercial recreation tenures came from GeoBC Data Discovery.

There were no useful or relevant spatial data available from regional or local sources.

20.3.2 Inputs from Consultation

IDM conducted consultation with regulators and Aboriginal Groups through the EAO-led Working Group. Where more detailed and technical discussions were warranted, IDM and Working Group members, sometimes including NLG representatives, held topic-focused discussions, the results of which were brought back to EAO and the Working Group as a whole.

Further consultation with Aboriginal Groups, community members, stakeholders, and the public have been conducted as outlined by the order under Section 11 of BCEAA (the Section 11 Order) and the EIS Guidelines issued for the Project. The results of those

consultation efforts relevant to the Social Effects Assessment have been summarized in Table 20.3-1.

More information on IDM's consultation efforts with Aboriginal Groups, community members, stakeholders, and the public can be found in the following documents: Information Distribution and Consultation Overview (Volume 2, Chapter 3), Aboriginal Consultation (Volume 4, Part C), Public Consultation (Volume 4, Part D), Aboriginal Consultation Report (Volume 9, Appendix 27-A) and Public Consultation Report (Volume 10, Appendix 28-A). A record of the Working Group's comments and IDM's responses can be found in the comment-tracking table maintained by EAO.

During consultation with stakeholders, government agencies, Aboriginal Groups, and the public, a preliminary list of proposed VCs and ICs based on early drafts of the Project description and IDM's understanding of the local area was presented.

No feedback from consultation with regulators, Aboriginal Groups, community members, stakeholders, or the public was received on Project-related Traffic or Visual Quality.

Table 20.10-1 summarizes the feedback received from consultation on CULRTP.

Table 20.3-1: Summary of Consultation Feedback on Social VCs/ICs

Topic (VC, IC)	Feedback by*				Consultation Feedback	Response
	NLG	G	P/S	O		
Potential Social Issues Related to Project and Project Workforce		X			Northern Health requested that the assessment of Potential Social Issues Related to Project and Project Workforce should include consideration of the importance of inequities, impacts on vulnerable populations, mental health concerns, community cohesion, drug and alcohol use, and communicable disease rates, as well as other topics that might be identified through community consultation.	The considerations suggested by Northern Health were included in the assessment of Potential Social Issues Related to Project and Project Workforce.

Topic (VC, IC)	Feedback by*				Consultation Feedback	Response
	NLG	G	P/S	O		
Community Health and Wellbeing		X			Northern Health requested that Community and Family Health/Wellbeing be included as a VC under the Health Pillar.	In order to recognize the link between health outcomes and the socio-economic determinants of health, Community Health and Wellbeing has been included as the assessment endpoint for Social and Health Services, Housing, Infrastructure, Recreational Values, and Potential Social Issues related to Project and Project Workforce. IDM and Northern Health have discussed the relative merits of assessing Community Health and Wellbeing under either the social or health pillars and have agreed that having it under the social pillar is acceptable.
Contemporary Land and Resource Use	X				NLG requested that the VC be entitled "Contemporary Land and Resource Use", instead of "Current Land and Resource Use" to help to distinguish between cultural and other land uses.	IDM has made the change requested by NLG.
Social and Health Services		X			Northern Health requested that Terrace be included in the socio-economic Local Study Area.	In consultation with Northern Health, IDM has included Terrace in the LSA for Social and Health Services to account for potential effects to services in Terrace.

Topic (VC, IC)	Feedback by*				Consultation Feedback	Response
	NLG	G	P/S	O		
Social and Health Services		X			Northern Health requested that Social and Health Services be split into two VCs (Social Services and Health Services) to allow for easier review and management of this component.	IDM has maintained the linkage between social and health services as a single VC to reduce the complexity and redundancy involved in attempting to assess them independently. IDM has undertaken to use effective headings, document structure, and cross-references to facilitate easier review and management of the Social and Health Services VC and the Community Health and Wellbeing assessment endpoint.

*NLG = Nisga'a Lisims Government;
G = Government - Provincial or federal agencies;
P/S = Public/Stakeholder - Local government, interest groups, tenure and license holders, members of the public;
O = Other

20.3.3 Valued and Intermediate Components, Assessment Endpoints, and Measurement Indicators

The VCs, ICs, assessment endpoints, and measurement indicators used in the Social Effects Assessment are summarized in Table 20.3-2 and

Table 20.3-3. The rationale for their selection was informed by input from Working Group members (including NLG, stakeholders, and government regulators), review of government guidelines, consideration of other comparable projects, published research, and professional judgment. Ongoing consultation and engagement with local communities and Nisga'a citizens during socio-economic baseline research in Stewart, Terrace, and Gitlaxt'aamiks and the IDM open houses in Gitwinksihlkw and Gitlaxt'aamiks also helped confirm and refine the rationale for inclusion of each VC.

Key considerations in developing the rationale for selection of VCs, ICs, and assessment endpoints included:

- The potential for interactions with Project components or activities and the potential for adverse Project effects arising from these interactions;

- Nisga'a Nation Treaty interests as identified in the NFA and/or through ongoing consultation with NLG and Nisga'a citizens;
- Aboriginal Interests;
- Local or community concerns; and
- Social science research into the social and economic effects of similar projects.

Where available and important to reviewers, specific measurement indicators were used to focus the assessment on metrics or proxies of social attributes or activities.

The following social VCs and ICs were identified for assessment:

- Social and Health Services;
- Potential Social Issues Related to the Project and Project Workforce;
- Housing;
- Infrastructure;
- Recreational Values;
- Project-related Traffic; and
- Visual Quality.

The VC CULRTP is addressed separately in Section 20.10.

The potential socio-economic effects to Aboriginal Peoples as a result of Project environmental effects are discussed in Volume 4, Part C, Chapters 25 (Tsetsaut Skii km Lax Ha), 26 (Métis Nation BC), and 27 (Nisga'a Nation).

Table 20.3-2: Assessment Endpoints and Measurement Indicators for Social VCs

Valued Components	Primary Measurement Indicators	Assessment Endpoints
Social and Health Services	• Local and regional demographic statistics • Estimated size of Project workforce • Anticipated demographic changes • Availability and capacity of local social and health services • Potential demands of Project workforce on local health and social services (using available statistics on industrial accidents in the BC mining sector) • Available data on clinic visits, use of social, health, and medical services, and related information from other comparable projects currently under construction or in operation and similar data from NHA studies, if available	Continued delivery of social and health services and maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects.

Valued Components	Primary Measurement Indicators	Assessment Endpoints
Potential Social Issues Related to Project and Project Workforce	• Estimated Project workforce demographics • Anticipated demographic changes • Availability of social and health services • Published and unpublished research on the links between comparable projects and social- and health-related issues of neighbouring communities, including, for example, measures or indicators that are available and relevant that might assist in consideration of inequalities, vulnerable populations, mental illness, community cohesion, drug and alcohol abuse, increased rates of communicable diseases, and other aspects of community health and wellbeing that may be identified through consultation with communities	Maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects. This includes considerations for inequalities, vulnerable populations, mental illness, community cohesion, drug and alcohol abuse, increased rates of communicable diseases, and others aspects of community health and wellbeing that may be identified through consultation with communities.
Housing	• Local and regional demographic statistics • Estimated Project workforce demographics • Anticipated demographic changes • Quantity and quality of housing stock	Continued maintenance of housing availability and affordability, community services, and infrastructure availability and access. Maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects.
Infrastructure	• Local and regional demographic statistics • Estimated Project workforce demographics • Project-related traffic • Anticipated demographic changes	Continued maintenance of infrastructure availability and access and maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects.
Recreational Values	• Changes to view-scapes • Changes to access, such as prohibitions and/or increased numbers of persons wanting access • Changes in existing recreational opportunities • Project footprint	Continued use of recreational and tourism opportunities and maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects.

Table 20.3-3: Assessment Endpoints and Measurement Indicators for Social ICs

Intermediate Components	Primary Measurement Indicators	Assessment Endpoints
Project-related Traffic	• Local and regional demographic statistics • Estimated Project workforce demographics • Project-related traffic • Anticipated demographic changes	Infrastructure: Continued maintenance of infrastructure availability and access and maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects. Wildlife: The maintenance of ecological conditions that support populations relative to existing baseline.
Visual Quality	• Changes in visual quality as determined through modeling	Recreational Values: Continued use of recreational and tourism opportunities and maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects. Contemporary Land and Resource Use: Continuity of contemporary land and resource use.

20.3.4 Assessment Boundaries

The following sections identify the spatial, temporal, administrative, and technical study area boundaries, as applicable to the VCs.

20.3.4.1 Spatial Boundaries

The boundary of the RSA for the assessment of social effects coincides with boundary of the RDKS Figure 20.3-1 and Figure 20.3-2). The LSA for the assessment of potential social effects of the proposed Project encompasses and area within a 50 kilometre (km) radius of the Project, excluding lands outside of Canada. The LSA includes the following communities:

- District of Stewart;
- Unincorporated settlements of Meziadin Junction and Bell II;
- Village of Gitlaxt'aamiks (formerly New Aiyansh);
- Village of Gitwinksihlkw (Canyon City);
- Village of Laxgalts'ap (Greenville); and
- Village of Gingolx (Kincolith).

Due to lack of interaction between Canadian and American social VCs and ICs, such as Housing, Infrastructure, and Project-related Traffic, IDM is confident that the exclusion of lands outside of Canada is appropriate.

The LSA spatial boundary for the VC Social and Health Services was expanded to include the City of Terrace at the request of Northern Health.

The social effects of the Project will not extend to any federal lands or lands outside of Canada.

20.3.4.2 Temporal Boundaries

The temporal boundary for the Social Effects Assessment encompasses the following phases:

- Construction Phase: 18 months;
- Operation Phase: 6 years; and
- Closure and Reclamation Phase: 5 years.

The Project Post-Closure Phase is expected to continue for approximately 10 years and includes ongoing Post-Closure monitoring. The social implications of these activities will be very small in both the LSA and RSA; hence this phase of the Project is not considered in the Social Effects Assessment.

20.3.4.3 Administrative and Technical Boundaries

Administrative boundaries limiting the Social Effects Assessment are established by the type, availability, and scale of social data collected. Datasets are frequently presented for a population from a specified area defined by the government or other administrative unit. Administrative boundaries influencing this assessment include geographic areas used by Statistics Canada, BC Stats, and Northern Health Authority (NHA, or Northern Health) such as development regions, regional districts, Health Service Delivery Areas (HSDA), and Local Health Areas (LHA). The NFA also delineates the geographic areas of relevance to the Nisga'a Nation.

Technical boundaries are those that may limit the ability to predict or measure social change. The Social Effects Assessment is limited by gaps and irregularities in available data and whether or not data are current. Most statistical data presented are from the Canada Census and the National Household Survey (NHS)[1]. As most data from the 2016 Census were not released at the time of writing, data were limited to the 2011 Census and NHS. Census data collected for areas that include communities with very small populations are often suppressed to protect individual privacy. The 2011 Census data were suppressed for Stewart and the unincorporated settlements of Meziadin Junction and Bell II and were inconsistently available for the Nisga'a Villages.

Another technical boundary arises due to the unpredictability of social outcomes. It is not difficult to gain a general understanding of the potential social effects of a project and predict a range of possible outcomes and potential effects; however, social effects also depend on individual and municipal decisions regarding health and social services, housing, employment, and education, training, and business opportunities. The sheer number of social and economic variables at play increases the uncertainty of predictions. To help deal with this uncertainty, IDM will seek to work with its partners in the LSA to monitor socio-economic conditions and use that knowledge to inform the development and implementation of mitigation measures and adaptive management strategies.

[1] The National Household Survey replaced the long form census in 2011. The long form census was reinstated for 2016.

Figure 20.3-1: RSA and LSA for Social Effects of the Project, except Social and Health Services

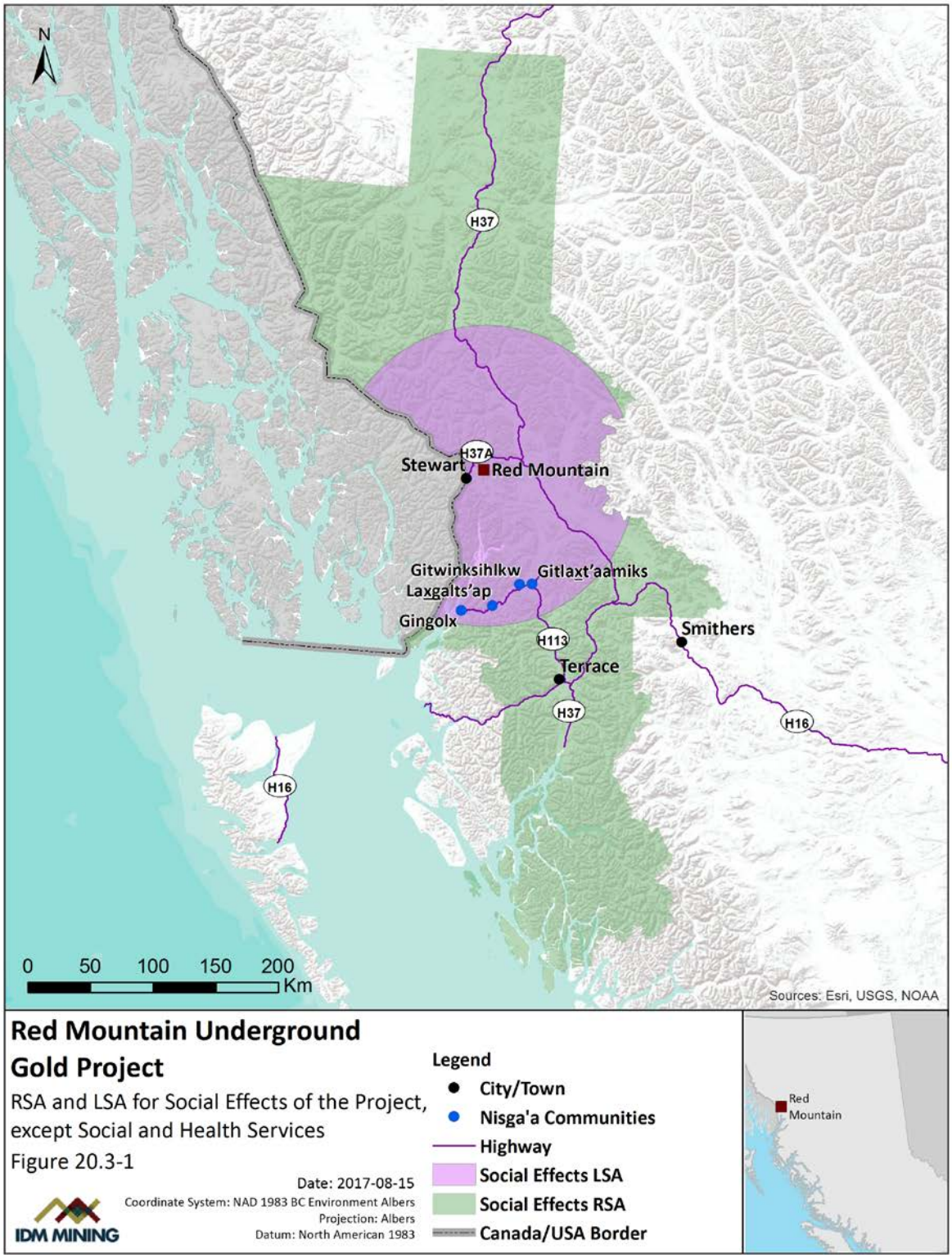
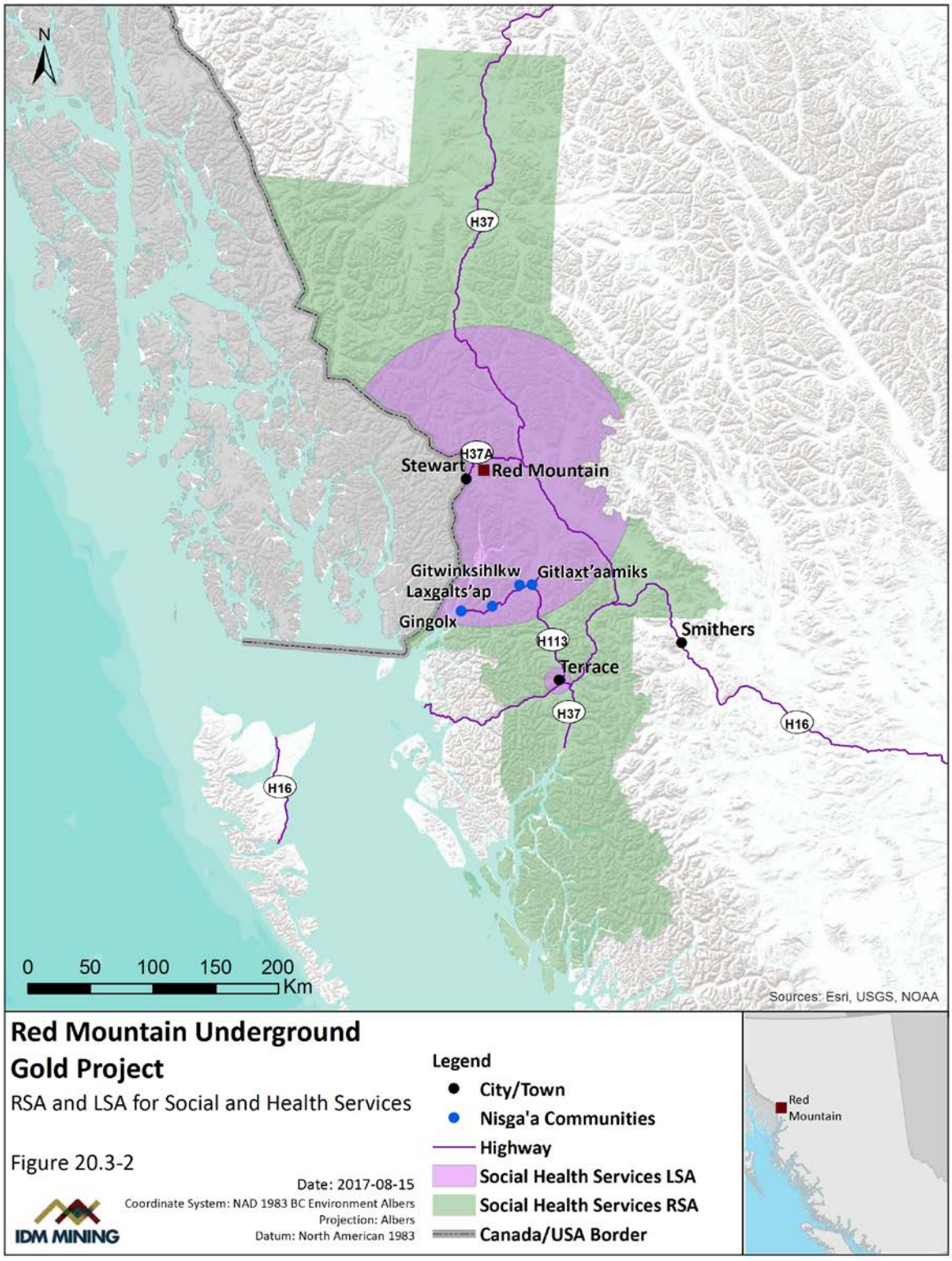


Figure 20.3-2: RSA and LSA for Social and Health Services



20.4 Existing Conditions

20.4.1 Overview of Existing Conditions

Communities in northwest BC, including those across the RSA communities, have a long history of resource development, boom and bust cycles, and the associated positive and negative effects on community health and wellbeing.

Abundant natural resources drive growth and development in the LSA, RSA, and northwest BC. Many communities in the region were founded upon and owe their continued existence to resource based industries (e.g., forestry, fishing, and mining) and have weathered periods of high immigration and emigration (RDKS 2016). These fluctuations in the local economy, resident populations, and demographics affect social structures, community cohesion and wellbeing, and the level and type of social, health, medical services, and infrastructure available.

The Social Effects Assessment RSA follows the administrative boundary of the RDKS, which provides regional government services to approximately 36,000 residents within an area of approximately 100,000 km^2 in northwestern BC, including Terrace, District of Kitimat, Stewart, Village of Hazelton, and District of New Hazelton as well as six Electoral Areas: A (Nass Valley, Meziadin), B (Hazeltons rural areas, Kispiox Valley, Moricetown through Cedarvale), D (Telegraph Creek, Iskut, Bob Quinn), E (Thornhill), F (Dease Lake), and C (Rural Terrace area, south coast) (Statistics Canada 2012).

Population in the RDKS has been steadily declining since the mid-1990s, having reached a peak of approximately 45,000 people in 1996 (BC Stats 2017). The RSA, in general terms, has a high proportion of working age people, low population growth, and an ageing workforce (Statistics Canada 2012; Volume 8, Appendix 20-A). A quarter of the population is below the age of 19 and approximately 10% is above the age of 65. The majority of the RDKS population is third generation Canadians with European ancestry. Approximately 4% self-identify as visible minorities, predominantly South Asian and Filipino (Statistics Canada 2011a). The RDKS has a higher proportion of people who identify as Aboriginal compared to the province (34% of RDKS; 5.3% of Province; Statistics Canada 2011b).

The Social Effects Assessment LSA is predominantly focused on Stewart, which is approximately 15 km from the Project turnoff on Highway 37A, but also encompasses the four Nisga'a Villages and the unincorporated settlements of Meziadin Junction and Bell II.

The community of Stewart began to develop in 1902 during the gold rush and has a long history of weathering the up- and down-swings of resource development. The community lies within the boundaries of the RDKS and has a close relationship with Hyder, Alaska, which lies along Stewart's southern border.

Since 1990, the population of Stewart has fallen from 1,400 residents to 401 in 2016. The decline coincided with the closure of the Granduc and Premier mines in 1984 and 1998, respectively (Bridges and Robinson 2005), and was slowed by an upturn in the forestry

sector. The forestry sector waned after 1995, particularly with the closure of Skeena Cellulose in 2001 (Stewart Bulk Terminal Ltd. 2002).

Stewart is working to diversify its economy, which to-date includes tourism, logging, transportation, and mining (District of Stewart 2014). Local employment is often seasonal and associated with the tourism or resource industry. The largest employers in Stewart are Ascot Resources, Mountain Boy Minerals, Billabong Highway Maintenance, the King Edward Hotel, School District 82, Granmac Services, the Ripley Creek Hotel, and Arrow Transportation Systems Inc. (NDIT no date).

The unincorporated settlements along Highway 37 (Bell II and Meziadin Junction) officially fall under the jurisdiction of the RDKS. Meziadin Junction is located 65 km from Stewart at the junction of Highways 37 and 37A. Gas and diesel services were formerly available, as well as a café, repair shop, and campground/recreational vehicle (RV) park. However, facilities closed in 2006, have been decommissioned, and the property has been for sale for several years (Destination BC Corp. 2014).

Bell II is located 94 km north from Meziadin Junction and was established in 1979 as a service station for travelers along Highway 37 (Bell 2 Lodge 2017). Additional facilities and services developed over the years and the site is now a wilderness destination as well as a service station for travelers. The lodge attracts visitors from around the world on a seasonal basis. In the fall, international tourists and recreationists pursue steelhead fishing on the Bell-Irving, Nass, and other rivers, while heli-skiing dominates the winter months. The lodge offers guiding services for heli-skiing through Last Frontier Heli-skiing. Last Frontier additionally offers helicopter and small-plane tours, wildlife viewing, and heli-hiking expeditions during the summer months (Last Frontier Heliskiing 2014).

Bell 2 Lodge includes a central lodge, restaurant, and five chalets. Other services include fuel (gas, diesel, and propane), camping and RV hook-ups, helicopter landing and fueling facilities, and a garage for minor automotive repairs (Bell 2 Lodge 2017).

The Nisg̲a’a Villages of Gitlax̲t’aamiks, Gitwinksihlkw, Laxg̲alts’ap, and Ging̲olx are also included in the LSA. Nisg̲a’a Nation consists of approximately 6,066 members, almost 2,050 of whom reside in one of the four Nisg̲a’a Villages located within Nisg̲a’a Lands, along the Nass River (INAC 2011). Nisg̲a’a citizens also live in Terrace, Prince Rupert/Port Edward, Vancouver, and elsewhere.

Nisg̲a’a Lands encompass approximately 2,000 km^2 around the estuary and lower reaches of the Nass River (NLG 2017a). The Nisg̲a’a Villages are located along the Nass flood plain and at the mouth of the Nass River. The Villages are connected to Terrace by the Nisg̲a’a Highway (Highway 113). The Cranberry Connector, a gravel road, provides seasonal connection between Gitlax̲t’aamiks and Highway 37.

Terrace is the largest and closest service centre for the LSA communities and is considered part of the LSA for the discussion on Social and Health Services. In 2016, the population of Terrace was 15,000 people, which grew from a small sawmill community of 350 people in 1951 (City of Terrace no date). The city has developed into a strategic regional centre for business, retail, medical, and government services and has a developed transportation network including air, sea, railways, and roadways. Terrace is located on a key freight

corridor at the junction of three highways: Highway 16 (Yellowhead Highway), Highway 37 (Stewart-Cassiar Highway), and Highway 113 (the Nisga'a Highway).

20.4.2 Past and Current Projects and Activities

Stewart and other LSA communities are very familiar with the mining and mine exploration sectors that have played a prominent role in the area's history throughout most of the 20th century. The closing of the Granduc Mine in 1984 marked the end of an era and was the last mine to provide significant employment in Stewart. Other mines in the region that reached the end of their productive lives recently include the Eskay Creek Mine (closed in 2008) and Kemess South Mine (closed in 2010), which were both important regional employers (Heisler and Markey 2010).

The Huckleberry Mine, until recently the only operating mine in the RSA, suspended operations in August 2016 (Imperial Metals Inc. 2017). The Red Chris Mine ships concentrate through Stewart, which provides some economic benefit to the community (Imperial Metals Inc. 2015; Arrow Transportation Systems Inc. 2015).

Hydro-electric projects in the LSA include the recently completed Long Lake Hydro Project, which commenced commercial production at the end of 2013. Workers from the Long Lake Project were housed in a 135-person work camp in Stewart (Terrace Standard 2011). Three hydro projects farther north in the Iskut River watershed have recently come on line: Forest Kerr (195 megawatts (MW)) and Volcano Creek (16 MW) in 2014 and McLymont Creek (66 MW) in 2015 (AltaGas Ltd 2017).

20.4.3 Project-Specific Baseline Studies

20.4.3.1 Data Sources

Baseline information used to develop the Social Effects Assessment is derived from the Socio-economic Baseline Report (Volume 8, Appendix 20-A), which is based on a variety of published and unpublished sources, including: technical reports, official statistics, peer reviewed research, minutes or notes from Working Group meetings, and baseline and effects assessment reports developed for other, comparable projects (i.e., Brucejack Underground Gold Project, Kitsault Mine Project, Kemess Underground, and the KSM Project).

With the results of the 2016 Census only gradually being released from February 8 to November 29, 2017, this report relies on census data generated in 2006 and 2011. Caution is necessary with respect to drawing specific conclusions about the study communities' current characteristics and outlooks based on data that are at least six years out of date.[2] At the same time, there is an element of continuity and stability in social and economic

[2] Prior to Census 2011, completion of the Canadian census was mandatory for all Canadians and those who failed to comply faced penalties ranging from fines to jail time. 2011 marked the replacement of the long form census with the voluntary national household survey (NHS). The change in how Statistics Canada collects data will make comparisons with previous census years problematic. The 2016 Census returned to the mandatory long-form census.

conditions such that it is reasonable to assume that, while things are likely to have changed, they are unlikely to have changed so much as to render the data useless for the purposes of the social effects assessments.

For certain data sources and statistics, direct comparisons between areas or across time periods may be problematic because of variations in both geographical and statistical definitions. Regional subdivisions of the province, for example, include areas defined by regional districts, municipal areas, health areas, economic development zones, and land management planning units. The areas included within the borders of these regions and categories rarely coincide with one another and often change over time. Furthermore, the cultural linkages and traditional territories of relevant Aboriginal Groups transcend many of these contemporary boundaries or administrative boundaries. Efforts have been made to note inconsistencies where possible.

Availability of information often varies between one community and the next. Incorporated municipalities tend to have more information than unincorporated settlements. Nisga'a Nation and Aboriginal Groups have their own protocols and capacities for producing and maintaining social and economic data. Statistical information, particularly for the smaller communities, may be limited or intentionally suppressed by Statistics Canada to help protect the confidentiality of personal information of people living in small communities.

Notwithstanding these gaps and limitations, the data is sufficiently accurate and consistent with professional practice for the purposes of describing a socio-economic baseline and the subsequent assessment of potential economic effects.

As outlined in the Effects Assessment Methodology (Volume 3, Chapter 6), IDM has not conducted primary traditional use or traditional ecological knowledge (TEK) surveys in support of the Project due to the preferences of Nisga'a Nation, as represented by the Nisga'a Lisims Government, and EAO's and the Agency's direction for comparatively low levels of engagement with the other Aboriginal Groups potentially affected by the Project. IDM has committed to using TEK where that information is publically available. As no TEK relevant to this effects assessment was publically available at the time of writing, no TEK has been incorporated.

All written sources are identified in the References (Section 20.11).

20.4.3.2 Primary Data Collection

To supplement secondary source material, a brief field visit to Stewart, Terrace, and Gitlaxt'aamiks was undertaken from November 28 to December 1, 2016. The purpose of the fieldwork was to meet with key informants to gather additional information on social and economic conditions. Interviews were semi-structured and focused on corroboration and updating of information gathered from secondary sources, filling gaps in understanding, and the identification of additional sources of information.

Interviews were held with several staff members of RDKS, provincial agency representatives, staff and council of the District of Stewart, overlapping tenure holders, business owners in Stewart, community organizations, health, social service, and education professionals, and the Royal Canadian Mounted Police (RCMP).

20.4.4 Baseline Characterization

The following sections provide a summary description of the existing social setting in the RSA and LSA. More detailed descriptions related to existing conditions are provided in the Socio-Economic Baseline Report (Appendix 20-A).

Information is presented according the social VCs and ICs identified for the assessment to help establish clear linkages between existing conditions and the effects assessment.

20.4.4.1 Context for Potential Social Issues Related to the Project and Project Workforce

The social and economic settings in which people are born, grow, work, live, and age all contribute to health and wellbeing outcomes (WHO 2017). The assessment endpoint for the Potential Social Issues Related to the Project and Project Workforce VC is the maximization of positive effects of the Project on community health and wellbeing while minimizing negative effects.

There are a number of social determinants of health and wellbeing, including socio-economic status, job security, living wage, access to safe affordable housing, stress levels, education status, leisure activities, and access to social and health services. Characterization of these social determinants using relevant and available data and proxies is provided in the following sections.

Health and socio-economic data available are predominantly at the scale of the regional district, HSDA, and Nisga'a and Terrace LHAs. Due to very low population levels, much of the population and health related data for the Snow Country LHA (District of Stewart) was suppressed. NHA's 'Healthy Northern Communities' Profile for Stewart is used to present additional data and context on community health and wellbeing for Stewart.

20.4.4.1.1 Socio-economic Status

RDKS experiences one of the highest levels of economic hardship in BC (BC Stats 2011). This composite index is comprised of the proportion of the population age 0 to 64 on Income Assistance (IA), the length of time on IA, the proportion of the labour force receiving Employment Insurance (EI), per capita income, income inequality, and net taxes paid. More than half of the RDKS population fell in the bottom half of the Canadian distribution of adjusted after-tax family income (Statistics Canada 2011a). The prevalence of low income households was higher in both RDKS and Terrace compared to the provincial average and a higher percentage of the population (aged 0-64) was receiving income assistance (as of Sept 2012; 4%) compared to the BC average (1.7%[3]; BC Stats 2011).

Little information is available on the prevalence of low incomes or levels of poverty experienced by residents in Stewart. Stewart participates in the Union of BC Municipalities' Community Poverty Reduction Project, the smallest community selected as one of the seven communities across BC involved in this initiative. During the development of the poverty reduction action plans, committee members identified the following barriers to poverty

[3] This does not include Aboriginal persons on-reserve and the disabled.

reduction: lack of childcare, collaboration of services, education, food security, health, and transportation. In the 2014/2015 progress report, Stewart committee members noted the difficulties in identifying and working directly with families in need because of the perceived social stigma of receiving help (Union of BC Municipalities 2014, 2015).

20.4.4.1.2 Education Status

Indicators relating to education show low high school graduation rates and a lag behind the rest of the province in basic skills for students in the North Coast Development Region (NCDR). The percentage of grade 7 students in the NCDR that are not meeting expectations in reading (34.8%), writing (32.5%), and math (45.5%) was higher in all three categories compared to the BC average (22%, 13.8%, and 25.9%, respectively) (NW BC Regional Workforce Table 2012; BC Stats 2012a). A larger difference was observed for the Nisga'a LHA compared to the province, with the percentage of grade 7 students below standards in reading (70.2%), writing (32.8%), and math (83.1%) exceeding the provincial average by 20 to 58%.

As a percentage of the population 15 years and over, the RSA has more people with apprenticeships, trades certificates, or diploma compared to the provincial average but fewer people with university degrees (Statistics Canada 2006, 2011b).

20.4.4.1.3 Physical Health Status

Life expectancy is an indicator of the population's general health and the quality of healthcare; however it does not account for quality of life. The average life expectancy at birth ranged across the RSA, with the lowest recorded for Nisga'a Nation LHA (75.4 years), followed by the Terrace LHA (77.8 years), and the RDKS (78.9 years) (BC Stats 2012b, 2012c). Stewart's average life expectancy was highest (79.4 years), but all communities reported were 3 to 7 years below the provincial average (82.3 years) (Northern Health 2012a). This difference may be related to a number of factors but, in part, is likely related to low access to health and medical services.

Infant mortality rates are also used as an indication of overall population health, economic development, general living conditions, social wellbeing, rates of illness, and quality of the environment (Reidpath 2003). Infant mortality rates were similar among the Terrace LHA (5.8 per 1,000 live births), RDKS (5.3 per 1,000 live births), and Northwest HSDA (5.1 per 1,000 live births) and all were higher than the province (3.7 per 1,000 live births) (BC Stats 2012b). No data were retrieved for infant mortality rates within Nisga'a Nation.

20.4.4.1.4 Potential Years of Life Lost

Potential Years of Life Lost (PYLL) refers to the number of years of life lost to early death (i.e., death before an individual reaches the age of 75, which is the established average age of life expectancy). Both the RDKS and Nisga'a Nation LHA had higher rates of PYLL due to natural or accidental causes or suicide/homicide compared to the provincial average (BC Stats 2012b). PYLL due to accidental causes and suicide/homicide were almost three times the provincial average within the Nisga'a Nation LHA (BC Stats 2012c). The NCDR had the highest rate of PYLL due to suicide/homicide across the other 8 development regions (BC Stats 2012a). High PYLL can suggest low access to health and medical care.

Data indicates that residents of the RSA are more likely to be in an accident resulting in death or to commit suicide compared to the province as a whole. NHA reported that northern BC[4] experiences higher rates of death related to motor vehicle crashes, alcohol-related diseases, respiratory diseases, and cardiovascular diseases compared to other areas of BC (Northern Health 2012b). The Northwest HSDA had double the number of suicides and self-inflicted injuries per 100,000 people (16.7) compared to the provincial average (8.8) (Statistics Canada 2013).

20.4.4.1.5 Chronic Conditions and Sexual Health

Generally, the Northwest HSDA had similar or lower chronic condition rates to the province. Notable exceptions include AIDS, Chlamydia, Gonorrhea, Tuberculosis, E.Coli, and Salmonellosis, which were all higher in the Northwest HSDA (BC CDC 2016; Table 20.4-1; Appendix 20-A).

Table 20.4-1: Rates of Reportable Infectious Disease in Northwest HSDA and British Columbia, 2015

Health conditions	Northwest HSDA	BC
	Rate per 100,000 population	
Sexually transmitted and blood borne pathogens		
AIDS	4.1	1.5
Chlamydia (genital)	490.8	302.82
Gonorrhea (genital)	81.6	66.94
Hepatitis B (Chronic and Unknown)	28	24.33
Disease Transmitted by Respiratory Routes		
Tuberculosis	8.3	5.57
Enteric, Food and Waterborne Diseases		
Shigatoxigenic E. Coli	5.5	2.4
Giardiasis	12.4	11.2
Salmonellosis	37.3	26.5
Vibrio Infection	4.1	1.9

Source: (BC CDC 2016)

20.4.4.1.6 Mental Health Status

The percentage of the population (aged 12 and over) who reported a diagnosed mood disorder[5] was lower for the Northwest HSDA (6.1%) compared to the provincial average

[4] Northern BC refers to all Health Service Delivery Area under Northern Health Authority jurisdiction.
[5] Mood disorders include depression, biopolar disorder, mania, and dysthymia.

(8.0%) (Statistics Canada 2013). However, the hospitalization rate for mental illness was 1,272 per 100,000 people in the Northwest HSDA compared to 646 per 100,000 people for the province (Statistics Canada 2013). In addition, NHA indicated that depression and hypertension were the two most commonly diagnosed chronic conditions between 2010 and 2011 (Northern Health 2012b).

20.4.4.1.7 Workplace Hazards and Traffic Accidents

Between 2005 and 2010, there were 83 workplace fatalities in northern BC (BC Coroners Services 2010). All cases were classified as accidental, and 19% of the deaths reported occurred within in the mining industry (BC Coroners Services 2010; Northern Health 2011). In comparison to other regions in BC, northern BC accounted for 21.3% of all workplace fatalities with only 6.6% of the total BC population. In comparison, the Fraser region had 23.3% (with 35% of the total BC population), the Interior region had 26.2% (with 16.4% of the total BC population), the Island region had 16.9% (with 16.9% of the total BC Population), and Metro Region had 12.3% (with 25% of the total BC population) (BC Coroners Services 2010).

Injury and motor vehicle accident hospitalization rates were much higher in the Northwest HSDA compared to the BC average (Statistics Canada 2013). Between 1997 and 2009, there were nine fatalities resulting from motor vehicle accidents in Stewart, 33 in Terrace, two in Gitlaxt'aamiks, two in Meziadin Junction/Bell 2, and one in Laxgalts'ap (BC Coroners Services 2011). Of all the fatalities associated with motor vehicle accidents in northern BC between 2004 and 2009, more than a quarter were found to be associated with drug and/or alcohol use (BC Coroners Services 2011).

20.4.4.1.8 Health Behaviours

Health and wellbeing are also influenced by individual behavior, such as substance abuse, physical exercise, nutrition, and health-seeking behavior. On average, there were more daily smokers and a higher proportion of the population that reported heavy drinking in the Northwest HSDA compared to the BC average (Statistics Canada 2013).

Alcohol sales and consumption exceeded the provincial average ($796 spent per population age 19+; 103 litres consumed per population age 19+) in the NCDR ($1,004 spent per population age 19+; 152 litres consumed per population age 19+) and the Terrace LHA ($1,069 spent per population age 19+; 161 litres consumed per population age 19+) (BC Stats 2012a,b). Data were unavailable for the Nisga'a LHA. Substance abuse can contribute to and be an indication of poor individual and community health and wellbeing with potentially harmful consequences (Angell et al. 2006).

Leisure time physical activity was slightly higher and consumption of fruit and vegetables slightly lower in the Northwest HSDA compared to the provincial average (Statistics Canada 2013).

More people on average sought regular medical attention in the Northwest HSDA compared to the province (Statistics Canada 2013). For dental and non-emergency medical appointments residents must travel to Terrace or Prince George. If residents have access to a vehicle, the round trip to Terrace costs approximately $200 in gas, which may be out of

reach for some residents (Durant et al. 2015). Stewart and the NHA have had discussions regarding subsidized medical transportation (Union of BC Municipalities 2014).

20.4.4.1.9 Community Wellbeing

Two indices of community wellbeing provide a measure of overall social conditions including health: the Community Wellbeing Index (CWBI) and the Canadian Community Health Survey (2011/2012).

The CWBI developed by Indigenous and Northern Affairs Canada (INAC) provides a means of analyzing differences in wellbeing across Aboriginal and non-Aboriginal communities. Data from the Census of Canada is utilized to inform the CWBI score, which is a single number that ranges from a low of 0 to a high of 100. CWBI is composed of indicators based on income, education, housing conditions, and labour force activity (INAC 2017). Results of the CWBI are presented based on the 2006 Census data, as the 2011 Census data were suppressed for most of the LSA communities. The CWBI score ranged were 80 and 83 for the City of Terrace and District of Stewart but were much lower for the Nisga'a Villages of Gingolx and Gitlaxt'aamiks of 58 and 67, respectively.

The Canadian Community Health Survey (2011/2012) used questions on perceived physical health, mental health, life stress, community belonging, and life satisfaction as indications of community and individual wellbeing. Overall, the perceptions with the Northwest HSDA were similar to the provincial average, with some exceptions when disaggregated by gender (Table 20.4-2). The percentage of women with perceived "very good or excellent physical health" was lower compared to the provincial average, while the perception of "very good or excellent mental health" was higher (Statistics Canada 2013). More women in the Northwest HSDA reported that most days in their lives were "quite a bit or extremely" stressful compared to the provincial average. The results also indicate that understanding of the linkages between stress and mental and physical health are lacking in the HSDA. Notably, more people in the HSDA overall and by gender had a stronger sense of community belonging compared to the provincial average (Statistics Canada 2013).

Table 20.4-2: Wellbeing and Perceptions of Health, 2011/2012

Indicator		Northwest HSDA	British Columbia
Perceived Physical Health (Very Good or Excellent [%])	Total	57.6%	59.9%
	Male	63%	62%
	Female	52.1%	57.9%
Perceived Mental Health (Very Good or Excellent [%])	Total	71.4%	68.7%
	Male	70%	70%
	Female	72.7%	67.5%
Perceived Life Stress (%)	Total	21.4%	21%
	Male	17.1%	18.9%
	Female	25.8%	22.9%

Indicator		Northwest HSDA	British Columbia
Sense of community belonging (%)	Total	76.7%	65.4%
	Male	78.5%	64.4%
	Female	74.8%	66.4%
Life satisfaction, satisfied or very satisfied (%)	Total	91.9%	92.3%
	Male	91.3%	92.4%
	Female	92.4%	92.3%

Source: (Statistics Canada 2013)

20.4.4.1.10 Crime

Between 2009 and 2011, the Nisga'a LHA had the highest rate of serious violent crime of all LHAs in BC; Terrace ranked 28 out of 84 LHAs; and the NCDR had the 3rd highest rate serious violent crime across the 8 Development Regions behind Nechako and Cariboo Development Regions (BC Stats 2012a,b,c). Serious violent crimes are defined as homicide, attempted murder, sexual or non-sexual assault that result in bodily harm, robbery, and abduction. All the rates of serious crime declined in comparison to those reported for the 2006 to 2008 time period (-13.7% Nisga'a LHA; -21.7% for Terrace LHA; -27.3 for North Coast) (BC Stats 2012a,b,c).

Juvenile (ages 12 to 17) serious crime rates were found to be higher than the provincial average (3.5 offences per 1,000 people) for the NCDR (6.5 offences per 1,000 people), Terrace LHA (5.5 offences per 1,000 people), and Nisga'a LHA (5.6 offences per 1,000 people) (BC Stats 2012a,b,c). The rate of non-cannabis drug offences in the Nisga'a LHA was lower than the provincial average (51.3 and 170.3 offences per 100,000 people, respectively) (BC Stats, 2012).

20.4.4.2 Context for Social and Health Services

The delivery of emergency, health and medical, education, and social services varies across the RSA and between LSA communities with volunteers and non-government organizations playing an increasingly important role in the delivery of many services, especially in smaller communities.

20.4.4.2.1 Emergency Response

Emergency and protection services are provided by the RCMP, municipal fire departments, BC Ambulance, and Search and Rescue services. Protection and law enforcement services in rural areas and communities of less than 5,000 people and unincorporated areas of BC are provided by the RCMP provincial service. The RCMP also provides municipal forces under contract to larger communities. For example, Terrace benefits from both RCMP provincial services to areas around Terrace and RCMP municipal services.

The level of emergency services available in the Nisga'a Villages is similar to those available in other remote communities in BC (Rescan, 2012). The RCMP Lisims/Nass Valley detachment is located in Gitlaxt'aamiks and provides policing services to the other Nisga'a Villages (ERM Rescan 2014). Five constables, one corporal, and one sergeant are based in the Lisims/Nass Valley detachment (PRGT Ltd. 2014a).

Fire departments in the RSA provide firefighting, fire prevention, auto extrication, and first responder services. Fire departments in large centres such as Terrace employ paid firefighters and maintain a staff of volunteers (City of Terrace 2017). In smaller communities such as Stewart the fire departments are staffed mainly by volunteers (ERM Rescan 2013).

The service area for both the Stewart RCMP and fire department covers approximately 44,000 km^2 (ERM Rescan 2013). This includes all of Highway 37A, plus Highway 37 from Cranberry Junction to Bell II.

Ambulance services in the RSA and LSA communities are provided by BC Ambulance. The BC Ambulance Services detachment in Stewart has one ambulance which serves Highway 37A and Highway 37, from Cranberry Junction to Bell II, including the industrial camps (ERM Rescan 2013). Understaffing coupled with a large coverage area can result in wait times and require residents to make alternative plans to get access to emergency health care.

Search and rescue services are provided throughout the RSA with ground search and rescue groups based in Terrace and Stewart.

20.4.4.2.2 Health and Medical Services and Facilities

Health care services including programming, funding, and staffing of hospitals and health centres in northern BC are provided by NHA. Resourcing is largely determined by the LHA resident population and demographics with the number of physicians, beds, and types of services available changing rapidly depending on anticipated demand (Northern Health 2015b). Health services are generally considered 'at capacity' by NHA and in some cases community members need to travel great distances to access healthcare facilities or programs (Northern Health 2015b). Specialist and primary care practice vacancies are common in the HSDA (Northern Health 2016a).

The primary health care facility in northwest BC is Mills Memorial Hospital in Terrace, which has the largest concentration of physicians and services north of Prince George. Patients from Stewart, Bell II, Meziadin Junction, and the Nisga'a Villages with moderate to serious health issues are transported to the Mills Memorial Hospital. Other health services available on-site include extended care, home care nursing, x-ray services, physiotherapy and occupational therapy services, anesthetics services (two general practitioners), mental health and addictions counseling services, social work services, and outreach centres (RCCBC, no date).

NHA also operates the Terrace Health Unit, which focuses on environmental health, audiology, speech, and dental services (Office of Health and Resource Development, Northern Health 2017). Other services offered include home support, home care nursing, long-term care case management, community occupational therapy, physiotherapy, mental

health and addictions services, and public health services. A psychiatrist is available at this location.

NHA also manages a mental health and addiction community program, which includes a Community Response Unit, Community Acute Stabilization Team, and Community Outreach and Assertive Services Team. A combination of these services is offered through an inter-professional team to Stewart and other LSA residents through health centre referrals.

Terrace acts as a hub of health care services in the RSA and, in addition to the hospital and Terrace Health Unit, provides private clinics, dental services, pharmacies, a sexual health clinic, a residential rehabilitation home for adults with severe mental illnesses, homecare for adults and seniors with disabilities, and a long-term care home. Primary care (through four clinics) and dental services are provided by a number of privately owned and operated facilities in Terrace through a "fee for service" model from Medical Services Plan or private pay (PRGT Ltd. 2014b).

The Stewart Health Centre has physicians on staff supported by two nurses. One is a primary care nurse who is able to offer basic mental health, home support, and public health functions on an outpatient basis (Office of Health and Resource Development, Northern Health 2017). The other is an emergency care nurse (CPSBC 2017; RCCBC 2017; Office of Health and Resource Development, Northern Health 2017). The health centre operates Monday to Friday, from 8:30 to 16:30, with after-hours services available on an on-call basis for traumas and emergencies (Office of Health and Resource Development, Northern Health 2017). The health centre emergency room received 635 unscheduled visits in 2013/2014 (Northern Health 2016b).

NHA reported that visits to the health centre fluctuate seasonally, with volumes typically higher in the summer months pushing resources to near capacity. High levels of patients experienced during the winter of 2016/2017 were attributed to industrial development near the community. NHA is concerned that these winter levels will become the norm and stretch resources throughout both the summer and winter periods (Office of Health and Resource Development, Northern Health 2017).

Telehealth in Stewart is used to connect to clinicians in Terrace; mental health and dietician counseling are currently the only services offered through this venue (Office of Health and Resource Development, Northern Health 2017; Reid, Y. Pers Comm. 2016).

There are no private clinics, dental offices, or pharmacies in Stewart. The Stewart Health Centre has developed a relationship with pharmacies in Terrace for prescriptions issued at the Stewart Health Centre to be couriered to the health centre for pick-up by local patients (Office of Health and Resource Development, Northern Health 2017).

NLG manages the delivery of healthcare through the Nisg̲a'a Valley Health Authority (NVHA), which provides health care services in the Nisg̲a'a Villages. The NVHA is based in Gitlax̲t'aamiks and has satellite clinics in the other Nisg̲a'a Villages (ERM Rescan 2014). The NVHA provides physician health, public health, mental health, and dental services, home care for the elderly, and an emergency phone service (NVHA 2017; PRGT Ltd. 2014a; ERM Rescan 2014). The NHVA also operates a weekday bus service that provides transportation

assistance when a health service is not available in a patient's home community (NVHA 2017; Terrace Standard 2013).

20.4.4.2.3 Education Services

There are two school districts in the RSA: Coast Mountain Board of Education School District 82 and Nisga'a Nation School District 92.

Overall, 19 schools are managed by School District 82: five elementary schools, one middle school, one high school, and one alternate school in Terrace; and one kindergarten to grade 8 in Stewart. Grade 9 to 12 used to be offered through the Bear Valley School in Stewart, but is now administered through the North Coast Distance Education under School District 82. Distance Education is the only way for students to graduate high school without moving to Terrace or another larger city centre. Francophone, Christian, and Catholic schools are also available in Terrace.

Post-secondary education is available through Northwest Community College and the University of Northern British Columbia in Terrace. A number of specialty employment agencies, such as Terrace and District Community Services Society (TDCSS) and Northwest Training Ltd., are active in developing applicable work related and trade specific training.

School District 92 is run by both the BC Ministry of Education and NLG (ERM Rescan 2013). The majority of students and staff in the Nisga'a Nation School District are either Nisga'a citizens or members of other First Nations. The district provides culturally relevant education, integrating the Nisga'a language and the *Ayuukhl* Nisga'a into the curriculum (ERM Rescan 2013). Each Nisga'a Village has an elementary school, but all students must travel to Gitlaxt'aamiks to attend secondary school. Post-secondary education services are available in the Nass Valley through Wilp Wilxo'oskwhl Nisga'a Institute (WWNI), the Nisga'a House of Wisdom. The school provides academic, vocational, technical, and continuing education for adults and is affiliated with the University of Northern British Columbia, Northwest Community College, and Royal Roads University.

NLG also provides career counseling and skills training through Nisga'a Employment, Skills & Training (NEST).

20.4.4.2.4 Social Services

Social services, including family and children services, youth programming, employment services, crisis support, and care for seniors and the disabled, vary in availability across the RSA with communities serving larger populations such as Terrace typically offering a wider range of services. Both government agencies and not-for-profit groups are engaged in the delivery of services. In smaller communities such as Stewart, volunteer groups play an essential role in meeting community needs.

The Ministry of Children and Family Development (MCFD) has an office in Terrace and provides administration and programing for children and youth with special needs, youth justice, adoption and fostering, child care subsidies, supervised access, domestic violence, child protection services, family strengthening and development, and Aboriginal child and family development. These services are available to Stewart, Meziadin Junction, Bell II, and

Nisga'a Villages and, based on referrals or requests, social workers will travel throughout the RSA to complete assessments (Reid, Y. Pers Comm. 2016).

An MCFD family consultant has been placed in Stewart since 2012 under the Community Poverty Strategy Initiative. The family consultant identifies and connects low-income families with services and works with community members/committees to implement community programs and poverty reduction strategies (Union of BC Municipalities 2015).

Although a number of daycare and early childhood development programs are available in Terrace, no daycare or childcare is available in Stewart. *Success-by-six* provides a means for families with young children to interact and, on a volunteer rotation basis, provides an opportunity for childcare. Other early childhood programs such as Mother Goose, Tots and Tales, and First Steps have been offered through the Stewart Public Library.

TDCSS provides community living services, youth and family services (including the Big Brothers/Big Sisters Programs), employment services, and counseling and support services (TDCSS 2012). Employment services are also provided through Terrace Employment and Assistance Office and Northwest Training Ltd. Career Counselling and Employment Centre.

Domestic violence support is offered through a number of agencies in Terrace including Terrace and District Victims Assistance Program (TVAP), RCMP, MCFD, and Stopping the Violence Counsellors through the Ksan House Society. Both the TVAP and MCFD provide services to Stewart.

Shelters and transitional housing options are provided through the Ksan House Society in Terrace, however most are reportedly operating at capacity and specific options, such as second stage housing for women and children fleeing domestic violence and options for young adults in challenging living circumstances, are limited (NDIT 2015b).

For low-income families, some support services are available in Terrace including a soup kitchen and food bank, discount shopping options (i.e., Salvation Army, Hospital Auxiliary, TDCSS Core Store), and the Salvation Army food share. The Kalum Community School Society in Terrace also provides a Hungry Kids Project and the Kermode Friendship Society in Terrace implements an early childhood development program, a connection to a wellbeing health program, and an Aboriginal child and youth mental health program.

In Stewart, volunteer-based community groups have initiated programs for low-income families such as the Stewart food bank, Christmas hamper program, and the Stewart Community Emergency Fund.

Assisted living facilities for seniors, people with disabilities, and/or others are available in Terrace (ERM Rescan 2013). These facilities provide services for local residents as well as those in surrounding communities. Smaller communities, for example Stewart and Nisga'a Villages, do not have local long-term care homes for seniors.

The social service or social development department of each Nisga'a Village Government provides social services to the community (Rescan, 2012). Services offered by the Nisga'a Villages include pre-school, daycare, youth programs, home care for seniors and/or the disabled, domestic violence prevention, community preventative services, and training and

education support (ERM Rescan 2014; Tera Environmental Consulting 2014; ERM Rescan 2012).

NLG also provides social services through Nisga'a Child and Family Services (NCFS) (NLG 2017b). NCFS has offices in Gitlaxt'aamiks, Terrace, and Prince Rupert and works with MCFD to ensure the protection of and wellbeing of Nisga'a children is consistent with *Ayuukhl* Nisga'a and provincial laws (NLG 2017b).

20.4.4.3 Context for Housing

Since 2011, there have been concerns raised about the rapidly changing housing markets in the Northwest (NDIT 2015b). Average assessed value for single-family dwellings in 2017 in the RSA ranged from $100,000 to $300,000, with reported prices highest in Terrace and lowest in Stewart (BC Assessment 2017). Housing prices increased by approximately 30% in Terrace between 2011 and 2015 (NDIT 2014) and stabilized with an almost 0% increase between 2016 and 2017 (BC Assessment 2017). In Stewart, average assessed values of residential single family homes increased by 13% from 2015 to 2016 and almost 4% from 2016 to 2017 in Stewart (BC Assessment 2017, 2016). Much of the increase is attributed to the overflow pressures from development in Kitimat with the convergence of the Rio Tinto Alcan, LNG Canada, and Kitimat LNG projects (NDIT 2014, 2015b).

More than 4,900 private dwellings were reported in the 2016 Canada Census for Terrace with a 95% occupancy rate (Statistics Canada 2017). In Stewart, 292 private dwellings were reported in 2016, which is a 22% decrease from the 2011 Census (Statistics Canada 2017). The occupancy rate in Stewart was 64% with 187 homes occupied by permanent residents. The remaining 105 units were either unoccupied or rented by non-permanent residents. Stewart has one apartment building (18 units) and approximately 20 homes for rent (Volume 8, Appendix 20-A). Many of these are rented seasonally by transient employees of different resource based industries and exploration activities (M. Hyslop. Pers Comm. 2017).

Temporary accommodation includes two hotels, two motels, and two RV parks with approximately 100 rooms and 150 campsites. Approximately 40 rooms are also available in nearby Hyder, Alaska (PRGT Ltd. 2014b). Tourists and exploration crews heavily use temporary accommodation in the summer. Two former logging camps near Meziadin Junction are reportedly being restored to accommodate construction camps (PRGT Ltd. 2014b).

Rental availability and accessibility, particularly for low-and-fixed income families, has been a major concern for the city centres in the RSA. While Terrace's rental availability has increased in the last year as a result of new housing developments, rental rates also continue to increase (NDIT 2015b). The percent of tenant households spending 30% or more of household total income on shelter costs was 44% in 2011 and, on average, the monthly costs for rented dwellings was $722 (Statistics Canada 2011a). Rental rates in Terrace increased by 32% between 2006 and 2013 (NDIT 2015b). Data from the 2011 Census are suppressed for Stewart; however in 2006, 20% of permanent households rented in Stewart (Statistics Canada 2006).

Across the RSA, nearly 60% of dwellings were constructed prior to 1980, with 16% of total dwellings requiring major repair (Statistics Canada 2011a). According to the 2006 census, the majority of dwellings in Stewart (89%) were constructed prior to 1986 (mostly in the 1960s and 1970s) although none were reported as in need of major repairs (Statistics Canada 2006).

The Nisga'a Villages and village-based housing committees are responsible for housing management including financing, repairs, and new construction (Rescan Environmental Services 2012). In 2016, there were 677 private dwellings, of which 571 were occupied by usual residents in the Nisga'a Villages (Statistics Canada 2017). Approximately 40% of the housing stock in 2006 was constructed prior to 1986 with between 33% and 46% in need of repairs across the Nisga'a Villages (Rescan Environmental Services 2012). This is notably higher than the average in the RDKS and the province. The average number of persons per household across BC is around 2.5. Non-Aboriginal communities in the LSA are at or below the provincial average while Aboriginal communities, with two exceptions, have a mean of about 3.5 persons per household. Primary research completed in the Nisga'a Villages for the Kitsault Mine Project in 2011 showed that most respondents indicated the number of people per household is much higher, ranging from 4 to 8 (Rescan Environmental Services 2012).

20.4.4.4 Context for Infrastructure

The Infrastructure VC for the Social Effects Assessment is restricted to critical community infrastructure, such as domestic and commercial water supply, energy supply, solid and liquid waste disposal and management, ground and air transportation, and telecommunications.

For the most part, all communities in the LSA have adequate physical infrastructure and utilities for current population levels and have the capacity to absorb some increase in demand (Volume 8, Appendix 20-A). Most infrastructure in Stewart is in need of repairs, and the District lacks the necessary funding.

Stewart is serviced by three wells with capacity for 4,300 m^3/day. The current average daily demand is 1,400 m^3/day with peak demand of 3,000 m^3/day.

Solid waste management has, until recently, been managed through the Stewart landfill, which reached capacity in 2016. Plans are in place for waste to be redirected to the Meziadin Landfill, which is also nearly capacity and is heavily used by resource development projects (PRGT Ltd. 2014b). Recycling in Stewart is managed by a volunteer group operating at capacity with the current population.

Most communities within the RSA are connected by paved highways (Highways 37, 37A, 16, and 113). Terrace is a regional transportation hub. The Northwest Regional Airport, approximately 8 km south of Terrace, offers flights to Vancouver, Victoria, Prince Rupert, Prince George, and Kelowna. There is also a paved airstrip in Stewart. The smaller communities in the LSA have gravel airstrips for charter, contract, and emergency use. Winter weather is a challenge for air transport across the region, and Stewart's airstrip is closed during the winter months (G. Drury, T. Baker, and J. Larson. Pers Comm. 2016).

Greyhound bus service offers scheduled trips between Stewart and Terrace.

The only boat launch at the head of Portland Canal accessible to resident and visiting boaters in Stewart is in neighbouring Hyder, Alaska. Gitwinksihlkw, Laxgalts'ap, and Gingolx all have boat launches (Tera Environmental Consulting 2014). Gingolx also maintains a large breakwater facility, a helipad, and a marine tenure for a Prince Rupert-based floatplane company (Tera Environmental Consulting 2014).

Other sorts of community infrastructure in Stewart include housing (addressed separately in Section 20.4.4.3), school buildings, and recreational facilities. Many of these were built during previous economic boom times and have since fallen into disrepair due to the lack of use and maintenance. Many of these facilities require restoration and repair before they would be useable again.

20.4.4.5 Context for Project-related Traffic

The main highways in the LSA are Highway 37 from Kitwanga to Meziadin Junction and Highway 37A from Meziadin Junction to Stewart. These roads typically have low traffic volumes because of low population densities. The Highway 37 and 37A Traffic Impact Study (Volume 7, Appendix 1-C) indicates that the average annual daily traffic between 2004 and 2016 was 759 trips per day on Highway 37 and 256 trips per day on Highway 37A.

Traffic does increase in the summer due to tourism and other summer-based activities. Winter weather conditions, terrain, and speed limits are the main limiting factors for traffic flow (PRGT Ltd. 2014b).

20.4.4.6 Context for Recreational Values

In addition to resource development opportunities, Stewart attracts residents and visitors wishing to enjoy the region's natural features and activities and the picturesque and historical nature of the town and nearby Hyder, Alaska.

Stewart and the surrounding area have many recreation opportunities and unique attractions. Highway 37A, between Meziadin and Stewart, offers scenic sites of nearby mountains and glaciers; both Bear and Salmon Glaciers can be viewed from roadside locations. From Stewart, wildlife viewing is easily accessible. Tourists can travel across the border to Hyder, Alaska to access the Fish Creek bear-viewing platform (Destination BC Corp. 2014). Most recreation activities are pursued independently, with the exception of one guide outfitter, some guided fishing along the Portland Canal, and heli-ski trips (Tourism BC 2010).

There are a variety of campgrounds, community parks, recreation sites, hiking trails, wildlife watching, water sports, fishing, golf, snowmobile trails, ice rink for hockey and figure skating, and tennis courts in Stewart. Several maintain hiking trails in and around Stewart provide accessible outdoor recreation opportunities for residents and tourists alike. The Bear River and its tributaries, including Bitter Creek, are closed for fishing (FLNRO 2015b).

There are several lakes and rivers in the area for fishing, boating, and water skiing. Snowmobiling starts in November and can continue through to July. Snowmobiling events

are held by the Stewart Bordertown Snowmobile Club. The areas around Long Lake, 25 km north of Stewart, and Summit Lake, close to the old Granduc site, are two especially popular snowmobiling areas.

Clements Lake Recreation Area provides swimming, camping, canoeing, and hiking opportunities. It is located approximately 13 km from Stewart along Highway 37A, approximately 0.5 km north of the proposed turn off for the Project at the mouth of Bitter Creek. Clements Lake is the trailhead for a hiking trail that leads to Ore Mountain on the northern flank of the Bitter Creek valley. The trail is a steep, 4 km hike to a view point overlooking the Bear Valley. About 1 km beyond the viewpoint is a small alpine lake that marks the endpoint of the hike.

Current recreational use of the Bitter Creek valley is limited due to rugged terrain. The existing access road, including the bridge at Hartley Gulch, was decommissioned in the mid- to late-nineties. The only known recreational use of the Bitter Creek watershed is by heli-skiers and occasionally hunters (see Volume 3, Chapter 19, Economic Effects Assessment).

20.4.4.7 Context for Visual Quality

According to the NSSRMP, there are high scenic values along most of Highway 37A from Stewart to Meziadin Lake. The NSSRMP uses a classification system to establish visual quality objectives (VQOs) based on FLNRO criteria used in forest management. The corridor along Highway 37A is classified as a mix of *preservation* and *retention*, the two highest and rarely used VQO designations in the province (FLNRO 2012; Volume 8, Appendix 20-B Visual Quality Assessment). The area at the mouth of Bitter Creek is designated for *retention*, which means activities should be limited to those not visually evident (FLNRO 2001). The retention designation specifies that only up to 1.5% of the existing view scape should be altered from a perspective view (i.e., ground-level point of view). The road is considered an existing feature and does not enter the calculation of alternation (FLNRO, pers. comm. 2017).

20.5 Potential Effects

This section identifies how each social VC and IC may be affected by interactions with Project components and activities. Potential social effects of the Project are primarily related to Project employment, procurement of goods and services, and the influx of people (e.g., workers and their families, and induced migration) associated with the Project. In addition, visual disturbances to the landscape or changes in wildlife and fish habitat may detract from Stewart and Bear Valley recreational values.

The assessment notes interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and inputs received from EAO, government agencies, Nisga'a Nation, and the public regarding the exclusion.

Project effects on the socio-economic conditions of Aboriginal Groups resulting from a change in the environment are addressed more specifically in Volume 4, Chapters 25 (TSKLH), 26 (MNBC), and 27 (Nisga'a Nation).

20.5.1 Methods

The assessment of potential social effects of the Project is based on consideration of potential interaction of Project activities and components with social VCs and ICs informed by research that has examined *ex post* the social effects of other mining projects, including both theoretical and case-based research. Building on the social context described above (Section 0) and the results of the Socio-Economic Baseline Report (Volume 8, Appendix 20-A), a narrative has been developed to explore how individuals, families, and communities might react to, perceive, or experience change in relation to Project activities and components.

The Social Effects Assessment is inherently based on a number of assumptions and in full recognition that experience of social effects is dependent on, among other things, individual and family decisions and behaviours. Exact social outcomes and magnitudes of social outcomes are not directly predictable and can vary widely. Each assumption is informed, to the extent possible, on the experience of similar projects and reasonably accepted generalizations of social change associated with mining projects in remote communities.

20.5.2 Project Interactions

During the scoping phase, selection of VCs and ICs, and consideration of feedback generated through consultation and engagement with working group members, Nisga'a Nation, stakeholders, and the public, key potential interactions between proposed Project components or activities with the social features of the RSA and LSA were identified.

The main drivers of social effects due to the proposed Project components and activities are population in-migration, employment and income, and changes in view-scape or the environment. The key social interactions identified are summarized as follows:

- The employment of a workforce, contractors, sub-contractors, and procurement of goods and services may result in rapid demographic and population changes in the LSA. New and temporary residents will place direct and indirect pressure on health and medical, social, and emergency services, the housing market, and community infrastructure, including water supply, roads, solid waste collection, and sewage;

- Project-related employment, associated high stress, high wages, and the type of scheduling and living arrangements (e.g., block-shift rotations, fly-in/fly-out (FIFO), or bus-in/bus-out (BIBO) construction camps, or temporary/permanent housing) will interact with individual, family, and community health and wellbeing;

- Workforce, contractor, sub-contractor, and induced in-migration will put pressure on existing housing supply. Housing shortages, high wages, and income inequalities may limit access and availability of affordable housing; and

- Project-related infrastructure, such as the construction camp, the entrance to the Access Road, the Powerline near the Bitter Creek bridge, and the Process Plant, will change the view scape and potentially change recreational value for tourists visiting the historical town of Stewart, the public traveling along Highway 37A, those exiting the

highway to visit Clements Lake Recreation Area and the Ore Mountain trailhead, heli-skiers, and possibly hunters on guided hunting trips with Nisga'a Guide Outfitters.

No interactions between proposed Project components or activities and the selected social VCs or ICs identified by IDM, Working Group members, or through consultation were excluded during this scoping phase.

Table 20.5-1: Potential Project Interactions, Social VCs and ICs

Project Component or Activity	Valued Component or Intermediate Component	Potential Effect / Pathway of Interaction
Workforce (including employment of staff and contractors)	Potential Social Issues Related to Project and Project Workforce	Temporary demographic and population changes Relocation of workers and families Changes in demand for temporary and permanent accommodation Changes in average community income and income inequalities Changes in demand for health and medical, social, and emergency services Changes to worker stress levels, lifestyle, and behavioural choices Changes in family and children support
	Social and Health Services	Temporary demographic and population changes Changes in prevalence of social and health issues Relocation of workers and families Changes in traffic volumes
	Housing	Temporary demographic and population changes Relocation of workers and families Changes in demand for temporary and permanent accommodation Changes in worker and average community income
	Infrastructure	Temporary demographic and population changes Relocation of workers and families Changes in demand for temporary and permanent accommodation Development of construction worker camp Changes in needs and requirements for community infrastructure
	Recreational Values	Temporary demographic and population changes Relocation of workers and families Changes in demand for existing recreational opportunities

Project Component or Activity	Valued Component or Intermediate Component	Potential Effect / Pathway of Interaction
	Project-related Traffic	Employment and transport of workforce to and from the Project site
Construction, operation, and decommissioning of construction camp, mine-site, access road, transmission line, and processing facilities	Recreational Values Visual Quality	Changes in view scape Changes in access to recreational opportunities Changes to fish and fish habitat

20.5.3 Discussion of Potential Effects

Social VCs and the pathways that inform their assessment are necessarily intertwined. For example, the Social and Health Services VC acts as a pathway of potential effects on the Potential Social Issues Related to the Project and Project Workforce VC and vice versa. Each VC was also assessed against the assessment endpoint of maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects.

Project-related employment (direct, indirect, and induced) is considered the main driver of potential social effects and a consistent effect pathway for most social VCs. Therefore, a brief discussion on expected population change will precede the following detailed description of key effects summarized in Table 20.5-1 for each social VC.

Assumptions and uncertainty regarding the potential effects are documented under each subsection for each social VC identified.

20.5.3.1 Project-related Employment and Population Change

Estimates on how Project-related employment will affect the local population over the course of a Project life are difficult to predict and highly influenced by external factors. The Project-related Employment IC is assessed in detail in the Economic Effects Assessment (Volume 3, Chapter 19) and summarized here as Project-related Employment is also considered a pathway effect for the following social VCs:

- Potential Social Issues Related to Project and Project Workforce (Section 20.5.3.2);
- Social and Health Services (Section 20.5.3.3);
- Housing (Section 20.5.3.4); and
- Infrastructure (Section 20.5.3.5).

During the 18-month Construction Phase, the influx of people to Stewart is expected to be temporary and transient. The Project is estimated to require 754 person-years of direct and indirect employment and a further 111 person-years of induced employment during this period (Volume 8, Appendix 19-A). The Economic Effects Assessment (Volume 3, Chapter 19) outlined the challenges in predicting the proportion of employees and work packages that

may require contractors or businesses located outside of the RSA as opposed to professionals, trades, and semi-skilled labour that may be sourced from within LSA and RSA communities.

During the Construction Phase, it is assumed that most workers will be sourced from outside the LSA and will live in a self-contained work camp located in Stewart while on rotation. The basis for the assumption that most of the in-migration to Stewart during the Construction Phase will be temporary and transient, and that there will be little or no in-migration to Nisga'a Villages includes consideration of the following aspects:

- The 18-month Construction Phase is a short period of time;
- Employment during the Construction Phase is temporary;
- Workforce will be housed in a self-contained work camp within Stewart and provided with transportation to and from transit hubs (i.e., Terrace); and
- Construction workers will operate on a two week on, two week off work (or similar) rotation.

The Operation Phase is currently planned to last six years and is expected to generate 964 person-years of direct and indirect employment and a further 263 person-years of induced employment (Volume 8, Appendix 19-A). Stewart's population of 410 cannot fill all mining and direct supplier positions required, but is expected to benefit from both direct and indirect employment with the Project and induced opportunities.

IDM's long-term objective is to ensure that the Project results in net benefit to Stewart and other LSA communities. As such, IDM intends to prioritize local employment and procurement and encourage employees to relocate permanently to Stewart. IDM, in contrast to most contemporary mining projects, is not planning an onsite Operation Phase work camp. Instead the Project will rely on a range of housing arrangements to accommodate workers and their families in the town and provide transportation between the Project and Stewart. During the transition from construction to operation, the construction work camp will remain available to alleviate any negative effects on housing.

The Operation Phase is expected to generate a permanent increase of Stewart's population. The scale of the increase is difficult to predict and will depend largely on the level of local hiring and procurement, the percentage of employees willing to relocate, and the number of dependents that accompany the operation workforce.

Under different scenarios, Stewart could experience anywhere from a 25% to 100% increase in population. For example, if all workers are sourced from outside of Stewart and relocate with two dependents each, the population of Stewart would nearly double. In contrast, if three quarters of the workforce is sourced from outside of Stewart and only half of those workers have dependents, the population of Stewart would increase by approximately 40%. Population in-migration from induced employment opportunities would result in additional increases. Stewart's small population means that even small increases in population size will likely be felt as significant to community members.

IDM's commitment to a resident Operation Phase workforce located in Stewart will result in no noticeable effects on population levels for the rest of the LSA, specifically in the Nisga'a Villages, nor in the RSA. Those employed from other areas in the RSA, specifically Terrace or the Nisga'a Villages, or from elsewhere in the province, may prefer to retain their primary residence in their home community and work a shift rotation schedule. Low in-migration may be experienced in Terrace through increased demand for direct supplier positions.

20.5.3.2 Potential Social Issues Related to the Project and Project Workforce

Many social issues with consequences for individuals, families, and community wellbeing have been associated with mining projects. However, literature reviews show inconsistencies and relatively inconclusive cause-effect relationships between mining projects and social effects. The prevalence and type of social issues tend to vary across mining phases with many social concerns heightened at mine closure (J. A. Shandro et al. 2011).

Social outcomes vary for each Project and are highly influenced by location, histories of regional activities, corporate culture, community receptiveness, management approaches, and local socio-demographics (Lawrieet al. 2011; Lockie et al. 2009; Smith et al. 2009; Mactaggart et al. 2016).

Mining provides many socio-economic benefits to local communities, including employment opportunities, increased spending in local businesses, population growth, and higher tax revenues leading to new services and infrastructure. A study across three mining towns in Australia saw the total income assistance per capita and unemployment decrease during boom years (Lawrie et al. 2011). Employment, income, and education, including training and skill development, are key social determinants of health and wellbeing (Glymour et al. 2014; Buell 2006; Gibson and Klinck 2005; Shandro et al. 2011; Mikkonen et al. 2010).

The assessment endpoint for the Potential Social Issues Related to Project and Project Workforce VC is maximizing positive effects of the Project on community health and wellbeing while minimizing negative effects including consideration for inequalities, vulnerable populations, mental illness, community cohesion, drug and alcohol abuse, and increased rates of communicable diseases. Based on the literature and key issues emanating from other projects, issues and potential effect pathways are discussed under three dominant themes: (i) mental health and addictions; (ii) family health; and (iii) community cohesion, safety, and health.

Some measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Potential Social Issues related to the Project and Project Workforce are discussed below and are listed in more detail in Section 20.6.1.1 and Table 20.6-1.

20.5.3.2.1 Mental Health and Addictions

Work camps and FIFO/BIBO arrangements will be employed during the Construction Phase and have been linked to workers feelings isolated, depressed, and leading to substance abuse (Perring et al. 2014). In isolated camps, downtime can often be disrupted by the continuation of conflict with colleagues and lack of opportunities to gain space away from work. Some research also suggests that workers in remote areas with minimal social

amenities and recreational facilities and programs are particularly vulnerable to alcohol and substance abuse (Chandler 2014).

Itinerant, male-dominated, and highly paid workforces have been known to develop a culture of drinking at camps as a means of stress alleviation (Perring et al. 2014). High disposable incomes and lack of family responsibilities enables reckless spending on alcohol and drugs, particularly when workers are ill-equipped to manage sharp increases in income (Gibson and Klinck 2005). Substance abuse not only effects work performance; it features heavily in cases of crime, assaults, bankruptcy, infidelity, prevalence of sexually transmitted diseases, and family conflicts (Gibson and Klinck 2005; Shandro 2014).

There is a positive correlation between mining camp recreational facilities and infrastructure and worker health and wellbeing (Perring et al. 2014). An in-town camp location may further enhance the ability for workers to maintain their existing lifestyles and facilitate socializing. Workers will have access to parks, restaurants, areas to walk and jog, and will generally be able to distance themselves from work. Increased interactions between community members and the workforce will support development of sense of community and belonging (Perring et al. 2014).

During both the Construction and Operation Phases, IDM anticipates that workers will follow rotation schedules of 12-hour shifts organized into appropriate rotations (likely two weeks-on/two weeks-off during construction and 4 days-on/4 days-off or 5 days on/2 days off during operations). These atypical schedules and long work days have substantial implications on worker fatigue, stress, and overall wellbeing. Mine and construction sites are also high pressure and high risk working environments. The risk of injuries and accidents and the performance and production demands require high levels of alertness, concentration, and compliance with site policies (Gibson and Klinck 2005; AccessEAP 2015). Stress and fatigue are prevalent among employees with workers reportedly physically and mentally exhausted at the end of rotations (Gibson and Klinck 2005; Hajkowicz et al. 2011).

Chronic high stress and fatigue can also lead to a variety of mental health concerns, including higher incidences of criminal and anti-social behaviour and alcoholism (Petkova et al. 2009). Mental health issues can reportedly cost mines between $300,000 and $400,000 a year and result in workers being absent from work and less productive, and increases their risk of injury (Macgroarty and Pfaender, no date).

During the Operation Phase, the workforce will be encouraged to relocate themselves and their families permanently in Stewart. The transition phase may be associated with increased stress, common with moving and finding accommodation, and a period of adjustment while friend and support networks develop within the community.

In the long term, residing locally will build a stronger sense of place and meaningful attachment. A sense of belonging to the community is often coupled with informal social controls on behavior and a lower occurrences of social disruption compared to non-resident workforces (Carrington and Pereira 2011).

Workers will also benefit from having a home base and family to return to at the end of each shift as opposed to each rotation schedule (Shandro et al. 2011).

During the Closure and Reclamation Phase, the Project will gradually require fewer employees. Loss of direct employment as well as trickle down changes in indirect and induced employment and expenditure are part of the mining cycle but can exacerbate substance abuse, depression, and anxiety, and associated concerns with increases in domestic violence and family break-up (Shandro 2014; Buell 2006; Maksimowski 2014).

Depression and substance abuse are ongoing challenges in the RSA with rates exceeding the provincial average (Section 20.4.4.1; Volume 8, Appendix 20-A). Current high prevalence and vulnerability to substance misuse and depression in the RSA may be related to employment fluctuations and closure of past development projects. Reduction in mine employment in Tumbler Ridge coincided with increased rates of depression and anxiety amongst miners and their families (Shandro et al. 2011).

The likelihood and magnitude of these social issues at closure is largely dependent on the local economy at the time. Many resource development projects in the area are in the exploration phase and could be operating when the Project reaches the Closure and Reclamation Phase. Employees will have gained skills and experience and will be equipped to source new employment. The potential social issues arising from loss of employment during the Closure and Reclamation Phase do not outweigh the benefits of employment during the Construction and Operation Phases.

In summary, the Project workforce is likely to experience on-the-job stresses and fatigue common to mining projects and atypical schedules. IDM and stakeholders are much more aware of these social issues than projects have been in the past, and IDM will work proactively with stakeholders and service providers to implement programs and health services to promote stress and fatigue management and positive mental health. Recreational opportunities and leisure activities will be planned to provide outlets for stress release, other than substance abuse. Residual adverse effects on mental health and addictions are not anticipated as a result of the Project.

20.5.3.2.2 Family Health

Atypical work schedules can put a strain on families and place additional workloads on spouses (usually female) that remain at home. During the Construction Phase, crews will likely work 12 hour shifts and shift rotations organized into blocks of time-on and extended time-off, returning to their place of residence and families at the end of their rotation.

Routine separation from family and support can adversely affect the wellbeing of non-residents and their families (Carrington and Pereira 2011). Evidence suggests that relationships suffer when partners are away for extended periods and engaging in drinking or drugs while at camp (Carrington and Pereira 2011). One study found that happiness and wellbeing of spouses was directly tied to the rotation lengths of non-resident workers, their distance from home, and the efficiency of communication (Perring et al. 2014).

Many workers have also reported being too exhausted to participate and connect with family life and required a period of readjustment when coming off shift (Gibson and Klinck 2005; Hajkowicz et al. 2011; Petkova et al. 2009; Shandro et al. 2011). Poor quality and quantity of time spent with families can lead to chronic family dysfunction, stresses, and breakdowns (Hajkowicz et al. 2011; Petkova et al. 2009). High stress levels, poor coping

mechanisms, and family dysfunction amongst miners has also been associated with elevated occurrences of domestic violence (Hajkowicz et al. 2011).

During the Operation Phase, the mine will operate 24 hours per day, seven days a week, and require atypical schedules and substantial demand on employee time. Time-off often may not align well with family and community life and activities. A recent review of studies suggest that 12 hour work days adversely affect families in three ways (Sharma and Rees 2007):

- The work/eat/sleep cycle of workers while on-rotation limits the quality and quantity of time employees can spend with their families and intimacy with partners;
- Fatigue, irritability, and short tempers contribute to negative relationships; and
- Spouses are forced to play dual parental roles in child rearing and are obliged to take on responsibilities inside and outside the family.

High stress levels are common among women living in remote mining communities who shoulder extra household work and responsibilities for child care (Hajkowicz et al. 2011). Lack of resources for child care and household support in rural mining communities limits the ability of spouses to engage in the workforce (Sharma and Rees 2007). For some families, these challenges or sacrifices may be accepted for progress on longer term goals, such as financial security and career experience.

Much of the construction workforce will require specialized skills and will likely already be engaged in or have experience with FIFO/BIBO models and working in remote areas setting-up project sites. As such, the Construction Phase will likely simply maintain pre-existing circumstances for many families. This phase will be short and temporary, with the Operation Phase aiming to build a more family and community friendly model.

During operation, new workers and their families are likely to experience stress as family life adjusts to atypical schedules common in mining. A healthier work-life-balance will be supported through shorter rotation schedules for some crews and consistent access to home-bases. IDM will work proactively with employees, stakeholders, and service providers to encourage home-life balance and minimize potential effects on family health during the Operation Phase.

20.5.3.2.3 Community Health, Safety, and Wellbeing

Review of recent studies suggests that social effects experienced and perceived by local communities varies greatly between non-resident workforces flying-in for shift rotations and permanent residents (Carrington and Pereira 2011; Shandro et al. 2011; Perring et al. 2014; Smith et al. 2009).

Non-resident workforces will dominate during the Construction Phase, with most workers being housed in a work camp to be located within Stewart. Transient workforces often do not contribute in a positive way to community health, safety, and wellbeing and in some cases have been linked to higher incidences of criminal and other anti-social behaviour (Carrington and Pereira 2011; Petkova et al. 2009). Evidence from mining communities in

Australia showed that rates of violence were more than double regional averages, and in Fort McMurray during the oil boom, from 1986 and 2009, crime was three times the national average (Carrington and Pereira 2011). It has also been suggested that FIFO/BIBO arrangements contribute to a weakening of social bonds and structures (Lawrie et al. 2011).

Transient workforces and work camps are not new to Stewart and are generally welcomed. Anecdotal evidence from Stewart residents comparing past experiences with work camps located within or outside of the town suggests that in-town locations reduce socially disruptive behavior and encourage positive engagements between the workforce and local residents. With camps located in town, more money is likely to be spent locally and reduces potential for tensions associated with the 'fly-over' effect common with FIFO/BIBO workforces (Lawrie et al. 2011).

The Construction Phase is temporary and short, lasting only 18 months, and given Stewart's history with work camps and itinerant workforces, it is unlikely to result in a breakdown of social cohesion and wellbeing.

The beginning of the Operation Phase will be a period of transition and growth. While the exact population increase will be dependent on several factors, Stewart is likely to see a substantial change with both new residents and non-residents searching for long- and short-term accommodation. Recent studies have reported on the social issues surrounding housing and inflated costs of living near resource development projects. Higher-than-average incomes experienced by employees in the mining sector and failure to provide adequate housing has led to housing shortages, inadequate housing options for workers, inflated purchase and rental costs, and increased pressure on low- and assisted-income earners (Petkova et al. 2009; Carrington and Pereira 2011; Shandro et al. 2011). The RDKS population is vulnerable to fluctuations in living and housing costs, with a higher percentage of people on income assistance compared to the provincial average (Section 20.4.4.1).

Low housing stock associated with projects in Australia saw non-resident workers sleeping in their cars and using non-private dwellings such as hotels or motels, caravans, and shared houses (Petkova et al. 2009). The same case study reported a high proportion of permanent housing stock being used by non-resident workers in shared housing arrangements (Petkova et al. 2009). Elevated rental and purchase rates make it difficult for non-employees to access housing and may cause high population turn-over (Petkova et al. 2009).

Recent resource development activity in the northwest has adversely affected the housing market in Kitimat and Terrace. Homelessness outreach workers reported a number of cases where residents had their tenancy terminated to allow for renovations and could not, subsequently, find affordable housing (NDIT 2014, 2015b). Shelters also saw an increase in the number of people sourcing their services (NDIT 2015b).

Many of the adverse effects associated with mining are linked to the rapid rate of population increase that tends to outpace the response capacities of other sectors, such as housing and local government managed infrastructure and services. These effects are temporary and subside after the initial growth period. The construction camp will remain operational over a transition period to support workers as they relocate and minimize adverse effects on housing. In the long term, relocation of workers would change the

permanent resident base with positive implications for services and infrastructure in Stewart. Resourcing for public facilities such as schools, clinics, fire and rescue, and emergency services are based on permanent residence numbers, and increased tax revenue will support preservation and enhancements of community infrastructure.

Small, rural communities are heavily reliant on volunteers for local recreational, civic, social, and other activities and services. Recent studies have highlighted the detrimental effect that block rotations and atypical schedules can have on community groups (Carrington and Pereira 2011). Extended working hours and time off that does not follow normal weekly patterns make it extremely difficult for Project employees to engage in community associations. However, some new residents are likely to move with families or partners willing and wanting to participate in community life.

Volatility of the mining industry and loss of employment associated with the Closure and Reclamation Phase can have adverse effects on community wellbeing if population declines. Social issues that may or may not arise at the close of the Project will be strongly influenced by the economic conditions at the time of closure, such as commodity prices or development of new projects. Between the start of the Project and its close, local communities will have experienced improved services and employees will have developed relevant skills and experience that will help to support them in finding new opportunities. Based on the number of large scale resource-based projects currently under development in northern BC, most employees with training and experience will likely be able to gain employment should some of these project come on line, in which case they may choose to maintain their home-base in Stewart.

20.5.3.3 Social and Health Services

Social and health services available in remote, rural communities are generally resourced based on the resident population and are highly dependent on local volunteers. As a result of Stewart's low population and remoteness, the residents have access to limited emergency, health and medical, and social services and rely on Terrace service providers for a number of amenities and support.

The temporary and transient influx of workers during the Construction Phase, permanent in-migration during the Operation Phase, and the potential social issues outlined in Section 20.5.3.2 will interact with social and health services in the LSA with potentially adverse effects.

Within the Nisga'a Villages, low projected population increase and distance from the Project (approximately 300 km away) will likely result in low effects on Nisga'a Nation's social and health services. Nisga'a citizens working at the Project will have access to social and health services on site and within the community of Stewart. During their off-shift rotations, Nisga'a employees are likely to return to their primary place of residence, where they may seek the support of existing social and health services. IDM will work with NLG to monitor any added burden on existing services; however given the number of potential Nisga'a employees the effect is expected to be negligible.

20.5.3.3.1 Health and Medical Services

Population influxes may place demands on local service providers beyond their capacity and may undermine care available to residents.

Proponents often assume that non-resident mining workforces are likely to continue to use existing their family physicians for regular check-ups, specialist visits, or treatment of chronic conditions; therefore on-site medical care is planned to only manage occupational hazards and urgent health care. However, evidence suggests that much of the pressure placed on local health services from mining projects arise from non-occupational, non-urgent injuries and illnesses (Northern Health 2015a).

Miners and construction crews often have chronic concerns that need ongoing support and close living quarters, such as those experienced in work camps, can contribute to higher rates of communicable diseases such as colds and flu, gastroenteritis, whooping cough, and influenza (Macgroarty and Pfaender, no date). Health workers in Tumbler Ridge reported an increase in sexually-transmitted diseases and pregnancies associated with FIFO commuter arrangements (Community Development Institute 2015; Shandro et al. 2011).

Social issues common to mining workforces, such mental illness and substance abuse, may also place pressure on limited existing services. While workers are reportedly reluctant to access mental health and substance abuse support, these social issues can result in higher rates of injuries and accidents (Macgroarty and Pfaender, no date).

Injuries due to Project related traffic are not expected to place additional burden on health and medical services in Stewart, nor in Terrace, based on traffic model predictions that project a less-than-one-percent increase in traffic accidents (Section 20.5.3.6; Volume 7, Appendix 1-C).

Reports from other resource development projects suggest that health and medical service workers are on call 24 hours a day, seven days a week to meet increased demands (Shandro et al. 2011). Overextension of health and medical professionals may lead to high turnovers and poor success at recruiting staff.

During the Construction Phase, most workers will maintain permanent residence outside of the LSA and be housed in a work camp located in town. While on-rotation and living in camp, their non-urgent care demands may place additional burdens on local health services if appropriate medical and health staff are not provided.

The health centre in Stewart is only open from 8:30 am to 4:30 pm with staff on call for emergencies. These opening times are not likely to align well with anticipated Project work schedules and 12-hour shifts. Many specialized services are only available in Terrace, including physio- and occupational-therapy, dentists, optometrists, and pharmacies. Counseling services are also only available through tele-health and appointments are generally fully booked. On-rotation workers will not have time to access health services in Terrace and will be unlikely to remain in Terrace (unless Terrace is their home-base) during their time off. IDM will provide on-site (and in camp) health care that extends beyond occupational first aid and first responder care to ensure minimal adverse effects on health

services in Stewart. Offering of comprehensive health services in camp and on-site has also been linked with attracting and retaining mine staff.

During the Operation Phase, health services will adjust with the change in permanent population leading to improved resources over the long term. There will likely be gaps in service delivery in the short term while regulatory agencies respond to population changes and recruit professionals. Rural communities, such as Stewart, often have difficulties in attracting and retaining medical staff. Population growth and improvement in services and recreation may entice more permanent medical professionals to relocate to Stewart. Resources engaged during the Construction Phase may remain to bridge gaps in health and medical services during the transition period.

Many of the social issues highlighted in Section 20.5.3.2, and which have implications for health and medical services, are existing and ongoing concerns in the LSA and RSA. IDM will work with NHA, the District of Stewart, and other agencies as required to ensure that adequate and appropriate services are made available to the Project workforce and their families and that current residents of Stewart will experience no undue burden from changes in service.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Health and Medical Services are discussed in detail in Section 20.6.1.2.1 and Table 20.6-1.

20.5.3.3.2 Emergency and Protection Services

In Stewart, emergency and protection services are provided by the RCMP, municipal fire departments, BC Ambulance, and Search and Rescue services. These service provides cover large areas of approximately 44,000 km^2, which includes all of Highway 37A, plus Highway 37 from Cranberry Junction to Bell II (ERM Rescan 2013). Understaffing coupled with a large coverage area can result in wait times and require residents to make alternative plans.

During both construction and operation, mining projects have placed pressure on local emergency and protection services through increases in socially-disruptive behavior necessitating policing and higher rates of accidents and injuries at the mine site as well as on the road, in camp, or in surrounding communities (Carrington and Pereira 2011).

Crime, disorderly conduct, nuisance, and harassment are expected to be low and within the resourcing capacity of the Stewart RCMP. The Construction Phase is a short 18-month period and work camps and temporary, transient workforces are not new to Stewart. The work camp will be located in Stewart, which has been found to improve the relationships between local residents and transient workers.

During the Operation Phase, employees are anticipated to become community members, which supports establishment of social controls on behavior and decreases the likelihood of substantial increases in crime and other disruptive activities. In addition, changes in the resident population and government revenue from the Project may allow for increased policing resources.

Strain on emergency services has been experienced by similar projects. Higher rates of non-occupational accidents and injuries experienced by employees off-site and potentially in

backcountry areas will change the availability of these services for the local resident population. Health workers in Tumbler Ridge also reported that on-site injuries are becoming more severe, prevalent, and often beyond the capacity of on-site first aid attendants (Shandro et al. 2011).

Anecdotal evidence from the Project baseline study suggests that Stewart currently struggles to meet competing demands placed on their BC Ambulance service with cases of local families needing to drive themselves to Terrace to access emergency health services. The predominant potential adverse effect on emergency and protection services is likely to be an effect on the capacity of BC Ambulance services in the LSA.

During the Construction Phase, IDM will work with the District administration and service providers to define needs and services to ensure the resident population is not adversely effected by increased demand on services.

Long shifts, fatigue, and substance abuse common among miners have also been associated with increases in traffic accidents. During Construction and Operation Phases, IDM will provide transportation between the mine-site and Stewart. The Highway 37 and 37A Traffic Impact Study (Volume 7, Appendix 1-C) additionally concluded that the Project is not like to result in substantial increase in traffic or collision frequency along Highways 37 and 37A.

During the Operation Phase, the anticipated increase in the resident population will lead to new emergency service resources. Improved district-level resourcing will be geared to meeting local population needs and may not fully account for the increased demand on emergency services emanating from the Project or Project workforce. IDM will continue to ensure that on-site services and in-house medical emergency plans are adequate to meet occupational injuries. IDM will also work with service provides to monitor occurrences of off-site incidents, including traffic accidents, involving the Project workforce and will augment resources where necessary.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Emergency and Protection Services are discussed in detail in Section 20.6.1.2.2 and Table 20.6-1.

20.5.3.3.3 Social Services

Potential social issues outlined in Section 20.5.3.2 highlight the need for various social services. Many issues regarding the availability and capacity of social services currently exist in the LSA, and services are already struggling to meet demands.

During the Construction Phase, non-resident workers are unlikely to place additional demand on social services in the LSA. The temporary and transient workforce may access available in-house support services but, while on-rotation and working 12-hour shifts, are not likely to seek assistance from within the LSA. Induced migration is expected to be low during the short construction period and will not place additional demand on social services in the LSA.

During the Operation Phase, permanent in-migration to Stewart is expected, which will likely have a beneficial effect on the variety and level of services offered. However, certain

social issues and pressure on housing may increase the need for social services that to date are mostly offered by handful of community groups. Low-income families in Stewart can access a food bank and an emergency fund, but more permanent social services must be sourced from Terrace. Increases in population, local tax-base, and provincial and federal revenue received from the Project may lead to improved services with beneficial effects on community health and wellbeing.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Social Services are discussed in detail in Section 20.6.1.2.3 and Table 20.6-1.

20.5.3.3.4 Education Services

Low to no in-migration of families is expected during the Construction Phase with no effects anticipated on education facilities and services.

During the Operation Phase, in-migration of workers and their dependents will likely change the demand for education services. New enrollment of students in primary and high school may increase class sizes in the short term. In the long term, schools are staffed based on the number of students enrolled and school districts will be able to respond to the change in demand. School facilities are currently underused with capacity to absorb a substantial increase in students.

Technical institutions within the LSA that offer mining-related programs face issues such as funding, access, and/or capacity to meet demands. An increased request for educational and training services has the potential to stretch resources of institutions in the short term but will also likely support more permanent hiring and engagement of specialists. In the long term, it is anticipated that the educational institutions within the RSA and LSA will gain access to increased funding, build capacity, and increase access to their services, thereby adjusting to the changes in the socio-demographic and economic climate.

There are no adverse social effects anticipated on education services in the LSA; therefore, this effect is not discussed further.

20.5.3.4 Housing

During the Construction Phase, the Project will develop and manage a 250-person work camp in Stewart. The camp will house all temporary and transient workers operating under a FIFO/BIBO commuter arrangement. Low-to-no additional in-migration is anticipated as construction will only last for a short duration and the Project size and workforce is relatively small compared to other projects in the region. Low in-migration and the work camp will result in no adverse effects to housing.

During the Operation Phase, IDM will encourage workers and any dependent(s) to permanently relocate to Stewart. Given the Project turnoff from Highway 37A is located approximately 10 km from Stewart and approximately 400 km (via Highway 37) from the Nisga’a Villages, the Project is not expected to bring about any sort of increase in demand for housing in Nisga’a Villages. Nisga’a Villages are therefore excluded from the assessment.

No effect is expected on the unincorporated villages of Bell II and Meziadin Junction as there are limited housing options available and shuttles to site will run from Stewart, making these areas less desirable.

No effects on housing in the Nisga'a Villages are anticipated.

The effects on the Housing VC may include housing availability and affordability.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Housing are discussed in detail in Section 20.6.1.3 and Table 20.6-1.

20.5.3.4.1 Housing Availability

In the 1970s, Stewart accommodated a population three times the size of the current population; however, many of the homes associated with the large workforce at the time were abandoned and are now generally considered to need substantial repairs and restoration. Current understanding of housing availability and livability of the housing stock is limited.

Anecdotal accounts indicate that current housing stock will be unable to absorb in-migration anticipated during the Operation Phase. There are a number of private dwellings in Stewart available for rent or purchase, including apartment units and 3-4 bedroom homes, but likely not enough to accommodate the estimated Project workforce and their families.

Short-term rentals and temporary accommodations are also heavily used by tourists, other industries, and mineral exploration crews (Volume 8, Appendix 20-A). At least half of the available rental accommodations reviewed during the baseline assessment were fully booked for the upcoming summer months by other resource development companies. Displacement of these temporary and seasonal workers engaged with other projects would likely exacerbate housing demand and lead to inflated purchase and rental costs.

Recent experiences from Kitimat and Terrace highlight the potential adverse effect resource development projects, with high in-migration rates, can have on housing availability and affordability. The increased demand for rental and ownership housing led to lower vacancy rates, renovations, and higher rents, list, and sale prices (NDIT 2014, 2015b). Projects with inadequate space in camps supplied workers with Living Out Allowances and/or entered into longer-term leases with clauses that units would be renovated. Long term tenants, evicted for the renovations subsequently could not compete with the substantial increase in rental rates (NDIT 2014). Low-and-fixed income households were the most vulnerable.

Failure to provide sufficient housing for workers in Australia resulted in workers sleeping in their cars, hotels or motels, caravan parks, and shared houses and led to high population and worker turn-over (Petkova et al. 2009).

IDM fully recognizes the potential effects housing options may have on workers, the community, and vulnerable population groups. A range of housing options will be explored and implemented in partnership with the District, working group members, and other stakeholders. Accommodation options used by industry have included construction of apartments, houses, and neighbourhoods, and use of modular units, RVs, barges, or

floatels[6]. The construction work camp will also be available during the transition period to reduce adverse pressure on housing.

20.5.3.4.2 Housing Affordability

Rising housing and living costs have led to displacement of vulnerable residents, such as low-income Aboriginal residents, students, single parents, low-income households, low-income seniors, and people with disabilities, and difficulty in recruiting and retaining community service professionals (e.g., government, health, social services, and education workers) and other business sector employees, such as retail workers who receive lower wages. Management options that have been used in other communities affected by resource development projects include deployment of social housing funds and subsidized rent, rent control bylaws, and limits on Living Out Allowances. IDM will work closely with the District and social service community groups to ensure low-income and vulnerable households are not adversely affected by the Project.

Stewart residents have experience with boom periods and will be fully engaged in planning for the Operation Phase population growth. IDM will facilitate careful community planning with consideration for infrastructure, community services, and how different economic scenarios may affect municipal development during the Closure and Reclamation Phase.

Stewart has been heavily investing in diversifying their economy and attracting residents to live in the town. IDM's vision to have operational the workforce move to Stewart is aligned with community planning objectives and has been well received by community members and the District. IDM is committed to developing a housing plan and explore a range of options to maximize benefits and minimize adverse effects on housing availability and affordability.

20.5.3.5 Infrastructure

In general, infrastructure within the LSA including water, wastewater, and waste management systems, are old and in need of improvements and restoration.

During the Construction Phase, onsite water, sewage, and waste management will be required for the construction camp in Stewart. A number of plots that have previously accommodated camps have supplied camps of equal or greater size with water, sewage, and waste management services over the same, or longer, time period.

During the Operation Phase, roads, water, and sewage services may need to be extended to new development areas. Waste management collection may also need to include new areas.

No effects on infrastructure in the Nisga'a Villages are anticipated.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Infrastructure are discussed in detail in Section 20.6.1.4 and Table 20.6-1.

[6] A floating hotel, often a repurposed vessel used as a hotel.

20.5.3.5.1 Solid Waste Management

All the regional landfills are nearing capacity with little to no ability to accommodate increased waste from either Construction or Operation Phase workforces. IDM will work with the RDKS, who is responsible for waste management, to derive waste management solutions of benefit to both the local community and the Project.

20.5.3.5.2 Water Supply

The three wells in Stewart have some capacity to meet increased demand, particularly if/when leak detection and demand management programs outlined by NHA are put in place. A study completed by NHA in 2012 found that the maximum daily demand in Stewart was three times the level expected (Northern Health 2012c). During the Project baseline assessment, residents commented that one well recently failed (January 2017) and was being repaired. The ageing water supply infrastructure is in need of repairs under the existing population.

Tax base improvements resulting from the Project, including corporate and personal income tax, sales tax, property tax, and mining tax payments, will assist governments and local municipalities in meeting increased demands and repairing ageing infrastructure (Volume 3, Chapter 19, Economic Effects Assessment). Overall, improvements to infrastructure enabled by the Project will likely lead to continued infrastructure maintenance and availability with positive effects on community health and wellbeing.

20.5.3.6 Project-related Traffic

Project-related Traffic is considered an IC for the purposes of this assessment and was raised in relation to potential Project effects on infrastructure (e.g., public roads and highways) and human health and safety (e.g., accidents and collisions, air and water quality) during Pre-Application discussions with NLG, RDKS, and NHA.

The Highway 37 and 37A Traffic Impact Study (Volume 7, Appendix 1-X) estimated that both the Construction and Operation Phases will have little effect on the average annual daily traffic along Highways 37 and 37A. The largest traffic increase will be observed during the Operation Phase along Highway 37A and will be a maximum of a 3.12% increase in overall traffic rates.

The traffic assessment also concluded that increases in collision rates during both Construction and Operation Phases will be less than 1%.

There are no adverse social effects anticipated due to the Project-related Traffic in the LSA; therefore, this effect is not further discussed.

20.5.3.7 Visual Quality

Visual Quality is considered an IC for the purposes of this assessment with implications for Recreational Values (Section 20.5.3.8).

The Visual Effects Assessment (Volume 8, Appendix 20-B) determined that the Project will have a nominal effect on Visual Quality at the entrance to the Project Access Road at Highway 37A and within in the Bitter Creek valley. The beginning of the Project Access Road will be close to the entrance of Clements Lake Recreation site. Project infrastructure visible at the entrance will include the Access Road and Powerline. Along the Bitter Creek valley, Project components, such as the Process Plant, quarries, stockpiles, and buildings, will be visible to recreationists using the valley.

The scale of the disturbance is considered low relative to the large cut-blocks of a logging operation or the flooding of a valley for a hydro-electric project, however recreation enthusiasts and tourists have expectations of near pristine wilderness that are likely to be disturbed. Use of the Bear Valley is relatively low due to its remoteness and low access and is generally restricted to experienced hunters and heli-skiers.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Visual Quality are discussed in detail in Section 20.6.1.5 and Table 20.6-1.

20.5.3.8 Recreational Values

Stewart and other LSA communities are surrounded by vast wilderness areas with an abundance of outdoor recreational opportunities. The relative isolation and pristine natural environment attract some 40,000 visitors to Stewart each year (District of Stewart 2014). Residents engage in a number of activities including fishing, guide outfitting, hunting, heli-skiing, hiking, snowmobiling, and boating.

During Pre-Application discussions, working group members were concerned that recreational values in the LSA may be affected by changes in view-scapes and by environmental effects to fish and fish habitat. Recreational opportunities may also be affected by improved access and increased demand due to population growth.

Measures to avoid, minimize, mitigate, or otherwise address potential residual effects to Recreational Values are discussed in detail in Section 20.6.1.6 and Table 20.6-1.

20.5.3.8.1 Changes in View-scapes

The Project is located in a remote valley currently accessible only by helicopter or seasoned, backcountry hikers. Project infrastructure will change the Visual Quality for a small number of recreationists using the valley, but is unlikely to have an adverse effect on recreational and tourism use opportunities in Stewart.

The turnoff from Highway 37A to the Project Access Road will be close to the access road to Clements Lake Recreation Area and the trail head to Ore Mountain Trail. Remnants of the old access road are visible now and improvements to the road as well as a view of the Powerline are not likely to have an adverse effect on the assessment endpoint for Recreational Values.

20.5.3.8.2 Increased Access

The Project Access Road may lead to improved access to the Bitter Creek valley. The rugged terrain necessitates that enthusiasts are experienced, physically fit and well equipped. Access to the valley will be limited for safety reasons and to control unauthorized access to the valley. The construction and maintenance of the Access Road is unlikely to lead to changes in recreational values.

20.5.3.8.3 Increased Demand

During the Construction Phase, FIFO/BIBO commuter arrangements would limit time available to crews to engage in any outdoor recreation pursuits. New residents relocating during the Operation Phase may have time during time-off periods. However, the increase in population is not likely to overwhelm the large number of outdoor activities and areas available. Increase in population may benefit the LSA by providing incentive for development and maintenance of more trails and/or wildlife viewing platforms.

Approximately 250,000 adults in BC held freshwater angling licenses in 2010[7], which represented about 8% of the total provincial population (DFO 2012). Based on the dominance of outdoor leisure activities, it is likely that the proportion of adults with angling licenses is higher in the LSA. If the population increased by 100 adults, the LSA may gain an additional 8 to 16 fishers. As many of the fishing locations require at least two hours of travel from Stewart and workers will be on opposite shift rotations, adverse effects on fishing from increase demand is not anticipated.

20.5.3.8.4 Environmental Effects to Fish and Fish Habitat

Freshwater fishing is a common recreational activity for both residents and tourists. Effects to fish and fish habitat from the Project will not result in an adverse effect on Recreational Values as recreational fishing is not permitted on the Bear River and its tributaries, including Bitter Creek (FLNRO 2015). Recreational fishing is permitted on Meziadin Lake and the Nass River, and the Project is not anticipated to have any interaction with these waterbodies. This effect is not further discussed.

20.6 Mitigation Measures

Social effects of the Project do not lend themselves to the same sort of technical mitigation measures that are often available to mitigate environmental effects. In contrast to mitigation measures for environmental effects, there is much less certainty about the outcome of mitigation measures for social effects, which is why it is important to monitor social and economic changes to provide a basis for ongoing adaptive management and assessment of the social effects realized in the context of the Project.

[7] The latest survey was completed in 2015 but as of the date of this publication, results were not released http://www.dfo-mpo.gc.ca/stats/rec/canada-rec-eng.htm

Often there is not a clear distinction between what defines mitigation versus management measures; therefore, the two terms are often used synonymously in this chapter.

20.6.1 Key Mitigation Approaches

In response to the unpredictability of social effects, IDM proposes a series of management and mitigation measures and practices to proactively address potential adverse effects on social VCs.

20.6.1.1 Potential Social Issues Related to Project and Project Workforce

Many of the potential social issues related to mining projects and project workforces are not new to the LSA. These communities and residents have a long history with positive and adverse social effects of projects. The assessment of the Potential Social Issues Related to the Project and Project Workforce VC provides a descriptive narrative of the types of issues that are common and helps define the scope of social and economic management plans. As noted in Section 20.5.3.2, cause and effect predictions are inherently difficult for certain social outcomes. However, understanding potential issues allows companies, municipalities, and service providers to manage, monitor, and adapt programs as projects progress.

IDM proposes to work closely with NLG, the District of Stewart, Working Group members, and stakeholders to monitor and identify appropriate mitigation and management services and programs to limit the development of social issues. These measures will be outlined in a number of plans, the frameworks for each are included in Management Plans and Monitoring (Volume 5, Chapter 29):

- Community Involvement Plan;
- Health and Social Services Plan;
- Local Procurement Plan;
- Skill, Training, and Employment Plan; and
- Social and Economic Management Plan.

These plans will integrate approaches and recommendations from a number of best practice sources including:

- NHA's Best Management Guide for Industrial Camps;
- National Standard of Canada Psychological Health and Safety in the Workplace;
- Psychological Health and Safety: Action Guide for Employers;
- Canadian Cancer Society's Healthy Workplaces Online Guide;
- The Community Development Institute's Best Practices Guiding Industry-Community Relationships, Planning, and Mobile Workforces; and
- BC Healthy Living Alliance's Working on Wellness Resources.

IDM proposes a multi-pronged approach including a focus on individual, family, and community.

Individual mitigation measures may include alcohol and drug use policies, healthy living programs such as fitness and nutrition, physical and mental health support, life coaching, and codes of conduct concerning appropriate employee and contractor behavior in nearby communities.

Family programs may include orientation packages with information about local housing, businesses, services, amenities, and community groups, and development of support groups for families managing atypical schedules.

Community mitigation measures may include community engagement through volunteering or recreational opportunities to connect workers with the community. IDM will build relationships with the community and maintain strong, ongoing, and consistent communication. Open houses at work camps have also facilitated community acceptance.

With adequate mitigation measures and adaptive management approaches, negligible residual adverse effects on Potential Social Issues related to the Project and Project Workforce VC are anticipated.

20.6.1.2 Social and Health Services

The Social and Health Services VC includes consideration of health and medical, emergency, protection, social, and education services. The mitigation measures and likelihood of residual effects are presented for each. Across all services, IDM commits to maintaining open lines of communication with service providers and stakeholders and sharing Project information and updates on an ongoing basis. Early and proactive notification of anticipated population changes, Project delays, hiring, mitigation measures, and management approaches will be provided to support more effective planning and their ability to respond to changes.

20.6.1.2.1 Health and Medical Services

Many projects limit their on-site and in-camp medical and health services to a registered nurse, paramedics, and access to employee assistance programs for counselling (Community Development Institute 2015). Local communities surrounding these projects have seen increased pressure on health and medical services. IDM will work closely with NHA and other medical and health service providers (including family, mental health, and addiction counselors) to ensure that workers have access to a more fulsome set of services that are appropriately geared toward the characteristics of a male-dominated, transient workforce. Services will include non-urgent care demands, mental health and addictions care, sexual health clinics, public health promotion, disease prevention, and on-site wellness programs. Residual effects on medical and health services during construction are anticipated to be negligible based on commitments from IDM.

During the Operation Phase, negligible residual effects are expected on the Stewart health centre. Resourcing for the health centre is based on the community's resident population. During the Operation Phase, workers will be encouraged and supported in relocating to

Stewart. In addition, IDM will work closely with the District and service providers to identify and develop programs and services required to mitigate and address potential social issues related to the Project and Project workforce. The services and resources required will also refer to the best practices sources identified in Section 20.6.1.1.

Throughout the life of the Project, IDM will maintain consistent and open dialogue with NHA and will support the monitoring of health care demands and occurrences of medical escalations and traumas requiring support from local services. IDM will also initiate an operational group whereby NHA, BC Ambulance, Stewart, Terrace and other project proponents can share information and address issues as they arise and before they lead to chronic effects on services.

IDM has also committed to work with NHA in the Application Review Phase and beyond to develop a specific Medical and Health Services Plan prior to the commencement of Project construction. Mitigation measures proposed will result in negligible residual adverse effects on health and medical services.

Further development of mitigation measures are presented in the framework for the Health and Social Services Plan presented in Management Plans and Monitoring (Volume 5, Chapter 29).

20.6.1.2.2 Emergency and Protection Services

The predominant potential adverse effect on emergency and protection services was found to be an effect on the capacity of BC Ambulance services in the LSA. IDM will coordinate with the District, working group members, and stakeholders to establish the best way to mitigate this effect for a net positive benefit on community health and wellbeing. IDM is prepared to manage emergency transportation and evacuation for on-site personnel and in-camp workers and is open to discussions for the best way to support the service more generally. No residual adverse effects are anticipated on emergency and protection services.

Mitigation measures are outlined in the Social and Economic Management Plan (Volume 5, Chapter 29, Section 29.20); resourcing concerns for BC Ambulance will also be covered under the Health and Social Services Plan (Section 29.13).

A number of additional management plans (included in Chapter 29) will be developed to minimize risk of emergencies and injuries on-site, in camp, and within the region more generally:

- Emergency Response Plan (Section 29.8);
- Explosive Management Plan (Section 29.10);
- Hazardous Material Management Plan (Section 29.12); and
- Occupational Health and Safety Plan (Section 29.17).

20.6.1.2.3 Social Services

Social services available in Stewart are minimal with most residents having to travel to Terrace to access family support services, low-income services, and employment, training, and skill development services. Much of the services available in Stewart are volunteer-

based and, while there may be some additional pressure, the increase in population may also supply additional volunteers.

To address some of the Potential Social Issues related to the Project and Project Workforce, IDM and partners will identify the need for bylaws, new services, or work with service providers in Terrace to improve accessibility for Stewart residents. Negligible residual effects are anticipated on social services.

20.6.1.3 Housing

During the Construction Phase, potential Project effects are predicted to be minimal as IDM will provide a work camp with adequate capacity and ensure the work camp is in place prior to construction.

IDM will work closely with the District to develop a housing plan with a comprehensive description of housing availability, quality, and affordability. In collaboration with the District, community groups, and the MCFD consultant, IDM will determine Stewart's low-income and vulnerable population and ensure that plans address their specific needs.

A range of housing options may be implemented including construction of apartments, houses, and neighbourhoods, restoration of row-houses and apartment buildings, and use of modular units, RVs, barges, or floatels. While the operation workforce will gradually increase, the construction work camp will also be available during the transition period to reduce adverse pressure on housing.

IDM and the District of Stewart will consult with other jurisdictions in northwest BC who have completed Housing Action Plans to solicit advice on good practices for housing policies and measures to ensure housing remains affordable in Stewart. .

These mitigation measures as well as engagement with other resource companies will allow IDM, the District, working group members, and stakeholders to formulate a housing action plan to ensure negligible residual adverse effects on the availability and affordability of housing.

20.6.1.4 Infrastructure

The assessment of Stewart's infrastructure found that the water supply system is in need of repair but does have the capacity to support an increase in demand, while the solid waste landfills available are at capacity.

The Project is anticipated to result in a positive effect on the water supply infrastructure as the increase in population and tax-base will facilitate repairs. IDM will also work with the District to achieve improvements in the system to attract and to retain workers and families to the town.

The District and RDKS are in the midst of establishing options for waste disposal and IDM will further support in the development of these options. Overall, no residual adverse effects are anticipated on Infrastructure in the LSA as a result of the Project.

20.6.1.5 Visual Quality

Negligible adverse social effects are anticipated due to the Project's effect on Visual Quality. Project infrastructure including the Access Road, Powerline, and buildings do have a physical presence on the land and will be visible by recreationists accessing these areas. The number of users of the Bitter Creek valley is extremely low, and visibility of the Access Road, gate, and Powerline were determined to have minimal adverse effects on recreational values in the LSA.

Some measures that can be taken to reduce the effect on Visual Quality for backcountry users and recreationists include measures to retain existing vegetation to screen Project components from view and re-vegetation of embankments disturbed for road construction and right of way for the Powerline.

The Access Road entrance and the Powerline will be visible to Highway 37A users and to those on their way to the Clements Lake Recreation Area. Few options are available to hide these features and their location will be dictated by factors other than consideration of visual effect. Similar to road embankments, natural or assisted green-up of freshly cut areas will help them blend more readily into the surrounding landscape, reducing the visual effect.

20.6.1.6 Recreational Values

The assessment showed that low to negligible effects are anticipated on recreation values within the LSA. However, IDM will work closely with the District of Stewart, Tourism BC, working group members, and stakeholders to establish and promote recreational opportunities as a means of attracting tourist and permanent residents.

For the Bitter Creek valley, an Access Management Plan (Volume 5, Chapter 29, Section 29.3) will be developed to limit pressure on the natural resources due to improved access. This will include installation of a locked gate with appropriate signage and company policies prohibiting employees, contractors, and sub-contractors from entering the valley for any activities other than work-related.

20.6.2 Effectiveness of Mitigation Measures

The anticipated effectiveness of mitigation measures to minimize the potential for significant adverse effects is evaluated and classified as follows within this section:

- Low effectiveness: Proposed measure is experimental, or has not been applied in similar circumstances.
- Moderate effectiveness: Proposed measure has been successfully implemented, but perhaps not in a directly comparable situation.
- High effectiveness: Proposed measure has been successfully applied in similar situations.

- Unknown effectiveness: Proposed measure has unknown effectiveness because it has not been implemented elsewhere in a comparable project or environment.

The potential effects, proposed mitigation measures, and their effectiveness are summarized using Table 20.6-1. This table also identifies the residual effects that will be carried forward for residual effects characterization and significance determination.

Table 20.6-1: Proposed Mitigation Measures and Their Effectiveness

VC/IC	Potential Effects	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Residual Effect
Potential Social Issues Related to the Project and Project Workforce	Increased prevalence of mental health and addictions	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan • Human Resources Plan • Local Procurement Plan • Skills, Training and Employment Plan	Moderate	No
Potential Social Issues Related to the Project and Project Workforce	Reduced family health	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan • Human Resources Plan • Local Procurement Plan • Skills, Training and Employment Plan	Moderate	No
Potential Social Issues Related to the Project and Project Workforce	Reduced community health, safety and wellbeing	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan • Human Resources Plan • Local Procurement Plan • Skills, Training and Employment Plan	Moderate	No
Social and Health Services	Pressure on health and medical services	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Medical and Health Services Plan	Moderate to High	No
Social and Health Services	Pressure on emergency and protection services	Construction Operation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan • Human Resources Plan	High	No

VC/IC	Potential Effects	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Residual Effect
Social and Health Services	Increased demand for social services	Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan	Moderate to High	No
Housing	Reduced availability of housing	Operation	• Social and Economic Management Plan • Human Resources Plan • Local Procurement Plan	Moderate	No
Housing	Reduced housing affordability	Operation	• Social and Economic Management Plan • Avoid housing allowances that may lead to increases in housing costs	Moderate	No
Infrastructure	Pressure on existing solid waste landfills	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan	High	No
Infrastructure	Pressure on existing water supply	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan • Human Resources Plan • Local Procurement Plan • Skills, Training and Employment Plan	High	No
Recreational Values	Changes in view-scapes	Construction Operation Closure and Reclamation	• Vegetation and Ecosystem Management Plan	High	No
Recreational Values	Increased access to recreation opportunities	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Community Involvement Plan • Access Management Plan	High	No

VC/IC	Potential Effects	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Residual Effect
Recreational Values	Changes to or increased demand for recreation opportunities	Construction Operation Closure and Reclamation	• Social and Economic Management Plan • Health and Social Services Plan • Community Involvement Plan	High	No

[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

20.7 Residual Effects Characterization

It is difficult to conclude with certainty that there will be no adverse residual social effects. The preceding discussion (Section 20.5) provides a comprehensive narrative of the potential social effects and the mitigation and management measures that will be planned to address these according to best practice. In all cases, social effects identified are expected to be manageable and result in negligible adverse social effects or be offset by beneficial social effects. EAO guidance states that "…further analysis may not be warranted for project-VC interactions that are known (or found) to have no or negligible adverse effects" (BC EAO 2013).

Further analysis or assessment of these social effects would not add any value to the understanding of the Project's potential effects on the identified social VCs and ICs. IDM does recognize, however, that social and economic circumstances can and do change. Through its Social and Economic Management Plan (Volume 5, Chapter 29, Section 29.20), IDM proposes to work with NLG, the District of Stewart, Working Group members, and with interested stakeholders to identify and implement appropriate means to monitor the Project's social and economic effects. A well-constructed monitoring program will enable IDM and others to identify and, in some cases, anticipate potential adverse changes in economic VCs and ICs that will help to inform adaptive management responses. Monitoring will also allow other, potentially unforeseen social and economic changes to be identified, which is the first, vital step in being able to craft an effective response.

Monitoring and adaptive management of potential adverse residual social effects will also ensure that the assessment endpoints identified for each social VC are achieved:

- For Social and Health Services, the delivery of social and health services will continue, and IDM will work with stakeholders to maximize the positive effects of the Project on community health and wellbeing while minimizing the negative effects;

- For Potential Social Issues Related to the Project and the Project's Workforce, IDM will work with stakeholders to maximize the positive effects of the Project on community health and wellbeing while minimizing the negative effects, taking into consideration inequalities, vulnerable populations, mental illness, community cohesion, drug and alcohol abuse, increased rates of communicable diseases, and others aspects of community health and wellbeing that may be identified through consultation with communities;

- For Housing, housing availability and affordability will be maintained, and IDM will work with stakeholders to maximize the positive effects of the Project on community health and wellbeing while minimizing the negative effects;

- For Infrastructure, infrastructure availability and access will be maintained, and IDM will work with stakeholders to maximize the positive effects of the Project on community health and wellbeing while minimizing the negative effects; and

- For Recreational Values, use of recreational and tourism opportunities will continue and IDM will work with stakeholders to maximize the positive effects of the Project on community health and wellbeing while minimizing the negative effects.

20.8 Cumulative Effects

Generally speaking, cumulative effects are the result of a Project-related effect interacting with the effects of other projects or activities to produce a combined effect. The potential for cumulative effects arises when residual effects of the Project affect the same VC or IC that is affected by the effects of other past, existing, or reasonably foreseeable projects or activities. Cumulative effects are assessed as required by EAO (2013). The method for assessing cumulative effects generally follows the same approach as for the assessment of the Project's incremental effects.

According to Agency guidance (Canadian Environmental Assessment Agency 2014), a cumulative effects assessment is carried out where residual effects are predicted after consideration of mitigation measures, regardless of their significance.

The need for a cumulative effects assessment is established by addressing two key questions:

- 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?

As no residual adverse social effects are anticipated, according to these criteria, the Project is not expected to contribute to cumulative adverse social effects on communities in the LSA or RSA.

20.9 Follow-up Program

The purpose of a follow-up program is to monitor the accuracy of predictions of effects and the effectiveness of mitigation measures. In the event that effects are not as predicted and the mitigations in place are not appropriate for addressing them, the follow-up program provides strategies to adaptively manage unforeseen conditions. Adaptive management strategies potentially include additional mitigations and involvement of key stakeholders, Aboriginal Groups, and government agencies to identify and develop other measures deemed necessary to manage the issue.

In the absence of potential residual adverse social effects and subsequently of a cumulative effects assessment, a formal follow-up program is not presented here. However, contained within the relevant management plans are provisions to monitor a range of inter-related social and economic issues that will help the IDM identify any problem areas and respond

appropriately. Relevant management plans are included in the following sections of Volume 5, Chapter 29:

- Community Involvement Plan (Chapter 29.6);
- Human Resources Plan (Chapter 29.15);
- Local Procurement Plan (Chapter 29.16);
- Skills, Training, and Employment Plan (Chapter 29.21); and
- Social and Economic Management Plan (Chapter 29.22).

20.10 Current Use of Lands and Resources for Traditional Purposes

20.10.1 Introduction

This chapter describes the existing information for the current use of lands and resources for traditional purposes (CULRTP) by Tsetsaut Skii km Lax Ha (TSKLH) and Métis Nation BC (MNBC) in the area of the Red Mountain Underground Gold Project (the Project) and provides an assessment of the potential effects of the Project on CULRTP within the local study area (LSA). As outlined in the federal *Guidelines for the Preparation of an Environmental Impact Statement Pursuant to CEAA 2012* (EIS Guidelines, January 2016) issued for the Project, the assessment of potential effects on CULRTP will only be conducted for TSKLH and MNBC; as expressed by the Nisga'a Lisims Government, the assessment of potential Project effects on CULRTP does not apply to Nisga'a Nation.

The assessment of potential effects on CULRTP is informed by the assessment of potential effects of the Project on other related valued components (VCs) that represent interactions between the Project and biophysical environment. These linkages are listed in Section 20.10.3.5 (Pathways).

The assessment of the potential effects of the Project on Cultural and Heritage Resources, including cultural landscape, is covered in Chapter 21 (Heritage Effects Assessment). The assessment of potential effects of the Project on TSKLH and MNBC's Aboriginal Interests is covered in Chapters 25 and 26 of Part C.

20.10.2 Regulatory and Policy Setting

Section 5(1)(c)(iii) of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) requires an assessment of the potential effects on CULRTP due to changes in the environment resulting from the Project.

Section 6.3.4 of the EIS Guidelines issued for the Project requires a description and analysis of how changes to the environment caused by the Project will affect TSKLH and MNBC's CULRTP including, but not limited to:

1. Any effects of changes to resources (e.g., fish, wildlife, birds, plants, or other natural resources) used for traditional uses (e.g., hunting, fishing, trapping, collection of medicinal plants, use of sacred sites);

2. Any effects of alterations to access to the areas used for traditional uses, including development of new roads and deactivation or reclamation of access roads;

3. Any effects on cultural value or importance associated with traditional uses or areas affected by the Project (e.g. inter-generational teaching of language or traditional practices, communal gatherings);

4. How Project construction timing correlates to the timing of traditional practices, such as seasonal rounds, and any potential impacts resulting from overlapping periods;

5. The regional value of traditional use of the Bitter Creek valley and the anticipated effects to traditional practice of the Aboriginal Group, including alienation of lands from Aboriginal traditional use;

6. Indirect effects such as avoidance of the area by Aboriginal peoples due to increased disturbance (e.g. noise, presence of workers); and

7. An assessment of the potential to return affected areas to pre-disturbance conditions to support traditional practices.

Bullets number 1, 2, 3, and 6 have been brought forward as issues under Section 20.10.3.3 (Issues Scoping). Bullet number 4 is considered under Section 20.10.4.2 (Temporal Boundaries). Bullets numbers 5 and 7 is covered under Section 20.10.8 (Residual Effects Characterization).

This section has been prepared to meet the requirements of the EIS Guidelines and of CEAA 2012.

20.10.3 Scope of the Assessment

20.10.3.1 Information Sources

The following sources of information were reviewed and considered in the CULRTP Effects Assessment:

- Publicly available reports and databases, including Applications for an Environmental Assessment Certificate / Environmental Impact Statements for other mining and resource development projects in the region that describe information pertaining to TSKLH's and MNBC's CULRTP;

- Environmental baseline studies conducted in support of the Project; and

- Environmental effects assessments conducted in support of the Project.

Specific data sources are listed in Section 20.10.5.2 (Data Sources).

20.10.3.2 Input from Consultation

On May 25, 2017, a draft version of this section was provided to TSKLH and MNBC for their review and comment.

On June 19, 2017, MNBC stated that they have no comments at this time on this section of the Application/EIS.

IDM has considered all comments and feedback received from TSKLH in the finalization of this section and has summarized their feedback in Table 20.10-1.

Table 20.10-1: Summary of Consultation Feedback on CULRTP

Topic	Feedback by		Consultation Feedback	Response
	TSKLH	MNBC		
CULRTP	X		The term "houses" is common in much of the ethnographic literature and in translations of oral histories describing First Nations of northwestern British Columbia, but can be misleading in the present context. The Laxwiiyip Tsetsaut, from whom the TSKLH Nation is descended, were a group of closely related families. In his field notes from the 1920s, Barbeau lists together in one grouping the names Ksemgunqweek, Biiniks (or "pi'niks"), Skawill (sqa'wil), Skii km Lax Ha ("xske'gamlaxe"), and Nagan ("na'gan"). While Gyetem Galdo is not included in this list, Barbeau does include"noxsto for noxsgidamgaldo", which means "mother of Gyetem Galdo". This list compiled by Barbeau confirms the close family relations between the groups who have held the names Ksemgunqweek, Biiniks, Skawill, Skii km Lax, Nagan, and Gyetem Galdo. As Barbeau confirms in his book *Totem Poles of the Gitksan*, "Gitemraldo [Gyetem Galdo] and his kinsmen Sqawil [Skawill] and Sanaws [Shanoss]" share the same Raven clan origins and "came originally from the Groundhog country, at the headwaters of the Skeena. […] They still retain their hunting grounds in the Groundhog." By the early 1800s, Gyetem Galdo had become a prominent chief in Gitanmaax (Hazelton) "through his ability and success in the *potlatch*." In this way, Gyetem Galdo acquired territory among the Gitxsan, but still today recognizes his Laxwiiyip Tsetsaut ancestry and remains a member of the TSKLH Nation. Please also correct the spellings of "Johnson Negun" and Daniel Skowill" to "Johnson Nagun" and "Daniel Skawill", respectively.	IDM thanks TSKLH for the information and spelling corrections and has revised the document accordingly.
CULRTP	X		The Tahltan and Tsetsaut both belong to the Athapaskan ethnolinguistic group, though their common ancestry within that group is relatively distant. For instance, the Tahltan at Telegraph creek informed G.T. Emmons in 1904/1906 that the Tahltan are related to the Tsetsaut "only through the Kaska". Linguistic analysis confirms the relatively distant Athapaskan relationship of the Tahltan and Tsetsaut: "the linguistic evidence does not reflect favorably on the McKay-Morice-Drucker story, which depicts the Tsetsaut as a group of displaced Tahltan". The Tsetsaut and the Tahltan are thus clearly distinct First Nations. It must be noted, however, that there is much confusion in the writings of Duff and other	IDM thanks TSKLH for the information and has revised the document accordingly.

Topic	Feedback by		Consultation Feedback	Response
	TSKLH	MNBC		
			ethnographers about the identity of the "southern most band of the Tahltan". When Duff speaks of this southernmost Tahltan band that is the "most relentless enemies" of the Tsetsaut, he is quoting from Thorman's discussion of the "Nassgodeen [or Nassgotin] Taltan". Duff himself writes that the group whom he, Thorman, and others (notably James Teit; see below) refer to as "Nassgodeen Tahltan" are in fact called "Laxwiiyip Tsetsaut" in the oral histories of the region: "The Nassgodeen were known to Tsimshian-speaking Gitksan and Niska as 'Tsetsaut' (in a general sense as the same word was used for all Athapaskans inland of them) or in a more specific sense as 'Lakwiyip'. The Laxwiiyip Tsetsaut of those oral histories are in many cases identified by name and prominently include Skawill and his Tsetsaut Raven clan brothers, Luuxhon and Gamlaxyeltxw, who fled from Laxwiiyip Tsetsaut territory prior to European contact and helped establish Gitanyow. There is no doubt, then, that the term "Nassgodeen Tahltan" has at least sometimes been used inaccurately to refer to the Laxwiiyip Tsetsaut, including Skawill. The confusion seems to be clarified by Robert Adlam in a 1985 PhD dissertation addressing the "structural bases of Tahltan society", and drawing on Adlam's own field work conducted in 1978-79 as well as the work of previous researchers, particularly G.T. Emmons and James Teit. Adlam notes that James Teit, based on information gathered in 1912/1915, produced a map of Tahltan territories that placed a group of "Naskoten [Nassgodeen / Nassgotin]" in the Iskut River Basin and at the headwaters of the Nass River, with the following characterization found in Teit's notes: "Naskoten" people of Nass around head of Nass R. said to be descended from a Nass woman. Nass clan". Adlam goes on to note, however, that two Tahltan groups identified by Teit – the Tagicoten and the Naskoten – "seem largely to fade into a grouping which Emmons (1911:14) as well as informants refer to as 'Tuck-clar-way-tee' or 'Doclewaadee', respectively." Adlam further underscores this point: "In fact, informants designate as 'Doclewaadee' those persons whom Teit on his 1915 census refers to as being 'Naskoten' or 'Nass clan'". Adlam goes on to provide an explanation for this identification of the "Naskoten" as "Doclewaadee". Adlam first notes that the "Naskoten" group of Tahltan are identified as such for two reasons: (1) "a localized notion of the 'Naskoten' as occupying a country in the area of the Nass River", and (2) because of their oral history describing them as "descendants of a 'Nass woman'". However, when the "Naskoten" join the Tahltan who "regularly convene at the confluence of the Tahltan and Stikine Rivers,"	

Topic	Feedback by		Consultation Feedback	Response
	TSKLH	MNBC		
			they lose their identity as "Naskoten" and "are referred and refer to themselves as 'Doclewaadee'." Adlam explains this change of identity by suggesting that the country of the "Naskoten" in the area of the Nass River was not "within the country of the Tahltans". In particular, Adlam compares the situation of the "Naskoten" with that of the "Nangaii", who were associated with the Tlingit but also convened with the Tahltan at the confluence of the Tahltan and Stikine rivers. Adlam, citing his Tahltan informants, states that "the 'Nangaii' do not have a 'country' at least not among those people who convene at Tahltan. In fact it is when they are in this situation that they are said to be people who 'go with the others'." Adlam then notes that the "Nangaii" in fact convened at Tahltan on a more regular basis than the "Naskoten": Like the 'Naskoten' and the 'Tagicoten', the 'Nangaii' exist on the periphery of the area of those who regularly convene at the confluence of the Tahltan and Stikine Rivers. Yet while the 'Naskoten' and "Tagicoten' in the company of those who do meet at this confluence lose their separate identities to become 'Doclewaadee', the 'Nangaii' retain their identity. Indeed the reason for this, as suggested above, appears to stem from the regularity of trade between the coast Tlingit, some of whom are 'Nangaii', and those who usually convene in the vicinity of the confluence of the Tahltan and Stikine rivers. In this way, Adlam explains the fact that the "Naskoten", when they convene with the Tahltan, "are referred and refer to themselves as "Doclewaadee'." That is, he draws a comparison between the "Naskoten" and the "Nangaii', pointing out that the country of the Nangaii is not within Tahltan country. Indeed, both these identities – "Naskoten" and "Nangaii" – refer to descent and territory foreign to the Tahltan. Adlam then points out, in the paragraph just quoted above, that the "Naskoten" were in fact more peripheral than the "Nangaii" to "the area of those who regularly convene at the confluence of the Tahltan and Stikine rivers." Although Adlam does not draw the conclusion explicity himself, it would seem to follow inevitably that the country of the "Nasskoten" in the area of the Nass River is not within Tahltan country. If they hunted in that area at the headwaters of the Nass river, then it must have been because of their relations with the Laxwiiyip Tsetsaut who occupied tht territory, thee relations being recrded or symbolized in the "nasskoten" oral history that says they are "descendants of a Nass woman". Adlam's conclusions are based on 18 months of field research in Telegraph creek,	

Topic	Feedback by		Consultation Feedback	Response
	TSKLH	MNBC		
			speaking directly with informants, and a detailed review of the ethnographic record, including census records for the Tahltan. For the reasons given above, it seems to follow clearly from adlam's conclusions and from what is known of the Laxwiiyip Tsetsaut presence (notably that of Johnson Nagun and Daniel Skawill, as discussed in section (1) above) at the headwaters of the Nass river in the 19th and early 20th centuries, tha the 'country of the 'Naskoten'" was not within Talhtan country but rather within Laxwiiyip Tsetsaut territory, and tht the "naskoten Tahltan" could only have used that territory with permission of the Laxwiiyip Tsetsaut. This situation would seem to explain why Duff and other ethnographers did not always distringuish clearly (or at all) between the Nassgotin Tahltan living at Telegraph creek and the Laxwiiyip Tsetsaut with whom they seem to have maintained relations of some form into the 20th century.	
CULRTP	X		There are in fact approximately 35 members of the TSKLH Nation, many of whom live in Hazelton or New Hazelton, while some live in other locations in British Columbia and the United States.	IDM thanks TSKLH for the updated information and has revised the document accordingly.
CULRTP	X		The territorial boundaries can be described as follows, as illustrated on the annotated map attached as Appendix "F" to this letter: The eastern boundary of TSKLH Territory runs generally southeast from (i) Klappan Mountain in the North, (ii) following the height of land on the east side of the Skeena River to (iii) its junction with the Kluatantan River, then (iv) following the Skeena River further southeast to (v) its junction with the Duti River, and then (vi) continuing along the height of land dividing the Skeena and Nass watersheds to (vii) Octopus Lake, then (viii) continuing southwest to Aluk Creek, to include Octopus Lake, then (ix) along Aluk Creek to where Aluk Creek runs into the Cranberry (Salmon) River, all to include Slowmaldo Mountain, Blackwater (Damdochax or Sheduwitt) Lake, Sallysout Creek, Mount Skuyhil, Kwinageese River and Lake, and Brown Bear Lake. The southern boundary runs generally southwest from the confluence of Aluk Creek and the Cranberry (Salmon) River (x) along the Cranberry (Salmon) River to (xi) the confluence of the Cranberry (Salmon) and Nass Rivers. From the confluence of the Cranberry (Salmon) and Nass Rivers, the southestern boundary (xii) crosses the Nass River and (xiii) runs northwest along the height of land dividing the Kinskuch and Nass Rivers to (xiv) Scrub Lake, then (xv) along the height of	IDM thanks TSKLH for the information and has revised the document accordingly.

Topic	Feedback by		Consultation Feedback	Response
	TSKLH	MNBC		
			land between the White and Kinskuch Rivers, to include the White River watershed, then (xvi) continuing north along the height of land between Kitsault Lake and Jade Lake, and then (xvii) west along the height of land between Kitsault Lake and the White River, then (xviii) continuing northwest over the height of ice of the Cambria Icefield to (xix) the Alaska-Canada border. The Laxwiiyip Tsetsaut treated the height of ice on the Cambria Icefield as forming part of its southern border The height of ice has moved over time, as the Cambria Icefield itself has shifted. Appendix "A" and Appendix "F" illustrate this part of the southern border of TSKLH Territory as the height of ice exists today. From the junction of the Cambria Icefield and the Alaska-Canada border, the boundary (xx) continues northwest along the Alaska-Canada border to (xxi) the upper Unuk River watershed. From the upper Unuk River watershed, (xxii) the northwest boundary runs between the Unuk and Iskut/Stikine River watersheds, then (xxiii) northeast along the height of land dividing the Iskut/Stikine and Bell-Irving watersheds to (xxiv) Tumeka Lake, to include all of the Bowser Lake drainage, as well as Awijii (Oweegee) Lake, Awijii (Oweegee) Creek (Little Sowill Creek), Awijii (Oweegee) Mountain Range, Skowill Creek, and Mount Skowill. From Tumeka Lake, (xxv) the northern boundary runs generally east to meet up with Klappan Mountain, to include Mount Gunanoot and parts of the headwaters of the Nass, Stikine, and Skeena Rivers.	
CULRTP		X	MNBC provided information on their traditional land and resource use within 50 km of the proposed Project.	This information has been incorporated into the Application/EIS.

20.10.3.3 Issues Scoping

As outlined in the EIS Guidelines, TSKLH's and MNBC's CULRTP could be affected by the following changes in the environment due to the Project:

- Any effects to resources (e.g., fish, wildlife, birds, plants, or other natural resources) used for traditional uses (e.g., hunting, fishing, trapping, collection of medicinal plants, use of sacred sites);
- Any effects of access alterations to areas used for traditional uses, including development of new roads and deactivation or reclamation of access roads;
- Any effects on cultural value or importance associated with traditional uses or areas affected by the Project (e.g. inter-generational teaching of language or traditional practices, communal gatherings); and
- Indirect effects such as avoidance of the area by Aboriginal peoples due to increased disturbance (e.g. noise, presence of workers).

20.10.3.4 Valued/Intermediate Components, Assessment Endpoints, and Measurement Indicators

Based on IDM's methodology for VC selection, selected VCs should have the following attributes:

- **Relevant** to at least one of EAO's five pillars (i.e., environment, social, economic, heritage, and health) 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 interaction and the resulting effects pathway can be clearly articulated and understood, and redundant analysis is avoided.

In recognition of its importance to Aboriginal Groups and regulators, IDM has included CULRTP as a VC and has assessed the potential effects of the Project on that VC.

The structure of the assessment of potential Project effects on CULRTP is summarized in Table 20.10-2.

Table 20.10-2: Assessment Endpoints and Measurement Indicators for CULRTP

Primary Measurement Indicators	Assessment Endpoint
• Changes to the availability of fish or wildlife (including birds) resources trapped or hunted for traditional purposes. • Changes to the availability of plant resources gathered for traditional purposes. • Changes to access. • Changes to atmospheric conditions (i.e., Air Quality, Noise, and Visual Quality).	Maintaining existing CULRTP

20.10.3.5 Pathways

Several VCs and ICs are considered in the CULRTP Effects Assessment to meet the CEAA 2012 requirement of assessing potential changes to CULRTP resulting from changes to the environment.

To avoid unnecessary duplication, only relevant biophysical VCs have been selected to inform the assessment of CULRTP. For example, while changes to Sediment Quality may have effects on plants gathered for traditional purposes, the linkage between Sediment Quality and Vegetation has already been considered in the Vegetation and Ecosystems Effects Assessment (Volume 3, Chapter 15); therefore inclusion of Vegetation and Ecosystems in the CULRTP effects assessment considers any indirect effects resulting from changes to Sediment Quality.

The following pathways have been considered in the CULRTP effects assessment:

- Air Quality Effects Assessment (Chapter 7);
- Noise Effects Assessment (Chapter 8);
- Vegetation and Ecosystems Effects Assessment (Chapter 15);
- Wildlife and Wildlife Habitat Effects Assessment (Chapter 16);
- Fish and Fish Habitat Effects Assessment (Chapter 18);
- Commercial, Recreational, and Aboriginal Fisheries, under the Economic Effects Assessment (Chapter 19); and
- Visual Quality, under the Social Effects Assessment (Chapter 20).

Indirect pathways and other linkages, such as the example described above, are listed in the respective chapters.

20.10.3.6 Primary Measurement Indicators

Potential Project effects on TSKLH's and MNBC's CULRTP will be assessed through the following primary measurement indicators:

- Changes to the availability of fish or wildlife resources trapped or hunted for traditional purposes, where "wildlife" includes birds;
- Changes to the availability of plant resources gathered for traditional purposes;
- Changes to access; and
- Changes to atmospheric conditions (i.e., Air Quality, Noise, and Visual Quality).

20.10.3.7 Assessment Endpoint

IDM will conduct all Project planning and mitigation measures with the goal of maintaining existing CULRTP.

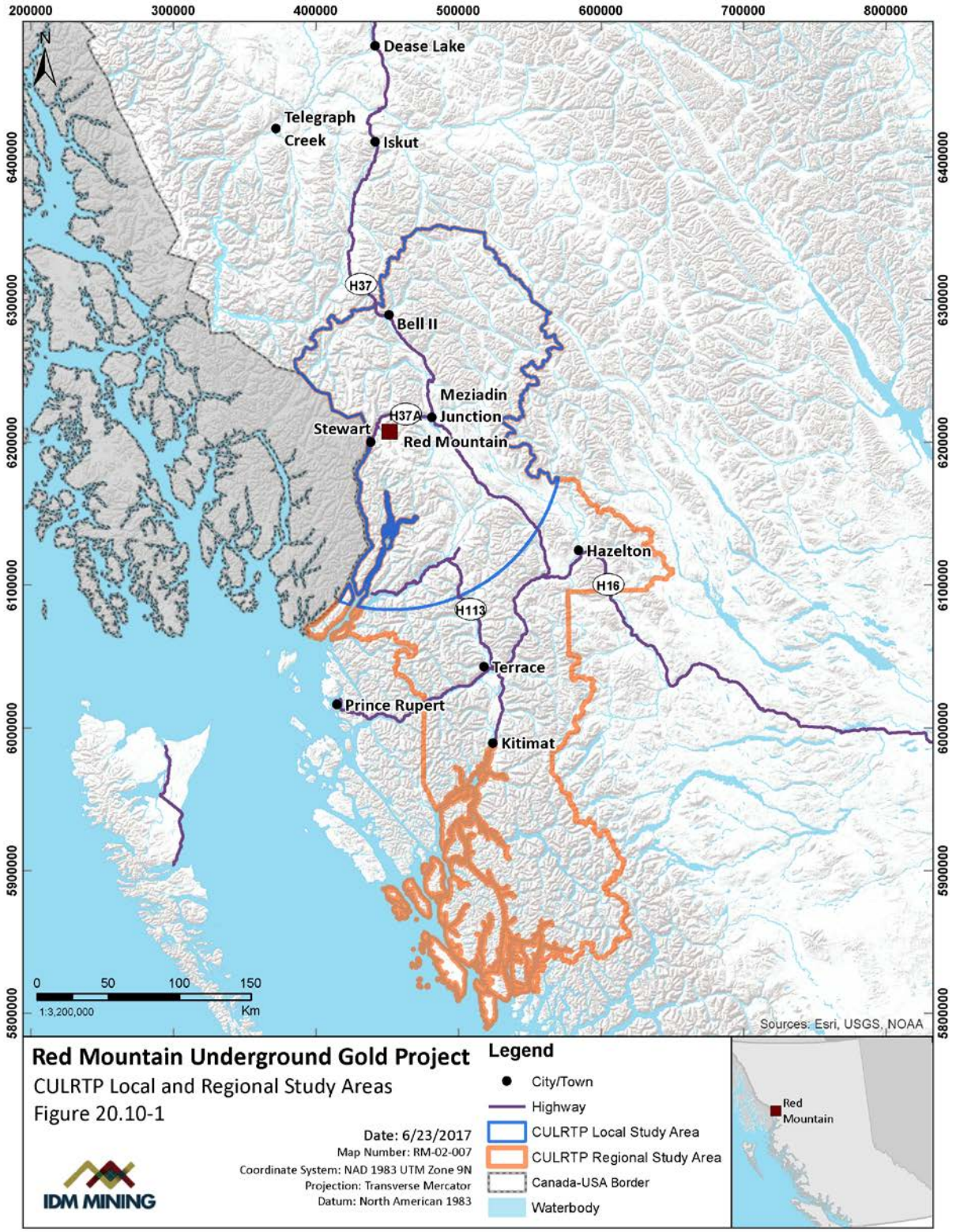
20.10.4 Assessment Boundaries

The following sections identify the spatial, temporal, and administrative area boundaries for the CULRTP effects assessment, in a manner consistent with the Effects Assessment Methodology (Volume 3, Chapter 6). This information is summarized in Table 20.10-3.

20.10.4.1 Spatial Boundaries

The LSA RSA for the CULRTP Effects Assessment is an area roughly corresponding to the LSA and RSA for the social and economic pillars (Table 20.10-3; Figure 20.10-1), adjusted to the northern extent of TSKLH's traditional territory boundary. Having similar spatial areas as the social and economic pillars allows for straightforward comparison between socio-economic aspects of TSKLH's and MNBC's CULRTP.

Figure 20.10-1: CULRTP Local and Regional Study Areas



20.10.4.2 Temporal Boundaries

The temporal boundary of the CULRTP Effects Assessment is the life of the Project, which includes Project Construction, Operation, Closure and Reclamation, and Post-Closure Phases (Table 20.10-3). It is IDM's understanding that TSKLH's and MNBC's CULRTP exists year-round. The Project will also operate year-round. Therefore, using the life of the Project as the temporal boundary of CULRTP will ensure that the effects assessment will consider how Project construction timing correlates to the timing of traditional practices, such as seasonal rounds, and any potential effects resulting from overlapping periods of activity. IDM is not aware of any specific overlap of proposed Project activities with the timing of traditional practices.

20.10.4.3 Administrative Boundaries

The boundary of the Regional District of Kitimat-Stikine (RDKS) has been considered as the basis of the CULRTP RSA.

Table 20.10-3: Spatial and Temporal Boundaries for CULRTP

VC	Temporal Boundary	Spatial Boundary
CULRTP	Life of Project	**LSA**: Area with roughly 50 kilometre (km) radius around the Project, adjusted for TSKLH's traditional territory boundary. **RSA**: Regional District of Kitimat-Stikine, adjusted for TSKLH's traditional territory boundary. See Figure 20.10-1

20.10.5 Existing Conditions

This section provides a high-level summary of the existing conditions of TSKLH's and MNBC's CULTRP within the LSA. The overview is intended to provide the reader with a brief introduction to the baseline setting and major components associated with the VC in the Bitter Creek valley. Further information about TSKLH's and MNBC's ethnographic backgrounds and Aboriginal Interests can be found in Volume 4, Chapters 25 and 26, respectively.

20.10.5.1 Past and Current Projects and Activities

The Bitter Creek valley has been the site of mineral exploration and development for nearly a century. Initial exploration took place in the early 1900s in the form of placer mining on Bitter Creek, at the base of Red Mountain (IDM Mining Ltd., 2015). Later, in the 1970s, Red Mountain was the subject of a limited molybdenum exploration program (IDM Mining Ltd., 2015). The area has also seen active forestry operations; the lower portions of the Bitter

Creek and nearby Roosevelt Creek valleys were commercially logged in the 1960s (IDM Mining Ltd., 2015).

The Project is located within the Nass Area and the Nass Wildlife Area, as defined in the Nisga'a Final Agreement, and Nisga'a Nation holds Treaty rights to manage and harvest fish, wildlife, and migratory birds in the Nass Area and Nass Wildlife Area (SC 2000, c. 7: Nisga'a Final Agreement Act, 2000). In the EIS Guidelines, the Canadian Environmental Assessment Agency (the Agency) identified TSKLH and MNBC as the Aboriginal Groups less likely to be affected by the Project and its related effects than Nisga'a Nation (Canadian Environmental Assessment Agency, 2016).

20.10.5.2 Data Sources

Data used to compile the baseline information listed below are summarized in Table 20.10-4.

Table 20.10-4: Data Sources for CULRTP Effects Assessment

Data Source	Quality, Reliability, and Applicability of Data
Northwest Transmision Line Project: Skii km Lax Ha Traditional Knowledge and Use Study prepared by Rescan for the Northwest Transmission Line Project in 2009.	• High-quality ethnographic report on TSKLH's CULRTP in the area of the Northwest Transmission Line Project. • Regional applicability, but not specific to Bitter Creek valley.
KSM Project: Skii km Lax Ha Traditional Knowledge and Use Research Report prepared by Rescan for the Kerr-Sulpherets Mitchell (KSM) Project in 2013.	• High-quality ethnographic report on TSKLH's CULRTP in the KSM Project area. • Lower level of participation by TSKLH leadership than the Brucejack report (below). • Regional applicability, but not specific to Bitter Creek valley.
Seabridge Gold Métis Interests Desktop Study prepared by Rescan for the KSM Project in 2013.	• Overview of MNBC governance structure and history of Métis in BC. • Includes database results of MNBC's wildlife, fish, bird, and small game harvesting in the upper and lower Bell Irving River watersheds and the Unuk River watershed (wildlife only). • Data appears to be inconsistent. As stated in the report, no attempt was made by Rescan to verify or rectify potential issues with the data (e.g., the potential for duplication across species and watersheds). • Regional applicability, but not specific to Bitter Creek valley.

Data Source	Quality, Reliability, and Applicability of Data
Brucejack Gold Mine Project: Tsetsaut/Skii km Lax Ha Nation Traditional Knowledge and Traditional Use Report prepared by ERM Rescan for the Brucejack Gold Mine Project in 2014.	• High-quality ethnographic report on TSKLH's CULRTP in the area of the Brucejack Project. • Very high level of participation with TSKLH leadership. • Regional applicability, but not specific to Bitter Creek valley.
Brucejack Gold Mine Project: Métis Interests Desktop Study prepared by ERM Rescan in 2014.	• Overview of MNBC governance structure, history of Métis in BC, and socio-economic and demographic information. • No conclusive information on MNBC CULRTP within the Brucejack area. • Regional applicability, but not specific to the LSA.
Ethnographic and historical information on TSKLH and MNBC's CULRTP, including: • Barman, J., & Evans, M. (2009). Reflections on Being, and Becoming Métis in British Columbia. *BC Studies* (161). • Duff W. (1981). Tsetsaut. In J. Helm, *Handbook of North American Indians Volume 6: Subarctic* (pp. 454 -457). Smithsonian Institute. • Krauss, M. E. (1981). Northern Athapaskan Languages. In J. Helm, *Handbook of North American Indians Volume 6* (pp. 67 - 85). Smithsonian Institute. • McLeod, I., & McNeil, H. (2004). *Prospectors, Promoters, and Hard Rock Miners: Tails of Stewart, B.C. and Hyder, Alaska camps.* Kelowna: S.H. Co. Ltd. • Sterritt, N. M. (1998). *Tribal Boundaries in the Nass Watershed.* Vancouver: UBC Press.	• Peer-reviewed and industry-standard ethnographic information on TSKLH and MNBC. • Regional applicability, but not necessarily to the LSA.

Data sources for the other disciplines that inform the CULRTP Effects Assessment are listed in their respective chapters.

The Agency has directed IDM to engage with TSKLH and MNBC at relatively low levels due to the anticipated low level of potential effect the Project will have on their Aboriginal Interests. Because of this level of engagement, IDM has not conducted any primary traditional use studies.

IDM has incorporated TSKLH and MNBC traditional knowledge where this knowledge is publically available or voluntarily shared by TSKLH or MNBC.

20.10.5.3 Baseline Characterization

This section provides a description of the baseline conditions of TSKLH's and MNBC's CULRTP within the LSA in order to provide the reader with sufficient detail to enable interactions between TSKLH's and MNBC's CULRTP and proposed Project activities and components to be identified, understood, and assessed.

20.10.5.3.1 TSKLH

TSKLH is not currently recognized as a band under the *Indian Act, 1876*. Previously, TSKLH was considered by the provincial government to be a house, or *wilp*, of Gitxsan First Nation. TSKLH, under the leadership of hereditary chief Darlene Simpson, has been advocating recognition as a First Nation for 15 years (Simpson D. , 2016).

In 2016, TSKLH estimated there are 15 members (Simpson D. , 2016) who live primarily in Hazelton and New Hazelton (ERM Rescan, 2014).

As TSKLH is not a recognized band under the *Indian Act*, there are no TSKLH designated Indian Reserves, and data regarding TSKLH members is not disaggregated in provincial and federal statistical information.

TSKLH claim descent from the Eastern branch of the Tsetsaut (Rescan, 2013; Ming, 2016), an ethno-linguistic group who occupied the territory around the headwaters of the Nass, Stikine, Unuk, and Skeena Rivers, around Meziadin Lake, and on Portland Canal, Observatory Inlet, and Behm Canal (Sterritt, 1998). Eastern Tsetsaut were never encountered by ethnographers; their existence was documented through Franz Boas' and George T. Emmons' meetings with Western Tsetsaut and through Gitxsan oral histories (Sterritt, 1998; Duff, 1981).

Historical documentation of Eastern Tsetsaut traditional land and resource use is sparse, as the Tsetsaut largely assimilated with other Aboriginal Groups in the early 20th century (Rescan, 2013).

Table 20.10-5 summarizes the information IDM could obtain regarding TSKLH's CULRTP in the Project LSA. The data supporting this summary, as well as additional details regarding TSKLH's ethnographic background and Aboriginal Interests, can be found in Chapter 25.

Table 20.10-5: TSKLH CULRTP Summary

Aboriginal Interest	Relevant Species	Location
Fishing	Salmon	• Throughout TSKLH territory, notably: - Meziadin Lake; - Bowser Lake; - Cranberry River; - Oweegee Creek; - Along the Bell-Irving River at the confluences with Treaty Creek; and - Snowbank Creek.
	Steelhead and rainbow trout	• Bell-Irving River between Treaty and Wildfire Creeks; • Meziadin Lake; and • Meziadin Falls.
Hunting and trapping	Moose	• Ningunsaw Pass; • Wetlands surrounding Oweegee Creek; • Wetlands surrounding Teigen Creek; • Bell-Irving River valley; and • Wetlands at the mouth of Bowser Lake.
	Grizzly and black bears	• Ningunsaw Pass; • Wetlands surrounding Oweegee Creek; • Wetlands surrounding Teigen Creek; • Bell-Irving River near Wildfire Ridge; and • Bowser Lake.
	Small furbearers: beaver, wolf, marten, wolverine, and rabbit	• Bowser Lake; • Bowser River; • Treaty Creek; • Teigen Creek, • Taft Creek; • Along the Highway 37 corridor; and • Three TSKLH-held trap lines.
Plant harvesting	Huckleberries, blueberries, soapberries, cranberries, mushrooms, fiddleheads (species unknown), dandelions, yarrow, devil's club, and willow	• Throughout TSKLH territory, notably: - Bell II; - Oweegee Lake; - Bowser Lake; - Bell I; - North of Mount Bell-Irving; - Meziadin Lake; - Meziadin Junction; and - Nass River north of Cranberry Junction.

Aboriginal Interest	Relevant Species	Location
Travel routes	n/a	• Meziadin Lake; • Bell-Irving River; • Bowser Lake; • Teigen Lake; and • Highway 37.
Occupation sites	n/a	• Highway 37 corridor between the Snowslide Range and the Oweegee Range; • Bowser Lake; • Bell II; and • Meziadin Lake.

20.10.5.3.2 MNBC

In BC, Métis citizens are represented by MNBC. Métis National Council (MNC), the national representative organization of the Métis citizens in Canada, recognizes MNBC as the governing organization for Métis in BC. MNBC further divides local Métis communities in BC into "Chartered Communities," which are defined by MNBC as communities with at least 25 Métis citizens over the age of 18 (MNBC, 2003). The only Chartered Community within the CULRTP LSA is Terrace, which is represented by the Northwest Métis Association. The estimated Métis population in Terrace and within the RDKS is summarized in Table 20.10-6.

Table 20.10-6: Métis Population within the RDKS

Location	2011 National Household Survey Métis Population	2011 National Household Survey RDKS Population
Terrace (City)	305	11,305
Kitimat (District Municipality)	170	8,340
Other RDKS Communities	360	17,380
RDKS Total	835	37,025

Source: (Statistics Canada, 2011)

As stated by MNBC in their submission to the Agency dated October 19, 2015, Métis citizens in Terrace, Prince Rupert, Smithers, and Stewart harvest country foods for sustenance purposes and hunt, fish, and trap in the area (Metis Nation BC, 2016). MNBC also has cultural sites mapped within the Project "region" (Metis Nation BC, 2016). In February 2017, IDM corresponded with MNBC to obtain more information regarding Métis citizens' CULRTP within the LSA and to determine whether the cultural sites mentioned are in proximity to the Project. IDM followed-up with MNBC on multiple occasions regarding this information but at the time of writing, no further information has been received.

More detail regarding MNBC's ethnographic background and Aboriginal Interests can be found in Chapter 26.

20.10.5.3.3 Environmental Conditions

The Project is located within the Bitter Creek watershed, which ranges in elevation from approximately 100 to 1850 m above sea level. Red Mountain, which holds the targeted ore deposits, is between the Cambria Icefield and Bromley Glacier.

Vegetation and Ecosystems

The Bitter Creek watershed is within the Southern Boundary Ranges ecoregion of BC. These ranges form an area of rugged coastal mountains with steep topography, glaciers, and icefields. The climate is typically cold and wet with heavy precipitation year round. In higher elevations, heavy snowpacks (up to 3 m) are typical.

Steep, wet slopes that contain frequent avalanche tracks characterize the Bitter Creek valley. The north end of the valley contains Coastal Western Hemlock (CWH) forests along the lower and mid slopes, including large areas of mid-slope mature and old forests. This zone encompasses 1,969 hectares (ha). Dominant tree species are Western Hemlock (*Tsuga heterophylla*) and Sitka Spruce (*Picea sitchensis*).

The mouth of Bitter Creek, as it drains into Bear River, is characterized by flat floodplain forests. Narrow fringes of floodplain forest extend up Bitter Creek, with most of the creek floodplain area being highly scoured rock and gravel, and occasional sparsely vegetated areas. Mountain Hemlock (MH) forests occupy a narrow, steep band above the CWH (around 700 m in elevation) and replace the CWH at the valley bottom as elevation increases to the east of Roosevelt Creek. Forests in the MH zone are dominated by Mountain Hemlock (*Tsuga mertensiana*) and Amabalis Fir (*Abies amabilis*). Yellow Cedar (*Chamaecyperus nootkatensis*) is also infrequently present. Parkland MH forests start around 900 m in elevation, and often contain old to very old forested stands before giving away to stunted Krummholz around 1,200 m as the alpine zone begins.

As Bitter Creek climbs in elevation towards Bromley Glacier, lower slope forests begin to be replaced by early seral shrub communities where the soil development is limited and vegetation communities are in early stages of establishment post-glaciation. At the southern end of the valley, the MH transitions into sparse parkland communities, with the majority of the area dominated by recently de-glaciated moraine, along with colluvial slopes and barren alpine communities. Alpine communities are varied in the Bitter Creek watershed. Transitional areas above the parkland forests are often diverse and contain rich herb meadow slopes, Subalpine Fir (*Abies lasiocarpa*) krummholz, and expanses of alpine heath intermixed with dwarf shrub tundra-like communities. Exposed higher elevations contain extensive sparsely-vegetated communities and barren rock outcrops before giving away to glaciers and icefields.

Avalanche tracks are abundant in the watershed, due to steep slopes and high snowfall. Avalanche habitat is typically wet and rich and dominated by Alder (*Alnus alnobetula*), with lesser components of Devil's Club (*Oplopanax horridus*) and various willows (*Salix* spp.). At upper elevations the avalanche slopes often contain rich herb meadows. The edge of

avalanche tracks, as they pass through forested areas, often contain slide-maintained forested communities that are highly irregular and fragmented in extent, and contain a high percent of dead or damaged trees.

Wildlife and Migratory Birds

Table 20.10-7 summarizes baseline data collection from 2015 to 2017 for key wildlife species. Field surveys from 2015 to 2016 focused on species presence and, where possible, relative abundance. Surveys conducted in 2017 were conducted to supplement data gaps in Mountain Goat winter surveys. A combination of ground and aerial surveys were used depending on the focal species.

The LSA for wildlife and migratory birds encompasses the area (14,594.6 ha) from the mouth of Bitter Creek to the headwaters at the base of the Bromley Glacier and the edge of the Cambria Icefields. The RSA is a much larger area surrounding the LSA and is intended to provide a regional context to the wildlife and wildlife habitat found within the LSA. The RSA encompasses 205,350 ha, from Meziadin Lake in the east to the head of the Portland Canal in the west, and from Hastings Arm in the south to the upper end of the American Creek watershed to the north. The RSA was also intended to provide regional context for the LSA and to provide an assessment of wide ranging species such as Grizzly Bear and Wolverine.

Table 20.10-7: Project-Specific Wildlife Baseline Studies

Species	Survey Description	Survey Dates
Mountain Goat	Surveys primarily conducted on an opportunistic basis while accessing the site or during other surveys	August 2015
	Aerial surveys within the LSA	June and July 2016
	Aerial surveys within the RSA	July 2016 (northern half of the RSA) August 2016 (southern half of the RSA)
	Aerial survey within Nisga'a Lisims Government Mountain Goat Block 25 (includes LSA)	March 2017
	Ground surveys within the LSA (fixed observation stations)	July 2016 March 2017
	Habitat assessments within the LSA, including WHR field verification (2015 field season only)	August 2015 June and July 2016
	Wildlife cameras	2015 and 2016 field visits March 2017
Grizzly Bear	Opportunistic wildlife surveys throughout the LSA Wildlife cameras	August 2015 June and July 2016
	Aerial den survey	August 2015

Species	Survey Description	Survey Dates
Moose	Opportunistic wildlife surveys throughout the LSA	August 2015
	Systematic transect surveys within suitable portions of the LSA	June 2016
Furbearers	Opportunistic wildlife surveys throughout the LSA	2015 and 2016 field visits
Migratory Breeding Birds	Unlimited radius point count surveys within the LSA	June to July 2016

Mountain Goat studies show that the LSA provides abundant habitat. High summer habitat use was observed in the proposed Mine Site area near Goldslide Creek. Trails and fresh tracks traverse from north to south and vice versa along well-established trails that cross Goldslide Creek just downstream of the current exploration camp. This movement pattern continues northward toward Roosevelt Creek, and the east side of the Bitter Creek valley is heavily utilized in summer.

Grizzly bear use within the LSA varies by season. Spring habitat is limited to lower elevations due to long-lasting snowpacks. During the summer, grizzly bears are wide roaming and a large portion of the LSA provides suitable habitat. Wildlife cameras detected individuals within the Goldslide Creek basin. Fall habitat is again located within lower elevations and is related to the limited availability of high protein foods and location of berry crops. Five grizzly bear dens have been identified on north facing slopes on the southern boundary of the LSA.

Moose studies show that the LSA provides little wintering habitat for this species. Most habitat is located along the floodplains of Bitter Creek at lower elevations and within the confluence of the Bear River. No signs of moose or evidence of use were observed during any of the 2015-2016 surveys.

Surveys for furbearers such as marten and wolverine were conducted opportunistically while conducting other studies. Furbearer observations included evidence of signs such as tracks and scat. While suitable habitat is present within the LSA, American Marten and Wolverine were not detected.

Migratory birds were detected through radius point count surveys and as incidental observations during species-specific bird surveys. Of the 28 migratory bird species detected, those that were most frequent included Varied Thrush (18%), Swainson's Thrush (13%) and American Robin (6%). Other species of note included Olive-sided Flycatcher (a *Species at Risk Act*-listed species), MacGuillvary's Warbler, and Black Swift. Most detections occurred within forested habitat in the CWH zone. This zone also had the greatest diversity of migratory bird species.

Fish and Fish Habitat

Fish and fish habitat baseline surveys were conducted to create a baseline for aquatic data. Surveys were initiated in 2014 and conducted seasonally through 2016. The scope of these baseline surveys included fish habitat, fish communities, sediment quality, tissue metal burdens of the invertebrate community, periphyton, and benthic macroinvertebrates.

The study area was divided into a LSA and RSA; the LSA contains watercourses that could be directly affected by mine development and operations, and the RSA represents that zone potentially influenced indirectly. 35 fish and fish habitat assessment sites were established within the RSA with 21 of those lying within the LSA, which is comprised of Bitter Creek and its tributaries. The Bitter Creek mainstem was delineated into 6 reaches. Reach 5 contains seven barriers in the form of falls, cascades, or chutes, each of which forms a complete fish migration barrier. Thus waters along Bitter Creek and its tributaries upstream of these barriers are non-fish bearing.

The LSA is characterized by a deeply-incised valley carved through rugged, rocky terrain. Landscape features within the Bitter Creek valley include: landslides, debris torrents, outwash channels, and alluvial fans associated with most tributaries.

Bitter Creek, the primary waterbody within the LSA, is a highly turbid watercourse originating beneath Bromley Glacier, and is charged by glacial melt and precipitation (rain and snowmelt) and, to a lesser extent, groundwater. Bitter Creek is a left bank and largest tributary to Bear River. Fish habitat is marginal throughout Bitter Creek and constrained by high velocity, heavy suspended sediment loads, and low habitat complexity.

Bear River sample sites (i.e., in the RSA) exhibited superior fish habitat quality and quantity over those in the LSA. Salmonid spawning and rearing areas, although not extensive through the Bear River watershed, were widely distributed with the majority associated with right bank tributaries and side channels. Conversely, fish habitat in the LSA appeared confined to the lower reaches of Bitter Creek tributaries allowing fish access. Habitat is also associated with those areas within or immediately downstream of Bitter Creek tributary confluences, where water is clear or sediment loads are significantly less than the Bitter Creek mainstem channel. In large part, the Bitter Creek mainstem channel provides very little habitat because of its elevated turbidity, high current velocities, and negligible refugia.

Two fish species were observed in the LSA: Dolly Varden and Coastrange Sculpin. Dolly Varden were found throughout the fish bearing portions of the watershed, Reaches 1 to 4, while sculpins were noted only in the lower section of Bitter Creek's first reach immediately adjacent to the mainstem of the Bear River. The majority of LSA fish were observed in Bitter Creek tributaries or in Bitter Creek channel margins influenced by tributary flow.

Fish species diversity in Bear River was greater than that of Bitter Creek and included Dolly Varden, Coho, Chum, Pink and Chinook salmon, Steelhead, Eulachon, and Coastrange Sculpin (Chum, Pink, Steelhead, and Eulachon documented but not observed). Sampled areas in the Bear River outside the LSA were confined to small tributaries, alluvial fans, and off-channel areas.

Fish habitat quality throughout the RSA is limited by flashiness, high-suspended sediment values, and minimal habitat complexity. Bitter Creek originates beneath the Bromley Glacier and receives additional sediment load directly from its bank margins in its upper three reaches, as well as from frequent events associated with its numerous tributaries over the length of its mainstem channel. A recent and ongoing failure of the Bromley Glacier upstream of its toe contributes large volumes of ice to Bitter Creek that imparts severe scour and elevated suspended sediment loads to downstream reaches. This recent and likely ongoing event will further degrade the already limited and stressed downstream main channel habitat suitability for fish.

20.10.6 Potential Effects

The purpose of this section is to identify how TSKLH's and MNBC's CULRTP may be affected by interactions with the Project's components and activities.

20.10.6.1 Methods

A standardized effects assessment methodology has been applied to all assessment topics. This methodology follows recommended provincial and federal guidelines and legislated requirements, pursuant to the *BC Environmental Assessment Act* and CEAA 2012.

20.10.6.2 Project Interactions

IDM anticipates that the following proposed Project components or activities may interact with TSKKLH's and MNBC's CULRTP within the LSA:

- Environmental changes to fish, fish habitat, wildlife, wildlife habitat, or vegetation and ecosystems resulting in changes to TSKLH's or MNBC's ability to harvest fish, wildlife, birds, or plants for traditional purposes;
- Changes in access to the Bitter Creek valley resulting in changes to TSKLH's or MNBC's ability to harvest fish, wildlife, birds, or for traditional purposes; and
- Changes to the cultural value of the Bitter Creek valley, including avoidance, resulting from changes in Air Quality, Visual Quality, and Noise.

These anticipated interactions are summarized in Table 20.10-8.

Table 20.10-8: Potential Project Interactions, CULRTP

Project Component or Activity	Valued Components / Intermediate Components	Potential Effect Pathway / Interaction with CULRTP
Access Road Powerline Mine Site Tailing Management Facility (TMF) Process Plant	Wildlife and Wildlife Habitat	Potential environmental changes to wildlife (including birds) and wildlife habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes, including: • Habitat alteration; • Sensory disturbance; • Disruption to movement; • Direct mortality; • Indirect mortality; • Chemical hazards; and • Attractants.
Mine Site TMF Access Road	Fish and Fish Habitat	Potential environmental changes to fish and fish habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest fish for traditional purposes, including: • Direct mortality; • Reduction in fish health; and • Changes in fish habitat quantity or quality.
Access Road Powerline Mine Site TMF Process Plant	Vegetation and Ecosystems	Potential environmental changes to vegetation and ecosystems resulting in changes to TSKLH's or Métis citizens' ability to harvest plants for traditional purposes, including: • Loss and/or alteration of ecosystem function and extent; and • Loss or alteration of known occurrences of rare plants or lichens.
Access Road	Access	Potential changes to TSKLH's or MNBC's ability to access the Bitter Creek valley for traditional purposes.
Access Road Powerline Mine Site TMF Process Plant	Air Quality Visual Quality Noise	Potential changes to the cultural value of the Bitter Creek valley due to changes in Air Quality, Visual Quality, and Noise.

20.10.6.3 Discussion of Potential Effects

This section provides a more detailed description of the potential effects listed in Table 20.10-8.

20.10.6.3.1 Potential Changes to Wildlife Resources

Potential environmental changes to Wildlife (including birds) and Wildlife Habitat may affect TSKLH's and MNBC's CULRTP through changes to TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes. For example, a reduction in the quantity of wildlife in the Bitter Creek valley could reduce TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes and would be an effect on TSKLH's and MNBC's CULRTP.

IDM anticipates three primary effects to wildlife and wildlife habitat that could affect TSKLH's and MNBC's CULRTP: reduction in habitat availability (including habitat alteration and sensory disturbance), disruption to movement, and mortality (including direct and indirect mortality and chemical hazards and attractants). These are discussed in more detail below.

Habitat Availability: Habitat Alteration and Sensory Disturbance

Habitat alteration includes the loss or alteration of wildlife habitat due to the Project footprint, which will result in the displacement of wildlife for a period of time. Habitat alteration will occur during the Construction Phase when the Project footprint is cleared of vegetation, but will persist throughout all phases until Project components are removed and reclaimed. All Project components will be temporary. Disturbed areas no longer required for the Project will be progressively reclaimed, and any Project components remaining once production has ceased will be removed and reclaimed.

Sensory disturbance includes the potential effects of Project-related noise, light, dust, or human presence on wildlife, which may result in behavioral changes, different predator-prey interactions, or avoidance of the Project footprint and adjacent areas. Sensory disturbance will occur during all Project phases. Sensory disturbance will be greatest from the Construction Phase through to the Closure and Reclamation Phase, but is anticipated to lessen during the Post-Closure Phase when minimal monitoring and maintenance activity will occur on site. Once production is completed, all Project components will be removed and reclaimed and the potential effects of sensory disturbance should cease.

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on wildlife habitat availability are listed in Section 20.10.7.

Habitat availability has been identified as a potential residual effect on mountain goat, moose, grizzly bear, furbearers, and migratory birds. These residual effects are discussed in Section 20.10.8.3.1.

Disruption to Movement

Disruption to movement includes the potential effects of Project activities and infrastructure on habitat connectivity and wildlife movements. Project activities and

infrastructure may create physical or sensory barriers or filters to movement between daily or seasonal habitats, which could have implications for the long-term persistence and viability of wildlife populations. Habitat fragmentation occurs through habitat removal (i.e., through vegetation clearing) in a location and in a manner that reduces habitat connectivity, potentially disrupting wildlife movements. Disruption to movement can also occur when infrastructure blocks wildlife movement through restricted terrain features (e.g., a narrow valley or canyon) or restricts wildlife movement within or between waterbodies. Increased traffic levels along the highway can confound the issue, adding a sensory barrier or filter to an already existing physical barrier or filter. Disruption to movement may occur during all Project phases and is considered a potential effect for all wildlife VCs except bats and birds, as flight allows movements to continue uninterrupted by Project activities or infrastructure. Once operations cease, all Project components will be removed, the site reclaimed, and the potential effects of disruption to movement should cease.

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on wildlife movement are listed in Section 20.10.7.

Habitat disruption has been identified as a potential residual effect on mountain goats, moose, grizzly bear, furbearers, and migratory birds. These residual effects are discussed in Section 20.10.8.3.1.

Mortality: Direct, Indirect, Chemical Hazards, and Attractants

Direct mortality includes the potential direct effects of Project activities and infrastructure on wildlife mortality caused by vegetation clearing and ground disturbance during construction, collisions with Project-related traffic on the Mine Site and Access Road, or collisions and electrocution caused by power lines. Mortality may occur during the Construction Phase through to the Closure and Reclamation Phase and is considered a potential effect via different pathways for each wildlife VC. Direct mortality risk due to vegetation clearing and ground disturbance is more closely related to small mammals, roosting bats, nesting birds, and amphibians that may not be able to escape clearing equipment. Direct mortality risk due to wildlife-vehicle collisions is pertinent for all wildlife VCs, while direct mortality risk due to power lines is linked to bats and birds only. Direct mortality risk will be greatest during the Construction Phase when the Project footprint is cleared of vegetation and from the Construction Phase through the Operation Phase when vehicle traffic is anticipated to be highest. The risk is anticipated to lessen during the Closure and Reclamation Phase and will be negligible during the Post-Closure Phase when minimal human activity will occur on site for monitoring and maintenance activities. Once operations cease, all Project components will be removed, the site will be reclaimed, and the potential effects of direct mortality should cease.

Indirect mortality includes the potential indirect effects of Project activities and infrastructure on wildlife mortality caused by increased hunting pressure (both legal and illegal) due to improved access, new travel corridors that facilitate predation, or entrapment in Project facilities such as holding ponds, buildings, or along the Access Road corridor during winter due to high snowbanks. This potential effect may occur during the Construction Phase through to the Closure and Reclamation Phase and is considered a potential effect via different pathways for each wildlife VC. Indirect mortality risk due to

increased hunting pressure is related to large mammals and furbearers. Indirect mortality risk due to facilitated predation is addressed for Mountain Goat and Moose only, while indirect mortality due to entrapment is addressed for all wildlife VCs. The risk is anticipated to be negligible during the Post-Closure Phase when minimal human activity will occur on site for monitoring and maintenance activities. Once production is completed, all Project components will be removed and reclaimed and the potential effects of indirect mortality should cease.

Chemical hazards include the potential effects of any Project-related chemicals that may cause adverse health effects on wildlife VCs. Exposure to chemical hazards may occur via uptake from the surrounding environment (e.g., water, dust, soil, or sediment) or via the ingestion of contaminated tissue (e.g., vegetation or animal prey). Exposure may also occur via direct contact with chemical hazards at on-site storage areas. This potential effect may occur during all Project phases and is considered an effect pathway for all wildlife VCs. Chemical hazards related to Project activities may persist within and adjacent to the Project footprint following the Post-Closure Phase (e.g., metal leaching and acid rock drainage).

Attractants include the potential effects of any Project-related features or materials that may interest or provide resources for wildlife VCs, which could lead to behavioral changes and potential human-wildlife conflicts. This may occur during the Construction Phase through to the Closure and Reclamation Phase and is considered a potential effect for all wildlife VCs. Project features or materials that may attract wildlife include infrastructure where odors or food sources associated with petroleum products, food waste and associated domestic garbage, or grey water and sewage may be present. Project infrastructure may also provide refuge or shelter for small mammals or perching, nesting, or roosting sites for bats and birds. Waterbirds and amphibians may be attracted to holding ponds or roadside pools as stop-over, foraging, or breeding sites. Amphibians may also be attracted to road surfaces during the summer that retain heat after sunset. Vegetation growing along Project roads or within the Powerline right of way may attract grazing or browsing wildlife, while roadkill carcasses along Project roads may attract scavenging wildlife. Wildlife may also be attracted to salt on Project roads used for deicing or dust suppression, and Project roads and the Powerline right of way may create favorable travel corridors. Once production is completed, all Project components will be removed and reclaimed and the potential effects of attractants should cease.

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on wildlife mortality are listed in Section 20.10.7.

Mortality has been identified as a potential residual effect on mountain goats, moose, grizzly bear, furbearers, and migratory birds. These residual effects are discussed in Section 20.10.8.3.1.

20.10.6.3.2 Potential Changes to Fish Resources

Potential environmental changes to Fish and Fish Habitat may affect TSKLH's and MNBC's CULRTP through changes to TSKLH's or Métis citizens' ability to harvest fish for traditional purposes. For example, a reduction in the quantity of fish in Bitter Creek could reduce

TSKLH's or Métis citizens' ability to harvest fish for traditional purposes and would be an effect on TSKLH's and MNBC's CULRTP.

The Project may have effects on Fish and Fish Habitat, including direct mortality, reduction in fish health, and changes in fish habitat quantity or quality. Three primary Project components will interact with Fish and Fish Habitat:

- Underground mining;
- The TMF; and
- The Access Road, which will involve Bitter Creek infill during construction.

The only direct loss of fish habitat is anticipated though construction of the Access Road parallel to Bitter Creek. Instream works as a part of this activity could affect the availability of instream habitat features (such as pools and substrates) that could affect overwintering, spawning, and rearing habitat availability for fish. Aquatic resources (benthic invertebrates and periphyton) colonization habitat may also be affected. Potential effects to aquatic resources have been considered as a pathway in the summary of potential effects to Fish and Fish Habitat.

The Fish VC in this assessment is represented by Dolly Varden, Bull Trout, Eulachon, and Salmonid species. Note that Salmonid species consist of all salmonids present in the LSA and RSA, except for Dolly Varden and Bull Trout, since the latter were identified as separate sub-components early in the VC selection process.

Goldslide Creek is a non-fish bearing watercourse that discharges more than 5 km upstream from any fish-bearing waters in Bitter Creek. Goldslide Creek is not fish habitat due to its discharge into Bromley Glaicer. It does not contribute to fish habitat in the form of food due to its distance from fish habitat below downstream fish barriers. It does make a minor contribution to Bitter Creek flow.

The potential interactions between proposed Project components and Fish and Fish Habitat are summarized in Table 20.10-9.

No effects of the Project are anticipated on salmonid species, eulachon, or coastrange sculpin as they are not found in the mainstem of Bitter Creek. Sockeye, pink, and chum salmon are absent from the LSA, and the Project is not anticipated to affect these species of salmon.

No effects of the Project are anticipated on steelhead. Steelhead only occur in the Bear River, and the Project is not anticipated to result in residual effects outside of the extent of Bitter Creek.

Table 20.10-9: Potential Project Interactions and Effects on Fish and Fish Habitat

Project Component/Activity	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	Potential Effect / Pathway of Interaction with Fish and Fish Habitat
Construction Phase						
Workforce (including employment of staff and contractors)	X	X				Potential increased fishing pressure due to increased access and increased presence in the Bitter Creek valley.
Construct Access Road and Haul Road from Hwy 37A to the Upper Portal	X	X	X	X	X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition; direct mortality from mine footprint and associated infrastructure; habitat loss from mine footprint development and associated infrastructure; habitat loss from changes to streamflow and channel morphology; direct mortality from increased fishing pressure.
Install powerline from substation tie-in to the Lower Portal laydown area	X	X			X	Changes to surface water quality as a result of erosion and sedimentation, dust deposition.
Discharge of water from underground workings at the Mine Site	X	X	X	X	X	Changes to surface water quality as a result of mine water discharge; habitat loss from changes in streamflow.
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	Habitat loss from changes to streamflow.
Clear and prepare the TMF basin and Process Plant site pad	X	X			X	Direct mortality and habitat loss due to mine footprint development and associated infrastructure; changes to water and sediment chemistry from erosion, sedimentation and dust deposition.
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	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.

Project Component/Activity	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	Potential Effect / Pathway of Interaction with Fish and Fish Habitat
Establish water management facilities including diversion ditches for the TMF and Process Plant	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Construct the TMF	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Construct the Process Plant and Run of Mine Stockpile location	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Construct water treatment facilities and test facilities at Bromley Humps	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Construct Bromley Humps ancillary buildings and facilities	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Commence milling to ramp up to full production	X	X			X	Changes in water and sediment chemistry from erosion, sedimentation and dust deposition.
Operation Phase						
Workforce (including employment of staff and contractors)	X	X				Potential increased fishing pressure due to increased access and increased presence in the Bitter Creek valley.
Use Access Road for personnel transport, haulage, and delivery of goods	X	X	X	X	X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Maintain Access Road and Haul Road, including grading and plowing as necessary	X	X	X	X	X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Maintain powerline right-of-way from substation tie-in to portal entrance, including brushing activities as necessary	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Discharge of water from underground facilities	X	X	X	X	X	Changes in surface water and sediment chemistry from mine discharge; habitat loss from changes to streamflow.
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	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.

Project Component/Activity	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	Potential Effect / Pathway of Interaction with Fish and Fish Habitat
Freshwater for the Process Plant will be obtained through water withdrawal from Bitter Creek	X	X			X	Habitat loss from changes to streamflow.
Treat and discharge, as necessary, excess water from the TMF	X	X	X	X	X	Changes in hydrology, and water and sediment chemistry from TMF discharges.
Progressively reclaim disturbed areas no longer required for the Project	X	X			X	Changes in surface water and sediment chemistry from erosion and sedimentation.
Closure and Reclamation Phase						
Workforce (including employment of staff and contractors)	X	X				Potential increased fishing pressure due to increased access and increased presence in the Bitter Creek valley.
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	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Decommission underground infrastructure	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Flood underground	X	X	X	X	X	Changes in hydrology, and water and sediment chemistry from mine discharges.
Decommission and reclaim Lower Portal Area and Powerline	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Decommission and reclaim Haul Road	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition.
Decommission and reclaim all remaining mine infrastructure (Mine Site and Bromley Humps, except TMF) in accordance with Closure Plan	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition
Construct the closure spillway	X	X			X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition
Treat and discharge water from the TMF	X	X	X	X	X	Changes to surface water quality as a result of discharge, erosion and sedimentation, and dust deposition

Project Component/Activity	Dolly Varden	Bull Trout	Eulachon	Salmonid Species	Fish Habitat	Potential Effect / Pathway of Interaction with Fish and Fish Habitat
Conduct maintenance of mine drainage, seepage, and discharge	X	X	X	X	X	Changes in hydrology, and water and sediment chemistry from discharges
Remove discharge water line and water treatment plant	X	X			X	Changes in surface water and sediment chemistry (due to filling of the TMF and discharge via the closure spillway)
Decommission and reclaim Access Road	X	X	X	X	X	Changes in surface water and sediment chemistry from erosion, sedimentation and dust deposition
Post-Closure Phase						
Flood underground	X	X	X	X	X	Changes to surface water quality as a result of ML/ARD and groundwater interaction

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on fish and fish habitat are listed in Section 20.10.7.

Some residual effects on fish habitat and Dolly Varden are anticipated due to the interactions between the Project and Bitter Creek. These are detailed in Section 20.10.8.3.2.

20.10.6.3.3 Potential Changes to Vegetation and Ecosystems

Potential environmental changes to Vegetation and Ecosystems may affect TSKLH's and MNBC's CULRTP through changes to TSKLH's or Métis citizens' ability to harvest plants for traditional purposes. For example, a reduction in the quantity of vegetation in the Bitter Creek valley could reduce TSKLH's or Métis citizens' ability to harvest plants for traditional purposes and would be an effect on TSKLH's and MNBC's CULRTP.

As outlined in Vegetation and Ecosystems Effects Assessment (Volume 3, Chapter 15), the Project is anticipated to have minimal adverse residual effects on vegetation and ecosystems in the Bitter Creek valley due to the limited magnitude of the Project footprint. Clearing of vegetation will be targeted to the footprint of surficial Project components; most of the works will be conducted underground.

During the Construction Phase, the loss and alteration of ecosystem and vegetation VCs will occur as a result of construction activities associated with the following Project components:

- Re-activation of the 14 km Access Road from Highway 37A to Bromley Humps;
- Clearing and construction of the TMF and the Process Plant at Bromley Humps;
- Clearing and construction of the 13 km Haul Road from the Process Plant to the underground mine;
- Clearing associated with the 138 kilovolt Powerline right of way from Highway 37A to the Mine Site; and
- Power pole installation along the length of the Powerline.

During the Operation Phase, incremental loss and alteration of Vegetation and Ecosystem VCs are expected as a result of activities associated with the following Project components:

- Ongoing use of the Access and Haul Roads;
- Loss of vegetation in the TMF footprint; and
- Temporary Waste Rock Storage Areas generated from mine development.

Decommissioning activities during the Closure and Reclamation Phase may result in small, incremental losses to ecosystem extent due to slope stabilization and re-contouring, re-vegetation, and reclaimed area maintenance activities. During this phase vegetation will also increase as reclaimed and re-vegetated areas are established.

Following mine closure and decommissioning of infrastructure, ongoing post-closure monitoring and management will be implemented. This is not expected to interact with

Ecosystem and Vegetation VCs. Vehicles travelling to and from site will pose a low risk of introducing invasive plants onto the Project site.

The Project is expected to result in loss and/or alteration of ecosystem function through the following potential pathway effects: surface disturbance (including soil erosion, compaction, and loss of soil fertility), dust effects, edge effects, introduction and/or spread of invasive plant species, windthrow, fragmentation, and alteration of hydrological connectivity.

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on plant resources are listed in Section 20.10.7. However, direct and indirect effects cannot be fully mitigated and thus loss and/or alteration of alpine and parkland ecosystems, old and mature forested ecosystems, BC Conservation Data Centre (BC CDC) listed floodplain and wetland ecosystems, and rare plants and lichens are predicted.

IDM has not found evidence of either TSKLH or MNBC harvesting BC CDC listed plants or lichens for traditional purposes, therefore this potential interaction and effect has not been brought forward into the effects assessment.

The potential residual effects of the Project on plant resources are discussed in Section 20.10.8.4.

20.10.6.3.4 Potential Changes to Access

Potential changes to access to the Bitter Creek Valley may affect TSKLH's and MNBC's CULRTP through changes to TSKLH's or Métis citizens' ability to access areas used for traditional purposes.

Project development may limit user access to resources within Bitter Creek due to safety considerations and disturbance. This effect is anticipated to occur during the Construction, Operation, and Closure and Reclamation Phases of the Project.

Measures to avoid, minimize, mitigate, or otherwise address the potential effects of the Project on access are listed in Section 20.10.7. IDM anticipates that through effective implementation of these mitigation measures, there will be no residual effects on access.

20.10.6.3.5 Potential Changes to Cultural Value

Potential environmental changes to air quality, visual quality, and noise may affect TSKLH's and MNBC's CULRTP through changes to the cultural value of the Bitter Creek valley. For example, an increase in noise and dust in the Bitter Creek valley could make TSKLH and Métis citizens less likely to use the valley for traditional purposes and would be an effect on TSKLH's and MNBC's CULRTP.

Air Quality

Proposed Project activities will result in air emissions to the ambient environment. This includes the generation and airborne transport of fugitive dust particles and exhaust

emissions from surface and underground equipment. The Air Quality Effects Assessment (Volume 3, Chapter 7) has characterized ambient air quality by seven indicators: nitrogen oxide, sulphur dioxide, carbon monoxide, total suspended particulate matter, respirable particulate matter, and dust deposition. An air dispersion model was used to predict the potential Air Quality effects of the Project and compared to provincial and federal ambient air quality objectives. The model was prepared in line with guidance stipulated in the BC Model Guidelines and in consultation with the BC MoE.

The Air Quality dispersion model considered ambient background concentrations of air contaminants. A regional air-emission inventory was prepared for the major sources associated with the Project.

There are six mining or development activities that are considered air emissions sources:

- Heaters and fans;
- Vented mining equipment tailpipe emissions from underground;
- Mining equipment and vehicle tailpipe emissions from surface;
- Unpaved road dust;
- Material handling, such as material drop onto stockpiles; and
- Other mining activities, such as earthworks, grading, and stockpiling.

As outlined in the Air Quality Effects Assessment (Chapter 7), air contaminant concentrations are predicted to be below ambient air quality objectives within 500 m of Project infrastructure and within 50 m of the Access Road. These objectives were developed to be protective of human and environmental health.

Due to the absence of Air Quality effects, it is unlikely that Project-induced changes to Air Quality will affect the cultural value of the Bitter Creek valley. As no effects on TSKLH's and MNBC's CULRTP have been identified due to changes in Air Quality, no mitigation measures or residual effects have been noted for this component.

Visual Quality

The Bitter Creek valley is a steep-sided, mountainous valley, heavily forested in the lower and middle reaches, gradually giving way to a treeless, alpine landscape dominated by glaciers in the higher regions. Access to the valley is limited due to rugged terrain and lack of infrastructure. A logging road and bridge at Hartley Gulch were decommissioned in the 1990s. Project interactions with Visual Quality are restricted to the Bitter Creek watershed where Project components or activities might be observed.

Project infrastructure will be visible to individuals entering the Bitter Creek valley. Given the steepness and narrowness of the valley, individuals are likely to access the valley using the Access Road as the other side of the valley has no known trails or access.

It is IDM's understanding that TSKLH and MNBC seldom use the Bitter Creek valley for traditional purposes; therefore the likelihood reduced cultural value due to Visual Quality effects is low.

The Access Road gate and Powerline will be visible to passing motorists driving along Highway 37A. Given highway speeds and the curvature of the highway, it is anticipated that this infrastructure will not be visible for more than a few seconds. The interaction between motorists and Visual Quality has no potential effect on TSKLH's and MNBC's CULRTP.

As no effects on TSKLH's and MNBC's CULRTP have been identified due to changes in Visual Quality, no mitigation measures or residual effects have been noted for this component.

Noise

Project activities may introduce noise to the surrounding environment, potentially creating adverse noise effects to receptors located in the area. Project-related noise levels (including blasting) have therefore been assessed and compared to relevant benchmarks and guidance levels for the protection of human health and wildlife (Noise Effects Assessment, Volume 3, Chapter 8). Noise modeling employed the protocols outlined in the International Organization for Standardization.

Due to the relatively remote location of the Project, it is expected that regional noise levels are low, and ambient noise will be prevalent along with other intermittent or infrequent sources, such as overlying aircraft.

An estimated baseline nighttime noise level of 35 A-weighted decibels (dBA) (L_n) was adopted for the Bitter Creek valley. Daytime ambient sound levels (L_d) are commonly 10 dBA L_{eq} higher than nighttime levels. For the purpose of assessing potential Project effects on TSKLH's and MNBC's CULRTP as a result of Noise, only daytime noise levels have been considered, as it is unlikely individuals would use the valley at night.

Predictions for Noise effects in the Bitter Creek valley are well below exceedance limits. During the Construction Phase, noise exceedances of 55 dBA (approximately the noise level of conversational speech or an air conditioning unit) are limited to the immediate area of construction at Bromley Humps. During operations, the immediate area around the Haul Road from the Process Plant to the Mine Site and the locations near the portals will also exceed 55 dBA.

Due to the very limited extent of Noise effects and to the known low level of TSKLH's and MNBC's CULRTP in the Bitter Creek valley (based on IDM's understanding), it is unlikely that Project noise will affect the cultural value of the Bitter Creek valley. As no effects to TSKLH's and MNBC's CULRTP have been identified due to changes in Noise, no mitigation measures or residual effects have been noted for this component.

20.10.7 Mitigation Measures

IDM has identified measures to avoid, minimize, mitigate, or otherwise address potential adverse effects to TSKLH's and MNBC's CULRTP. These are summarized in Table 20.6-1.

Approaches considered to manage, mitigate, and/or monitor potential effects may include:

- Optimizing Alternatives;
- Design Mitigation;

- Best Available Technology;
- Best Management Practices;
- Restoration; and
- Offsetting.

20.10.7.1 Effectiveness of Mitigation Measures

The anticipated effectiveness of mitigation measures to minimize the potential for significant adverse effects is evaluated and classified as follows:

- Low effectiveness: After implementation of the mitigation measure, the effect is largely unchanged (i.e., little to no improvement in the condition of the VC or indicator).

- Moderate effectiveness: After implementation of the mitigation measure, the effect is moderately changed (i.e., a moderate improvement in the condition of the VC or indicator).

- High effectiveness: After implementation of the mitigation measure, the effect is significantly improved (i.e., major improvement in the condition of the VC or indicator), or the effect is eliminated.

- Unknown effectiveness: The mitigation measure has not been employed elsewhere in similar circumstances, and its effectiveness is unknown.

The potential effects, proposed mitigation measures, and their effectiveness are summarized using Table 20.6-1. This table also identifies the residual effects that will be carried forward for residual effects characterization and significance determination.

Table 20.10-10: Proposed Mitigation Measures and Their Effectiveness

Potential Effect	Pathway Valued Components	Applicable Phase(s)	Mitigation Measure(s)	Residual Effect(s)
Potential environmental changes to wildlife (including birds) and wildlife habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes	Wildlife and Wildlife Habitat	Construction Operation Closure and Reclamation Post-Closure	IDM will seek to avoid, minimize, mitigate, or otherwise address potential changes to TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes through the measures identified to avoid, minimize, mitigate, or otherwise address potential changes to Wildlife and Wildlife Habitat, which are listed in Table 20.10-11.	There may be residual effects on wildlife habitat availability, habitat disruption, and mortality that could result in residual effects to TSKLH's and MNBC's CULRTP.
Potential environmental changes to fish and fish habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest fish for traditional purposes	Fish and Fish Habitat	Construction Operation Closure and Reclamation	IDM will seek to avoid, minimize, mitigate, or otherwise address potential changes to TSKLH's or Métis citizens' ability to harvest fish for traditional purposes through the measures identified to avoid, minimize, mitigate, or otherwise address potential changes to Fish and Fish Habitat, which are listed in Table 20.10-12.	There may be residual effects on Fish Habitat and Dolly Varden that could result in residual effects to TSKLH's and MNBC's CULRTP.

Potential Effect	Pathway Valued Components	Applicable Phase(s)	Mitigation Measure(s)	Residual Effect(s)
Potential environmental changes to Vegetation and Ecosystems resulting in changes to TSKLH's or Métis citizens' ability to harvest plants for traditional purposes	Vegetation and Ecosystems	Construction Operation Closure and Reclamation	IDM will seek to avoid, minimize, mitigate, or otherwise address potential changes to TSKLH's or Métis citizens' ability to harvest plants for traditional purposes through the measures identified to avoid, minimize, mitigate, or otherwise address potential changes to Vegetation and Ecosystems, which are listed in Table 20.10-13	There may be residual effects on ecosystem abundance, distribution and/or function and loss or alteration to known occurrences of rare plants that could result in residual effects to TSKLH's and MNBC's CULRTP.
Potential changes to TSKLH's or MNBC's ability to access the Bitter Creek valley for traditional purposes	n/a	Construction Operation Closure and Reclamation	IDM will develop, in consultation with the appropriate parties, an Access Management Plan to limit access to the Bitter Creek valley. The Access Management Plan will consider individuals' safety with respect to an active mining project; Aboriginal and Treaty rights in the Bitter Creek valley; existing tenured or licensed activities in the Bitter Creek valley; and existing recreational values in the Bitter Creek valley.	None

Table 20.10-11: Wildlife and Wildlife Habitat Mitigation Measures

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Mountain Goat					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Sensory Disturbance	All Phases	Project Design Minimize Habitat Disturbance Manage Vehicle Traffic	High Moderate Moderate	Low Low Low	Yes
Disruption to Movement	All Phases	Project Design Reduce Barriers or Filters of Movement Manage Vehicle Traffic Prevent Wildlife Entrapment	High Moderate Moderate High	Low Low Low Low	Yes
Direct Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Manage Vehicle Traffic	High High Moderate	Low Low Low	Yes
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Prevent Wildlife Entrapment Manage Vehicle Traffic Access Restriction on Access Road	High High High Moderate High	Low Low Low Low Low	Yes
Chemical Hazards	All Phases	Wildlife Protection Protocol Manage Chemical Hazards	High High	Low Low	No
Attractants	All Phases	Wildlife Protection Protocol Manage Attractants	High High	Low Low	No

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Grizzly Bear					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Sensory Disturbance	All Phases	Minimize Habitat Disturbance Manage Vehicle Traffic	Moderate Moderate	Low Low	Yes
Disruption to Movement	All Phases	Project Design Reduce Barriers or Filters of Movement Manage Vehicle Traffic Prevent Wildlife Entrapment	High High High High	Low Low Low Low	No
Direct Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Manage Vehicle Traffic	High High Moderate	Low Low Low	Yes
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Prevent Wildlife Entrapment	High High High	Low Low Low	No
Chemical Hazards	All Phases	Wildlife Protection Protocol Manage Chemical Hazards	High High	Low Low	No
Attractants	All Phases	Wildlife Protection Protocol Manage Attractants	High High	Low Low	No
Moose					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Sensory Disturbance	All Phases	Manage Vehicle Traffic Minimize Habitat Disturbance	Moderate Moderate	Low Low	Yes

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Disruption to Movement	All Phases	Prevent Wildlife Entrapment Minimize Habitat Disturbance Reduce Barriers or Filters of Movement Manage Vehicle Traffic	High Moderate Moderate Moderate	Low Low Low Low	No
Direct Mortality	All Phases	Wildlife Protection Protocols Manage Attractants Manage Vehicle Traffic	High High Moderate	Low Low Low	Yes
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols	High High	Low Low	No
Chemical Hazards	All Phases	Wildlife Protection Protocols Manage Chemical Hazards	High High	Low Low	No
Attractants	All Phases	Manage Attractants	High	Low	No
Furbearers					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Sensory Disturbance	All Phases	Minimize Habitat Disturbance Manage Vehicle Traffic	Moderate Moderate	Low Low	Yes
Disruption to Movement	All Phases	Project Design Reduce Barriers or Filters of Movement Manage Vehicle Traffic Prevent Wildlife Entrapment	High Moderate Moderate High	Low Low Low Low	Yes (marten only)
Direct Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Manage Vehicle Traffic	High High Moderate	Low Low Low	Yes (marten only)

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocol Prevent Wildlife Entrapment	High High High	Low Low Low	No
Chemical Hazards	All Phases	Wildlife Protection Protocol Manage Chemical Hazards	High High	Low Low	No
Attractants	All Phases	Wildlife Protection Protocol Manage Attractants	High High	Low Low	No
Hoary Marmot					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Disruption to Movement	All Phases	Project Design Manage Vehicle Traffic Prevent Wildlife Entrapment	High Moderate High	Low Low Low	No
Direct Mortality	All Phases	Minimize Habitat Disturbance Wildlife Protection Protocols Manage Vehicle Traffic	Moderate High Moderate	Low Low Low	Yes
Indirect Mortality	All Phases	Wildlife Protection Protocols Prevent Wildlife Entrapment	High High	Low Low	No
Chemical Hazards	All Phases	Wildlife Protection Protocols Manage Chemical Hazards Manage Attractants	High High High	Low Low Low	No
Attractants	All Phases	Wildlife Protection Protocols Manage Attractants	High High	Low Low	No
Bats					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance Wildlife Protection Protocols	High Moderate High	Low Low Low	Yes

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Sensory Disturbance	Construction Operation	Project Design Wildlife Protection Protocols	High High	Low Low	Yes
Direct Mortality	Construction	Project Design Minimize Habitat Disturbance Manage Vehicle Traffic	High Moderate Moderate	Low Low Low	No
Chemical Hazards	Operation Closure and Reclamation Post-Closure	Wildlife Protection Protocols	High	Low	No
Attractants	Operation Closure and Reclamation Post-Closure	Project Design Wildlife Protection Protocols Manage Attractants	High High High	Low Low Low	No
Migratory Breeding Birds					
Habitat Alteration	Construction	Project Design Wildlife Education Program Minimize Habitat Disturbance	High High Moderate	Low Low Low	Yes
Sensory Disturbance	All Phases	Wildlife Education Program Wildlife Protection Protocols Minimize Habitat Disturbance	High High Moderate	Low Low Low	Yes
Direct Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Vehicle Traffic Prevent Wildlife Entrapment	High High Moderate High	Low Low Low Low	No
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Vehicle Traffic Prevent Wildlife Entrapment	High High Moderate High	Low Low Low Low	No

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Chemical Hazards	All Phases	Project Design Wildlife Education Program Wildlife Protection Protocols Manage Chemical Hazards	High High High High	Low Low Low Low	No
Attractants	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Attractants	High High High	Low Low Low	No
Migratory Birds – Species at Risk					
Habitat Alteration	Construction	Project Design Wildlife Education Program Minimize Habitat Disturbance	High High Moderate	Low Low Low	Yes
Sensory Disturbance	All Phases	Wildlife Education Program Wildlife Protection Protocols Minimize Habitat Disturbance	High High Moderate	Low Low Low	Yes
Direct Mortality	All Phases	Project Design Wildlife Education Program Wildlife Protection Protocols Minimize Habitat Disturbance Manage Vehicle Traffic	High High High Moderate Moderate	Low Low Low Low Low	Yes (common nighthawk and marbled murrelet only)
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Vehicle Traffic Prevent Wildlife Entrapment	High High Moderate High	Low Low Low Low	No
Chemical Hazards	All Phases	Project Design Wildlife Education Program Wildlife Protection Protocols Manage Chemical Hazards	High High High High	Low Low Low Low	No

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Attractants	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Attractants	High High High	Low Low Low	No
Raptors					
Habitat Alteration	Construction	Project Design	High	Low	Yes
Sensory Disturbance	All Phases	Minimize Habitat Disturbance	Moderate	Low	Yes
Direct Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols Minimize Habitat Disturbance Manage Vehicle Traffic	High High Moderate Moderate	Low Low Low Low	No
Indirect Mortality	All Phases	Wildlife Education Program Wildlife Protection Protocols	High High	Low Low	No
Chemical Hazards	All Phases	Project Design Wildlife Education Program Wildlife Protection Protocols Manage Chemical Hazards	High High High High	Low Low Low Low	No
Attractants	All Phases	Wildlife Education Program Wildlife Protection Protocols Manage Attractants	High High	Low Low	No
Non-Migratory Game Birds					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	Yes
Sensory Disturbance	All Phases	Wildlife Protection Protocols Minimize Habitat Disturbance	High Moderate	Low Low	Yes

Potential Effect	Applicable Phase(s)	Mitigation Measures	Effectiveness[1]	Uncertainty[2]	Residual Effect
Direct Mortality	All Phases	Project Design Manage Attractants Manage Vehicle Traffic	High High Moderate	Low Low Low	Yes
Indirect Mortality	All Phases	Wildlife Protection Protocols Manage Attractants	High High	Low Low	No
Chemical Hazards	All Phases	Wildlife Protection Protocols Manage Attractants	High High	Low Low	No
Attractants	All Phases	Manage Attractants	High	Low	No
Amphibians – Western Toad					
Habitat Alteration	Construction	Project Design Minimize Habitat Disturbance	High Moderate	Low Low	No
Disruption to Movement	All Phases	Project Design Reduce Barriers or Filters to Movement	High Moderate	Low Low	No
Direct Mortality	All Phases	Minimize Habitat Disturbance Reduce Barriers or Filters to Movement Manage Vehicle Traffic	Moderate Moderate Moderate	Low Low Low	No
Indirect Mortality	All Phases	Prevent Wildlife Entrapment	High	Low	No
Chemical Hazards	All Phases	Manage Chemical Hazards	High	Low	No
Attractants	All Phases	Manage Attractants	High	Low	No

[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

Table 20.10-12: Fish and Fish Habitat Mitigation Measures

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Fish (as represented by dolly vardon, bull trout, eulachon and Oncorynchus salmonids)	Increased fishing pressure	No fishing policy for Project employees and guests	Staff training and awareness plus monitoring and enforcement of company policies are key components of many of IDM's management plans.	Construction, Operation, Closure and Reclamation	High	Low	No
		Existing DFO regulations will be followed.	IDM is committed to lawful operation of the Project.				
		All Project roads will be closed to the public, including private vehicles (snowmobile, all-terrain vehicles, etc.) and all foot traffic, with the possible exception of individuals with existing rights to access the Bitter Creek valley. Project road use will be restricted only to Persons required for Project construction, operation, and maintenance.	Public awareness is a key component of IDM's management plans.		Moderate (Providing round-the-clock monitoring of activity on the roads is not feasible)	Moderate (Difficult to predict how many individuals will ignore signage and rules)	
	Changes in aquatic resources	All implemented mitigation measures for Aquatic Resources will serve as mitigation for Fish and Fish Habitat relative to this effect (Chapter 17, Section 17.6).					No

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
	Changes in surface water quality	All implemented mitigation measures for Surface Water Quality will serve as mitigation for Fish and Fish Habitat relative to this effect (Chapter 13, Section 13.6).					Yes
	Changes in sediment quality	All implemented mitigation measures for Sediment Quality will serve as mitigation for Fish and Fish Habitat relative to this effect (Chapter 14, Section 14.6).					No
	Changes in stream flow	All implemented mitigation measures for Hydrology will serve as mitigation for Fish and Fish Habitat relative to this effect (Chapter 12, Section 12.6.3).					Yes
		Water withdrawal will follow provincial regulatory requirements and standard best practices to avoid adverse impacts to streamflows, fish and fish habitat.	IDM is committed to lawful operation of the Project.	Operation, Closure and Reclamation	High	Low	
	Effects of blasting	All implemented mitigation measures for Surface Water Quality will serve as mitigation for Fish and Fish Habitat relative to this effect (Chapter 13, Section 13.6).					No
		Blasting activities will be limited to the Mine Site during operations; there is no potential for effects on fish from explosive shockwaves as the blasting zone will not be near any fish-bearing watercourses.	Avoidance of blasting activities within fish-bearing watercourses.	Construction, Operation, Closure and Reclamation	High	Low	
		Capture surface runoff and diverting it to the Portal Collection Pond in the	Minimizes the potential for increased nitrogen loading to streams		High		

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
		Mine Site or the TMF in Bromley Humps for treatment prior to discharge.					
Fish Habitat	Habitat loss	Infrastructure (including the Access Road) shall be designed in a manner that minimizes or avoids habitat loss to Fish and Fish Habitat, including minimize the number of stream crossings.	Directly avoids and minimizes the amount of habitat loss to fish and fish habitat	Construction	Moderate (Some habitat loss will occur)	Low	Yes
		Road crossings have been designed to avoid unnecessary impact on fish-bearing streams.					

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

Table 20.10-13: Vegetation and Ecosystems Mitigation Measures

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Ecologically Valuable Soil	Loss and alteration of soil quality and quantity through soil stripping, handling, stockpiling, and dust effects	The design of the Access Road and Haul Road has been optimized to minimize the distance travelled, which will reduce dust associated with Construction and Operation	Reduces the loss and alteration of soil quantity and quality	Construction, Operation, Closure and Reclamation	Moderate (Proposed measures will minimize effect over the short, medium, and long term; however, losses will still occur)	Moderate (Setting realistic reclamation goals that take into consideration the ecology of the area will improve the likelihood of reinstating ecosystem function over time)	Yes
		The design of the Access Road optimizes the utilization of the existing forestry road to avoid and minimize new disturbance.					
		The clearing of soils will be minimized to the extent possible, and avoided where practicable, for unique features identified by Qualified Environmental Professionals (QEPs), including exposed bedrock and cliffs					
		Minimize cut-and-fill in areas with ML/ARD potential. Where possible, organic soils will be salvaged and stored separately from mineral soils.					
		Soil handling procedures will be developed specific to sensitive ecosystems. High quality soils will be identified and stockpiled.	Development of ecosystem-specific measures will allow for focused effects reduction. Stockpiling of valuable soil allow for better planning during reclamation				
		Implement ecosystem-based revegetation and progressive reclamation promptly to minimize erosion potential and to facilitate initiation of successional ecological processes					
		Conduct regular inspections to ensure drainage, erosion, and sediment control measures are effective and functioning properly; all necessary repairs and adjustments will be conducted in a timely manner	Regular inspections allows for corrective actions which will reduce impacts of sediments to stream course				

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Alpine and Parkland Ecosystems; Old Growth and Mature Forested Ecosystems; Floodplains and Wetlands Ecosystems; BC CDC Listed Ecosystems	Loss of ecosystem function, abundance and/or distribution through surface clearing	The clearing of vegetation will be minimized to the extent possible, and avoided where practicable, for unique features identified by QEPs, including wetlands, exposed bedrock, cliffs etc., which often provide high-value habitat to wildlife and may support sensitive vegetation communities and growth forms.	Minimizing vegetation clearing will reduce the effects on the VCs	Construction, Operation, Closure and Reclamation	Moderate (Proposed measures will minimize effect over the short, medium, and long term; however, losses will still occur)	Moderate (Setting realistic reclamation goals that take into consideration the ecology of the area will improve the likelihood of reinstating ecosystem function over time)	Yes
		The design of the Access Road optimizes the utilization of the existing forestry road to avoid and minimize new disturbance.					
		The area of landscape disturbance will be minimized and ecosystem-based revegetation and progressive reclamation will occur promptly to minimize erosion potential, introduction of invasive plants, and to facilitate initiation of successional ecological processes.					
		Revegetation will be undertaken with seeds (and/or plants) suitable for the local ecosystem and during the appropriate growing season and conditions to: 1) ensure maximum survival rate; 2) avoid establishment of invasive species; and 3) facilitate the establishment of ecological functions and their associated attributes (e.g. species diversity and productivity).	Development of ecosystem-specific measures will allow for focused effects reduction. This approach helps establishment of an ecological trajectory that is suitable for the area	Construction, Operation, Closure and Reclamation, Post-closure	High (implementation time will vary – implementation is rapid for revegetation to control soil erosion and exclude invasive species; the development of ecological functions occurs over decades		No
		Objectives of closure plans for reclaimed areas will be developed to establish site conditions that allow for realistic and operationally feasible ecological trajectories and that take into consideration ecosystem function and wildlife habitat objectives.					
		Monitoring of reclaimed areas will be conducted periodically to ensure they are revegetated.	This allows for the measurement of vegetation establishment				

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Alpine and Parkland Ecosystems		Ecosystem-specific soil handling procedures will be developed. High-quality soils will be identified and stockpiled when required.	Separating high quality soils allows for better use of these soils during reclamation	Construction, Closure and Reclamation	Moderate (Tailored handling procedures will minimize some of the key issues, such as a reduction in chemical, physical, and biological properties of soil; however due to the sensitive nature of alpine and parkland soils, some effects will remain).	Low	Yes
Old Growth and Mature Forested Ecosystems		Construction activities will be conducted in accordance with the guidelines outlined in the Wildlife Management Plan to ensure minimal risk to old growth and mature forest wildlife habitat, such adhering to sensitive periods, specific guidelines, and applicable legislation for wildlife species of concern that use old growth and mature forests.	Development of ecosystem-specific measures will allow for focused effects reduction	Construction, Closure and Reclamation	Moderate: the effectiveness of avoiding new disturbance to ecosystem abundance and extent through optimization measures is high; however, there is low confidence that reclamation efforts can restore the structure and function associated with old and mature forest ecosystems to a level similar to that of baseline condition in the long term.	Low	Yes
		Manage forests according to the *Forest and Range Practices Act* (FRPA) silviculture requirements and BMPs.	IDM is committed to lawful operation of the Project. Adhering to FRPA requirements will ensure compliance		High	Low	
Floodplain and Wetland Ecosystems		Reduce effects to terrestrial ecosystems that depend on hydrological connectivity and flow through management by ensuring free passage of water through fill materials (i.e., using free-span bridges or culverts).	Maintaining existing hydrological regimes is important for maintaining baseline ecosystems	Construction, Operation, Construction and Reclamation	High	Low	Yes (only to the BC CDC Listed floodplain ecosystems)
		Soil handling procedures will be developed specific to sensitive ecosystems. High-quality soils will be identified and stockpiled.	Separating high value soil from less valuable or unsuitable soil allows for more effective restoration				
		Retain roots and groundcover where possible to maintain slope stability and prevent surface erosion.	This allows for soil retention				

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
		Reduce erosion potential by conducting sensitive work during periods of low runoff to the extent possible.	This allows for soil retention				
		Riparian areas will be managed per the legislated reserve and/or management zone setbacks and work practices established under FRPA, where feasible.	IDM is committed to lawful operation of the Project. Adhering to FRPA requirements will ensure compliance				
BC CDC Listed Ecosystems		Soil handling procedures will be developed specific to sensitive ecosystems. High-quality soils will be identified and stockpiled.	Development of ecosystem-specific measures will allow for focused effects reduction.	Construction, Operation, Closure and Reclamation	Moderate (The effectiveness of avoiding BC CDC listed ecosystems through the communication and delineation of no-work zones around these ecosystems is high; however, BC CDC listed ecosystems will not be avoided altogether so the overall effectiveness is considered moderate).	Low	Yes
		Communicate the location of BC CDC listed ecosystems to ground crews.	Staff training and awareness are key components of many of IDM's management plans.				
		Conduct pre-construction surveys to delineate relevant boundaries of the BC CDC listed ecosystems.					
		Delineate “no work” zones and/or buffers around BC CDC listed ecosystems, where feasible.					
Alpine and Parkland Ecosystems; Old Growth and Mature Forested Ecosystems; Floodplains and Wetlands Ecosystems; BC CDC Listed Ecosystems	Alteration of ecosystem function, abundance, and/or distribution through dust effects, fragmentation, edge effects, and invasive plant introduction	The Vegetation and Ecosystems Management Plan will be implemented and will include the following measures where practicable: conduct pre-construction invasive plant surveys within the Project footprint to determine the presence/absence of invasive plants; remove existing invasive plant populations to prevent the spread to adjacent areas; and establish an early detection, inventory, control, and monitoring and follow up program in accordance with Provincial guidance (i.e., FLNRO 2017) and expert recommendations.	Development of ecosystem-specific measures will allow for focused effects reduction. Addressing invasive plants through survey and removal limits effects to sensitive ecosystems	Construction, Operation, Closure and Reclamation	Moderate (Preventive measures and early detection systems are effective in terms of avoiding introduction and spread of invasive plants in most cases; however, an efficient early detection plan needs trained personnel with clear accountabilities and a sustained long-term commitment to preventing invasive plant introduction and spread)	Low	No
		Appropriate setback and buffer distances from surface water bodies and riparian features will be implemented and maintained.					

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Alpine and Parkland Ecosystems		Minimize deposition of fugitive dust in alpine ecosystems through adherence to the Air Quality and Dust Management Plan	Reducing the source of the potential effect minimizes the potential effect. Minimizing dust limits potential negative effects to alpine and parkland ecosystems.	Operation	High	Low	No
Ecologically Valuable Soil		Implement ecosystem-based revegetation and progressive reclamation promptly to minimize introduction of invasive plants and to facilitate initiation of successional ecological processes.	Development of ecosystem-specific measures will allow for focused effects reduction. Revegetation with suitable vegetation limits the negative effects of invasive plants.	Construction, Operation, Closure and Reclamation	Moderate (Any time soil is moved and disturbed there will be some loss to soil quality. This loss of soil quality is dependent on inherent soil characteristics as well as moisture levels at the time of salvage/disturbance. If salvage occurs under ideal moisture conditions and the soil has a high sand content, degradation is minimal. If fine textured soils are moved when wet, degradation can be substantial). The re-establishment of ecological functions associates with alpine ecosystems in areas that have been disturbed will occur over several decades.	Low	Yes
		Strip and stockpile soil for future reclamation.	Proactive treatment and handling is more effective than post-hoc reclamation.				
		Minimize the number of times soil is moved.					
		Salvage and store organic soils separately from mineral soils, where possible.					
Old Growth and Mature Forested Ecosystems		Construction activities will be conducted in accordance with the guidelines outlined in the Wildlife Management Plan to ensure minimal risk to old growth and mature forest wildlife habitat, such as adhering to sensitive periods, specific guidelines, and applicable legislation for wildlife species of concern that use old growth and mature forest.	Development of ecosystem-specific measures will allow for focused effects reduction. Minimizing disturbance limits negative effects.	Construction, Operation, Closure and Reclamation	Moderate: the effectiveness of avoiding new disturbance to ecosystem abundance and extent through optimization measures is high; however, there is low confidence that reclamation efforts can restore the structure and function associated with old growth and mature forest ecosystems to a level similar to that of baseline condition in the long term.	Low	Yes
		Manage forests according to the *Forest and Range Practices Act* (FRPA) silviculture requirements and BMPs	IDM is committed to lawful operation of the Project.		High	Low	

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
Floodplain and Wetland Ecosystems		Appropriate setback and buffer distances from surface water bodies and riparian features will be implemented and maintained.	Development of ecosystem-specific measures will allow for focused effects reduction. Appropriate buffers reduces negative effects.	Construction, Closure and Reclamation	Moderate to High (The effectiveness of mitigation is moderate to high as most effects to wetland ecosystems will be avoided and minimized through adherence to the established protection measures outlined in the Project management plans. The effectiveness of avoiding effects to wetland ecosystems that depend on hydrological connectivity and flow is moderate as hydrological connectivity can be difficult to determine depending on the site characteristics.)	Low	Yes (only to the BC CDC Listed floodplain ecosystems)
		Riparian areas will be managed per the legislated reserve and/or management zone setbacks and work practices established under FRPA, where feasible.	IDM is committed to lawful operation of the Project.				
		All vehicles and machinery travel will be restricted to designated road surfaces.	Reducing the source of the potential effect minimizes the potential effect. Traffic confined to designated roadways limits soil degradation.				
BC CDC Listed Ecosystems		Manage riparian areas per the legislated reserve and/or management zone setbacks and work practices established under the FRPA.	IDM is committed to lawful operation of the Project.	Construction, Closure and Reclamation	High	Low	Yes
Rare Plants, Lichens, and Associated Habitats	Loss of known occurrences of rare plants or lichens and/or habitat through surface clearing.	Apply adaptive Project design changes that avoid harm to rare plant and lichen populations, where practicable.	Reducing the source of the potential effect minimizes the potential effect.	Construction, Operation, Closure and Reclamation, Post-closure	High	Moderate (Potential alteration through surface clearing of adjacent areas and dust deposition may have effects on rare plants and lichens beyond our current understanding. Many rare plant and lichens and their specific abiotic and biotic requirements are not well understood)	Yes
		Conduct pre-construction rare plant surveys to delineate the rare plant/lichen habitat.	Improving quality of baseline data allows for better mitigation by excluding rare plant populations from development activity.				
		Avoid surface disturbance in areas with known rare plant and lichen populations.	Reducing the source of the potential effect minimizes the potential effect.				
		Avoid use of all herbicide sprays within 200 m of rare plant and lichen populations and limit such use to direct application rather than broadcast sprays.					

VC/IC	Potential Effects	Mitigation Measures	Rationale	Applicable Phase(s)	Effectiveness[1]	Uncertainty[2]	Residual Effect
		Create exclusion zones around rare plant and lichen habitats to minimize effects related to surface clearing, fugitive dust, and invasive plant introduction.					
		Erect temporary fencing or other barriers around the nearby rare plant and lichen populations to avoid further disturbance to the site where avoidance is not feasible and development is permitted within buffer areas around plant populations.					
		Minimize deposition of fugitive dust on rare plant and lichen populations through adherence to the Air Quality and Dust Management Plan.					
		Ensure that a qualified environmental monitor, capable of identifying rare plants and lichens, is on site (at the clearing location) during vegetation-clearing activities in known rare plant habitat.	Regular monitoring allows for proactive solutions.				
Rare Plants, Lichens, and Associated Habitats	Alteration of known occurrences of rare plants or lichens or habitat through edge effects, dust deposition and introduction and spread of invasive plants	Avoid use of all herbicide sprays within 200 m of rare plant and lichen populations and limit such use to direct application rather than broadcast sprays.	Reducing the source of the potential effect minimizes the potential effect. These collective mitigation measures reduce direct negative effects to rare plants and lichens, and associated habitat	Closure, Operation, Closure and Reclamation	High	Moderate (Effectiveness will vary among species)	Yes
		Apply dust suppression measures (i.e., wetting work areas, roads, and storage piles, installing equipment covers, and using dust hoods and shields).					
		Apply water to roads to minimize dust from ore and waste rock haulage and grading.					
		Install windbreaks or fences around known problem areas or stockpiles to limit the dispersion of dust emissions from equipment and stockpiles.					
		Design and manage stockpiles and storage areas to minimize dust emissions.					

20.10.7.2 Management Plans and Monitoring

IDM has developed a series of management plans targeting anticipated Project-specific mitigation and monitoring requirements. These are listed in Volume 5, Chapter 29 of the Application/EIS. These plans will be implemented to address potential effects on TSKLH's and MNBC's CULRTP:

- Environmental Management System (Section 29.1);
- Adaptive Management Plan (Section 29.2);
- Access Management Plan (Section 29.3);
- Air Quality and Dust Management Plan (Section 29.4);
- Aquatic Effects Management and Response Plan (Section 29.5);
- Erosion and Sediment Control Plan (Section 29.9);
- Material Handling & Geochemistry Management Plan (Section 29.15);
- Noise Abatement Plan (Section 29.16);
- Site Water Management Plan (Section 29.18);
- Spill Contingency Plan (Section 29.21);
- Tailings Management Plan (Section 29.22);
- Terrain and Soil Management Plan (Section 29.23);
- Vegetation and Ecosystems Management Plan (Section 29.24);
- Waste Management Plan (Section 29.25); and
- Wildlife Management Plan (Section 29.26).

20.10.8 Residual Effects Characterization

20.10.8.1 Summary of Residual Effects

Based on Section 20.10.6 and Table 20.6-1, the following residual effects on TSKLH's and MNBC's CULRTP have been brought forward and are discussed below:

- Potential environmental changes to Wildlife (including birds) and Wildlife Habitat resulting in changes to TSKLH's and MNBC's ability to harvest wildlife for traditional purposes, including residual effects to:
  - Habitat availability;
  - Habitat distribution;
  - Mortality Risk;

- Potential environmental changes to Fish and Fish Habitat resulting in changes to TSKLH's and MNBC's ability to harvest fish for traditional purposes, including residual effects to:
  - Fish habitat;
  - Dolly Varden; and

- Potential environmental changes to Vegetation and Ecosystems resulting in changes to TSKLH's and MNBC's ability to harvest plants for traditional purposes, including residual effects to plant resources:
  - Loss and alteration of ecosystem abundance, distribution, and/or function; and
  - Loss or alteration to known occurrences.

No residual effects are anticipated regarding potential changes to access or potential changes to cultural value for Air Quality, Visual Quality, and Noise.

20.10.8.2 Methods

This section presents the methods used to determine potential residual effects on TSKLH's and MNBC's CULRTP.

As this section draws on the result of other chapters of the Application/EIS: notably Wildlife and Wildlife Habitat Effects Assessment (Volume 3, Chapter 16), Fish and Fish Habitat Effects Assessment (Chapter 18), and Vegetation and Ecosystems Effects Assessment (Chapter 15). The specific methodologies used to determine and characterize residual effects are presented in those respective chapters.

This residual effects assessment employs a spatial- and logic-based approach to determine the effect of the biophysical residual effects on TSKLH's and MNBC's CULRTP.

20.10.8.2.1 Residual Effects Criteria

Each residual effect has been characterized based on the following aspects:

- **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.

- **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.

The definitions for the characterizations of residual effects differ between the Wildlife and Wildlife Habitat, Vegetation and Ecosystems (Table 20.10-14 for both), and Fish and Fish Habitat Effects Assessments (Table 20.10-15).

Table 20.10-14: Residual Effect Characterization Definitions for Wildlife and Wildlife Habitat and Vegetation and Ecosystems

Criteria	Residual Effect Characterization Definitions for Wildlife and Wildlife Habitat and Vegetation and Ecosystems
Magnitude	• **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. • **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)	• **Discrete (D):** effect is limited to the Bitter Creek valley. • **Local (L):** effect is limited to the LSA. • **Regional (R):** effect extends beyond the LSA but within the RSA. • **Beyond regional (BR):** effect extends beyond the RSA.
Duration	• **Short-term (ST):** effect lasts less than 18 months (during the Construction Phase of the Project). • **Long-term (LT):** effect extends beyond the life of the Project (encompassing Operation, Reclamation and Closure, and Post-Closure Phases). • **Permanent (P)**: effect will continue in perpetuity.
Frequency	• **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.

Criteria	Residual Effect Characterization Definitions for Wildlife and Wildlife Habitat and Vegetation and Ecosystems
Reversibility	• **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	• **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.

Table 20.10-15: Residual Effect Characterization Definitions for Fish and Fish Habitat

Criteria	Residual Effect Characterization Definitions for Fish and Fish Habitat
Magnitude	• **Low (L):** The magnitude of effect is within the range of natural variation and is unlikely to affect the existing productive capacity of fish habitat. • **Moderate (M):** The magnitude of the effect is at the limits of natural variation or habitat changes affect up to 10% of the available habitat in a watercourse, such that the productive capacity of the habitat may be reduced and affect fish populations in the entire watercourse; and/or the value of the measurement indicator is up to 30% greater than guideline or threshold value for the protection of aquatic life. • **High (H):** The magnitude of effects exceeds natural variation, or habitat changes affect more than 10% of the available habitat in a watercourse, such that the productive capacity of the habitat may be reduced and affect an entire fish population, or more than one fish population; and/or the value of a measurement indicator is more than 30% greater than guideline or threshold value for the protection of aquatic life.
Geographical Extent	• **Discrete (D):** Effect is limited to the immediate receiving environment in Goldslide Creek watershed (mine area) or the immediate freshwater environment in Bitter Creek (TMF area, Access Road) • **Local (L):** Effect is limited to the immediate receiving environment in Goldslide Creek watershed (Mine Site) or the immediate freshwater environment in Otter Creek (Bromley Humps) or the immediate receiving environment in Bitter Creek (Access Road). • **Regional (R):** Effect extends across the RSA • **Beyond Regional (BR):** Effect extends beyond the RSA and beyond the province (transboundary effects)

Criteria	Residual Effect Characterization Definitions for Fish and Fish Habitat
Duration	• **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
Frequency	• **One time (O)**: Effect is confined to one discrete event (month). • **Sporadic (S)**: Effect occurs rarely and at sporadic intervals. • **Regular (R)**: Effect occurs on a regular basis. • **Continuous (C)**: Effect occurs constantly.
Reversibility	• **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	• **High (H):** the receiving environment has a high natural resilience to imposed stresses, and can respond and adapt to the effect. • **Neutral (N):** the receiving environment has a neutral resilience to imposed stresses and may be able to respond and adapt to the effect. • **Low (L):** the receiving environment has a low resilience to imposed stresses, and will not easily adapt to the effect.

20.10.8.2.2 Assessment of Likelihood

Likelihood is determined per the attributes listed in Table 20.10-16, where possible.

Table 20.10-16: Attributes of Likelihood

Likelihood Rating	Threshold
High	Effect has > 80% chance of effect occurring.
Moderate	Effect has 40-80% chance of effect occurring.
Low	Effect has < 40% chance of effect occurring.

20.10.8.2.3 Significance Determination

The significance of each biophysical residual effect has been brought forward to this section. The definition of "significant" or "not significant" for each residual effect is defined in its particular chapter. Due to the unique nature of Aboriginal Interests and CULRTP, IDM has made no determination of the significance of residual adverse effects for CULRTP. It would be inappropriate for IDM to make such a statement of determination. A significance determination for CULRTP is not required under the EIS Guidelines.

20.10.8.2.4 Confidence and Risk

Confidence definitions are provided in Table 20.10-17.

Table 20.10-17: Confidence Ratings and Definitions

Confidence Rating	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 Bitter Creek valley 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 Bitter Creek valley 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.

20.10.8.2.5 Analytical Assessment Techniques

There are no specific models, calculations, references, or supporting data relevant to this residual effects assessment.

20.10.8.3 Potential Residual Effects Assessment

20.10.8.3.1 Potential Residual Effects to Wildlife Resources

IDM has identified three potential residual effects relating to wildlife resources (Table 20.10-18, Table 20.10-19, and Table 20.10-20).

Table 20.10-18: Characterization of Potential Residual Effects on Habitat Availability

Wildlife VC	Summary of Residual Effects Characterization	Likelihood (High, Moderate, Low)	Significance (Significant or Not)	Confidence (High, Moderate, Low)
Mountain Goat	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Low to Neutral	High	Not Significant	Moderate
Grizzly Bear	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	High	Not Significant	Moderate
Moose	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	High	Not Significant	Moderate
Marten	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	High	Not Significant	High
Wolverine	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	Moderate	Not Significant	Moderate
Habitat Guilds (Migratory Birds)	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	High	Not Significant	Moderate

Wildlife VC	Summary of Residual Effects Characterization	Likelihood (High, Moderate, Low)	Significance (Significant or Not)	Confidence (High, Moderate, Low)
Black Swift	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Low	Moderate	Not Significant	Low
Common Nighthawk	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Low	Moderate	Not Significant	Moderate
MacGillivray's Warbler	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	High	Not Significant	Moderate
Marbled Murrelet	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Neutral	Moderate	Not Significant	Moderate
Olive-sided Flycatcher	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Low	High	Not Significant	Moderate

Table 20.10-19: Characterization of Potential Residual Effects on Habitat Distribution

Wildlife VC	Summary of Residual Effects Characterization	Likelihood (High, Moderate, Low)	Significance (Significant or Not)	Confidence (High, Moderate, Low)
Mountain Goat	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: Low to Neutral	High	Not Significant	Moderate
Marten	Magnitude: Low Extent: Local Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	Low	Not Significant	High

Table 20.10-20: Characterization of Potential Residual Effects on Mortality Risk

Wildlife VC	Summary of Residual Effects Characterization	Likelihood (High, Moderate, Low)	Significance (Significant or Not)	Confidence (High, Moderate, Low)
Mountain Goat	Magnitude: Negligible to Low Extent: Local Duration: Long-term Frequency: Regular and Continuous Reversibility: Partially Reversible Context: Neutral	Low	Not Significant	Moderate
Grizzly Bear	Magnitude: Low Extent: Local Duration: Long-term Frequency: Sporadic Reversibility: Reversible Context: Neutral	Low	Not Significant	High
Moose	Magnitude: Moderate Extent: Discrete Duration: Long-term Frequency: Sporadic Reversibility: Reversible Context: Low	Low	Not Significant	Moderate

Wildlife VC	Summary of Residual Effects Characterization	Likelihood (High, Moderate, Low)	Significance (Significant or Not)	Confidence (High, Moderate, Low)
Marten	Magnitude: Low Extent: Discrete Duration: Long-term Frequency: Sporadic Reversibility: Reversible Context: Neutral	Low	Not Significant	High
Common Nighthawk	Magnitude: Low Extent: Discrete Duration: Long-term Frequency: Sporadic Reversibility: Reversible Context: Low	Low	Not Significant	Moderate
Marbled Murrelet	Magnitude: Low Extent: Local Duration: Long-term Frequency: Sporadic Reversibility: Reversible Context: Neutral	Moderate	Not Significant	Moderate

The Project is not likely to result in significant residual effects on wildlife resources in the Bitter Creek valley, and all potential residual effects on wildlife resources are at least partially reversible. This lack of significant residual effects coupled with TSKLH's and MNBC's low level of use of the Bitter Creek valley in the exercise of their Aboriginal rights (to IDM's knowledge), means that the Project has a low likelihood of resulting in low magnitude residual environmental effects on wildlife resources used by TSKLH or MNBC for cultural or traditional purposes.

Therefore the Project has a low likelihood of resulting in low magnitude residual effects to TSKLH's and MNBC's CULRTP due to changes in TSKLH's and Métis citizens' ability to harvest wildlife for traditional purposes. The extent would be discrete, as it would be confined to the Bitter Creek valley, of continuous frequency, and the duration would be long-term, as it would last for the life of the Project. The residual effect would be reversible upon reclamation of the Project and have a high context, as the Bitter Creek valley is a small portion of the area in which TSKLH and MNBC practice their Aboriginal rights. The effect would be not significant.

IDM's confidence in this determination is moderate due to the limited data available on TSKLH's and MNBC's specific traditional practices in the Bitter Creek valley.

In comparison to the traditional use value of the RSA, the Bitter Creek valley has low traditional use value and the Project will not likely result in alienation of lands from Aboriginal traditional use due to residual effects to wildlife.

20.10.8.3.2 Potential Residual Effects to Fish Resources

Potential Residual Effects to Fish Habitat

There will be no fish habitat loss under the mine infrastructure in Bromley Humps or the Mine Site because there are no fish bearing watercourses within these areas. Loss of non-fish bearing aquatic habitat is described in the Aquatic Resources Effects Assessment (Volume 3, Chapter 17).

No residual effects are anticipated on Bull trout, Eulachon or Salmonid Species as they do not occur in the LSA or mainstem of Bitter Creek where road access is proposed.

There will be no instream fish habitat loss at watercourse crossings along the Access Road: only two crossings, Roosevelt Creek and Hartley Gulch, are fish bearing and these will be facilitated using clearspan bridges. No instream fish habitat loss is associated with clearspan bridges, as there is no instream infrastructure required for this type of crossing. Riparian habitat loss at clear span bridges is expected where the road right of way intersects with the riparian buffer zone.

There is potential for fish habitat loss where infilling within the Bitter Creek channel is required for the Access Road. The proposed road alignment along the North/North East bank of Bitter Creek follows an abandoned existing road at the toe of steep hillside on the North side of Bitter Creek. To avoid destabilizing sensitive slopes and putting road users and workers in an unsafe position, portions of the access road will encroach on the Bitter Creek channel.

Sections of the existing road were washed away during a 2011 flood event; therefore, upgrading of the road along its original alignment requires construction within the channel formed during the flood. However, the 2011 flood was 1-in-25 to 1-in-100 year event; therefore, some of the areas where the road construction is proposed are very rarely wetted and well above the annual high water.

One 150 m section of the access road requires re-alignment of Bitter Creek at the toe of a weak fractured bedrock face. The works involve realignment of the Bitter Creek channel towards the South/South East bank, construction of a road prism along North/North East bank, with bank armouring. Approximately 1.14 ha of habitat will be altered; however, no net loss of habitat is expected because the existing channel can accommodate the annual range of flows and realignment of the creek will not reduce average channel width.

Approximately 2.7 ha of riparian habitat will be disturbed adjacent to fish bearing streams (e.g. earthworks, armouring, slope cut and fill, roadway surface, crossings), the majority of which occurs where the road right of way intersects with the Bitter Creek riparian buffer zone. Some of the disturbed riparian area will be re-vegetated post construction, although maintenance of a maximum canopy height will be necessary to maintain slight lines along the road. The road will be deactivated prior to the end of the Closure and Reclamation Phase, using forestry practices, and therefore riparian vegetation will revert to near baseline conditions.

The characterization of residual effects on fish habitat is summarized in Table 20.10-21.

Table 20.10-21: Characterization of Residual Effects on Fish Habitat

Criteria	Interaction with Fish Habitat
Magnitude	**Low**: The area of habitat loss is limited to the LSA and to less than 150 m stretch along the Access Road/Bitter Creek.
Geographical Extent	**Discrete:** The areas of total habitat loss are limited to a short section of Bitter Creek from the road.
Duration	**Short-term**: Habitat loss occurs once during the Construction Phase; fish populations will recover once conditions return to their pre-disturbance state.
Frequency	**One time:** Habitat loss will be limited to a discrete occurrence during the construction of the Access Road.
Reversibility	**Partially Reversible:** Replacement habitat will become available when the channel is realigned, although it may not be the same quality or type or habitat. Riparian areas will be replanted were possible, and reclaimed in closure.
Context	**High:** Fish populations have high resilience to a relatively small and temporary decrease in available habitat.

The likelihood rating for this residual effect on Fish Habitat is moderate; the residual effect has 40-80% chance of effect occurring.

The residual effect on Fish Habitat is determined to be not significant. Residual effects are limited to the local area (less than 200 m), and existing habitat does not provide critical function that could not be provided elsewhere in the local area. Any loss of habitat will be offset, as required, and determined by DFO in subsequent permitting stages.

The confidence rating for this residual effect on Fish Habitat is high. There is sufficient baseline data to understand the form and function of existing Fish Habitat. The proposed mitigation measures are commonly applied best management practices with a high degree of effectiveness. This leads to high confidence in the conclusions of the assessment.

Due to the localized aspect of the residual effect on Fish Habitat and TSKLH's and MNBC's low level of use of the Bitter Creek valley for traditional purposes (as understood by IDM), the Project is unlikely to result in a residual effect on fish resources used by TSKLH or MNBC for cultural or traditional purposes.

Therefore, the Project has a low likelihood of resulting in low magnitude residual effects to TSKLH's and MNBC's CULRTP due to changes in TSKLH's and Métis citizens' ability to harvest fish for traditional purposes. The extent would be discrete, as it would be confined to the Bitter Creek valley, of continuous frequency, and the duration would be long-term, as it would last for the life of the Project. The residual effect would be reversible upon reclamation of the Project and have a high context, as the Bitter Creek valley is a small

portion of the area in which TSKLH and MNBC practice their Aboriginal rights. The effect would be not significant.

IDM's confidence in this determination is moderate due to the limited data available on TSKLH's and MNBC's specific traditional practices in the Bitter Creek valley.

The Bitter Creek valley has low traditional use value compared with traditional use in the regional area; therefore the Project will not likely result in alienation of lands from Aboriginal traditional use due to residual effects to Fish Habitat.

Potential Residual Effects to Dolly Varden due to Surface Water Quality

Residual effects on Fish from changes in Surface Water Quality are expected, based on the Water and Load Balance Model (Appendix 14-C) which, for the mitigated scenario, predicts that some water quality parameters will exceed CCME or BC WQGs.

The Water and Load Balance Model (Volume 8, Appendix 14-C) predicted the maximum monthly concentrations of water quality parameters in Goldslide Creek, Bitter Creek, Rio Blanco Creek and Bear River, occur for operations (Years 1 to 6) and closure/post-closure (Years 7 to 21). Water and Load Balance Model predictions are summarized in the Surface Water Quality Effects Assessment (Volume 3: Chapter 13). Contaminants of potential concern (COPCs) for Fish were identified as those parameters predicted to exceed water quality guidelines (CCME or BC MOE), in the expected case (P50), at model assessment nodes located in the fish-bearing areas (BC06 and BC02). The following COPCs were identified in Bitter Creek, which are discussed below in relation to residual effects on Dolly Varden:

- Operations: selenium; and
- Post Closure: cadmium, selenium, silver, and zinc.

There are no potential contaminants of concern for Fish in Bear River.

Cadmium

There are cadmium exceedances during operations in Bitter Creek. During post-closure, cadmium marginally exceeds the BC WQG (1.1 times and 1.2 times higher) at BC06 and BC02, respectively, and exceeds the CCME WQG (1.6 times and 1.7 times higher) at BC06 and BC02, respectively.

Toxicity of cadmium is highly variable among taxonomic groups and life-stages, and is also highly dependent on length of exposure. Excess cadmium interferes with the uptake of calcium by fish, which can result in cellular damage, decreases in metabolic activity, increased mortality, decreased growth, and decreased reproductive capacity and success (BC MOE 2015). The BC WQG is the more relevant guideline for Bitter Creek, whereas the CCME guidelines are more stringent as they apply to all Canadian waters. Cadmium has been found to be toxic to salmonid species, however tolerance is highly dependent on species and life-stage. Rainbow Trout are particularly sensitive to high cadmium concentrations, whereas Bull Trout have been found to be more tolerant (Hansen et al. 2002).

The exceedances of the BC WQG are marginal, and therefore adverse effects on Dolly Varden from water borne exposure to this contaminant are expected to be low. Furthermore, exceedances are seasonal (spring / summer), thereby limiting the potential for chronic effects on Dolly Varden.

Selenium

Selenium exceeds the BC WQG and CCME WQG during both operations and post-closure at both BC06 and BC02. During operations, BC WQGs are exceeded by 1.2 times and 2.1 times and CCME WQGs are exceeded by 2.7 times and 4.1 times at BC06 and BC02, respectively. During post-closure, BC WQGS are exceeded by 2.2 times and 3.8 times at BC06 and BC02, respectively. These exceedances are largely due to background concentrations, which exceeded guidelines in both the water and sediment.

CCME and BC water quality guidelines for selenium are based on a lowest observed effect level (LOEL) of 0.01 mg/L introduced by the International Joint Commission (IJC) to protect species in the Great Lakes (IJC 1981). For the CCME guideline, a safety factor of 10 was applied to the LOEL to end up with the guidance of 0.001 mg/L. The BC WQG of 0.002 mg/L incorporates a safety factor of 5 to recognize that selenium is an essential trace element for animal nutrition and that it is the bioaccumulation of selenium through the food chain (chronic effects) that is the major source, not through the water column.

Selenium has the potential to induce both reproductive and non-reproductive effects in fish. Reproductive impacts originate from the maternal transfer of selenium, whereas non-reproductive effects are related to direct effects on individuals, and both primarily result from dietary uptake (Lemly 2008; DeForest and Adams 2011). Chronic effects of selenium toxicity include lack of fertilization, hatchability and higher mortalities of eggs as well as increased cataracts, pathological alterations in liver, kidneys, heart and ovaries and skeletal deformities (Lemly 1997, 2002). The likelihood of adverse effects to fish in Bitter Creek is low, as selenium exceeds BC WQG during the winter months (September to March/April). Additionally, a difference in selenium toxicity and bioaccumulation has been noted between lentic and lotic systems. A clear distinction was demonstrated between fast and slow moving water systems, with selenium bioaccumulation generally ten times greater in lentic environments in comparison to lotic environments (Adams et al. 2000). Bitter Creek is a fast moving, lotic systems, therefore bioaccumulation and associated dietary uptake by fish are expected to be low.

Silver

There are silver exceedances during operations in Bitter Creek. During post-closure, silver is below BC WQG at both BC06, and marginally exceeds the CCME WQG (1.6 times and 1.2 times higher) at BC06 and BC02, respectively.

Silver uptake in freshwater fish mainly occurs in cells related to nutrient uptake and ion regulation on the gills (CCME 2015). The inhibition of sodium and chloride uptake channels on fish gills due to silver ions can negatively impact ion balances (CCME 2015).

An effect on Dolly Varden from increased silver concentrations is considered highly unlikely as concentrations will not exceed the BC WQG and exceedances of the CCME guideline are small and occur in six months of the year only.

Zinc

There are zinc exceedances during operations in Bitter Creek. During post-closure zinc is predicted to be below the CCME WQG. Zinc will exceed the BC WQG (1.3 times higher) at BC06 but be essentially equal to or below the guideline at BC02.

Zinc is an important micronutrient and is therefore essential in the structure of numerous proteins (Hogstrand and Wood 1996). Uptake of zinc primarily occurs on fish gills, and high concentrations of calcium in the water can reduce uptake (Bradley and Sprague, 1985). High concentrations of zinc can cause physical damage to the gills, which then induces hypoxia (Spry and Wood 1984). Lower concentrations of zinc have been seen to impede calcium uptake, and cause hypocalcemia (Spry and Wood 1985). Zinc exceedances at BC06 are predicted to occur during April to July when water hardness is lower. However, the overall potential for zinc toxicity to fish is expected to be low given the seasonal frequency and small magnitude of exceedance of the BC WQG.

The characterization of residual effects on Dolly Varden is summarized in Table 20.10-22.

Table 20.10-22: Characterization of Residual Effects on Dolly Varden due to Changes in Water Quality

Criteria	Interaction with Dolly Varden
Magnitude	**Low:** The effect on Dolly Varden is at the limits of natural variation, as only one parameter (selenium) is predicted to exceed the BC WQG for the protection of aquatic life by more than 30%.
Geographical Extent (Biophysical)	**Local:** Effect is limited to the immediate freshwater environment in Bitter Creek (TMF and Access Roads).
Duration	**Permanent:** changes to Surface Water Quality from TMF and Mine Site discharge are predicted to be beyond the Post-Closure Phase.
Frequency	**Sporadic:** Discharges and predicted guideline exceedences occur on an intermittent basis, such that effect on Dolly Varden may not occur during periods where there are no discharges.
Reversibility	**Reversible:** After post-closure, the Surface Water Quality, and therefore potential effects on Fish (Dolly Varden), are expected to revert back to within baseline conditions after a number of years.
Context	**High:** Fish can recover once water quality reverts to baseline conditions.

The likelihood rating for this residual effect on Dolly Varden is low.

Exceedances of water quality guidelines are predicted, but any effects on Fish (Dolly Varden) will be localized and have no far-reaching effects on regional productivity or diversity. Overall, ecological conditions that support Fish populations relative to existing baseline will be maintained. Therefore, the residual effect is considered not significant.

Confidence in the significance determination for this effect is Moderate, because the magnitude of the effect (changes in Surface Water Quality concentrations) cannot be fully quantified but only inferred from the water quality predictions. Monitoring of the aquatic environment, including fish tissue, as part of the MMER and the Project AEMP (Volume 5, Chapter 29) will provide further confidence in managing the risk of selenium on fish populations in the LSA.

Potential Residual Effects to Dolly Varden due to Changes in Streamflows

A residual effect to Fish and Fish Habitat from changes in streamflow in Bitter Creek is anticipated based on the water quantity predictions in Appendix 14-C. During operations, increases in flow will occur in Bitter Creek as result of mine discharge into Goldslide Creek. The maximum predicted increase in flow in January and December is 15% and 10% of baseline conditions at BC06 and BC02 respectively. During freshet and summer (May to September) the change in flow is negligible in Bitter Creek.

The increased flow during operations for the winter is much less than the peak flows during the summer in Bitter Creek, so the increase in flow during the winter is not expected to have any effect on the geomorphology of the stream channel. Under natural conditions, winter is a low flow period. Dolly Varden egg incubation occurs over the winter period, and increases in flow could therefore affect incubating eggs and fry emergence timing. Increased winter flows are also expected to improve the availability of overwintering habitat (deeper areas that do not freeze to bottom) for juveniles.

Table 20.10-23: Characterization of Residual Effects on Dolly Varden due to Changes in Streamflows

Criteria	Interaction with Dolly Varden
Magnitude	**Low**, based on the predictions for increases in flow.
Geographical Extent (Biophysical)	**Local:** Effect is limited to the immediate freshwater environment in Bitter Creek (TMF and Access Roads).
Duration	**Short-term:** Changes to streamflows from discharge inputs is limited to the Operation phase.
Frequency	**Regular:** Flow increases will occur seasonally during the winter months.
Reversibility	**Reversible:** After operations, the flow regime will return to within baseline levels and therefore Fish and Fish Habitat will recover as well.

Criteria	Interaction with Dolly Varden
Context	**High:** Fish and Fish Habitat can recover once flows revert to baseline levels.

The likelihood of effects to Fish from changes in streamflows in Bitter Creek is high.

Although effects on Dolly Varden life stages may occur as a result of winter flow increases in Bitter Creek, the effect will be localized and have no far-reaching effects on regional productivity or diversity. The effect is also seasonal (winter only), short-term (operations), and reversible. Overall, ecological conditions that support Fish populations relative to existing baseline will be maintained. Therefore, the residual effect is considered not significant.

Confidence in the significance determination for this effect is Moderate, because the magnitude of the effect can be indirectly quantified (magnitude of flow changes) and the mechanism through which changes in streamflow impact Fish and Fish Habitat is reasonably well understood.

Due to the localized and short-term aspects of the residual effect on Dolly Varden and the low level of use of the Bitter Creek valley by TSKLH and MNBC in their exercise of their Aboriginal rights (as understood by IDM), the Project is unlikely to result in residual effects on fish resources used by TSKLH or MNBC for cultural or traditional purposes.

Therefore, the Project has a low likelihood of resulting in low magnitude residual effects to TSKLH's and MNBC's CULRTP due to changes in TSKLH's and Métis citizens' ability to harvest fish for traditional purposes. The extent would be discrete, as it would be confined to the Bitter Creek valley, of continuous frequency, and the duration would be long-term, as it would last for the life of the Project. The residual effect would be reversible upon reclamation of the Project and have a high context, as the Bitter Creek valley is a small portion of the area in which TSKLH and MNBC practice their Aboriginal rights. The effect would be not significant.

IDM's confidence in this determination is moderate due to the limited data available on TSKLH's and MNBC's specific traditional practices in the Bitter Creek valley.

In comparison to the traditional use value of the regional area, the Bitter Creek valley has low traditional use value and the Project will not likely result in alienation of lands from Aboriginal traditional use due to residual effects to Dolly Varden.

20.10.8.4 Potential Residual Effects to Plant Resources

Some residual effects on plant resources are anticipated however these are not likely to be significant due to the relatively small Project footprint. The characterization of potential residual effects on plant resources is summarized in Table 20.10-24.

Table 20.10-24: Characterization of Potential Residual Effects to Plant Resources

Residual Effect (Measurement Indicators)	**Valued Component**	**Project Phase(s)**	**Mitigation Measures**	**Summary of Residual Effects Characterization** *(context, magnitude, geographic extent, duration, frequency, reversibility)*	**Likelihood** *(High, Moderate, Low)*	**Significance** *(Significant, Not Significant)*	**Confidence** *(High, Moderate, Low)*
Loss of Ecologically Valuable Soils	Ecologically Valuable Soils	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Neutral Magnitude: Moderate Geographic Extent: Discrete Duration: Long-Term Frequency: Sporadic Reversibility: Irreversible	High	Not Significant	Moderate
Alteration of Ecologically Valuable Soils	Ecologically Valuable Soils	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Low Magnitude: Low Geographic Extent: Discrete Duration: Long-Term Frequency: Continuous Reversibility: Partially Reversible	High	Not Significant	High
Loss and alteration of ecosystem abundance, distribution, and/or function	Alpine and Parkland Ecosystems	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Low Magnitude: Moderate Geographic Extent: Discrete Duration: Long-Term to Permanent Frequency: Continuous Reversibility: Partially Reversible	High	Not Significant	Low to Moderate

Residual Effect (Measurement Indicators)	**Valued Component**	**Project Phase(s)**	**Mitigation Measures**	**Summary of Residual Effects Characterization** *(context, magnitude, geographic extent, duration, frequency, reversibility)*	**Likelihood** *(High, Moderate, Low)*	**Significance** *(Significant, Not Significant)*	**Confidence** *(High, Moderate, Low)*
Loss and alteration of ecosystem abundance, distribution, and/or function	Old Growth and Mature Forested Ecosystems	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Low Magnitude: Moderate Geographic Extent: Discrete Duration: Permanent Frequency: Continuous Reversibility: Partially Reversible to Irreversible	High	Not Significant	Moderate
Loss and alteration of ecosystem abundance, distribution, and/or function	BC CDC Listed Ecosystems	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Neutral Magnitude: Negligible to High Extent: Discrete Duration: Long-Term to Permanent Frequency: Continuous Reversibility: Partially Reversible to Irreversible	High	Not Significant	Moderate
Loss or alteration to known occurrences	Rare Plants, Lichens, and Associated Habitat	Construction Operation Closure and Reclamation	See Table 15.6-2	Context: Low Magnitude: Negligible to High Extent: Beyond Regional Duration: Short Term to Permanent Frequency: One time to Continuous Reversibility: Partially Reversible to Irreversible	Moderate to High	Not Significant	Moderate

TSKLH

Plants traditional harvested by TSKLH (as summarized in Table 20.10-5), including huckleberries, blueberries, soapberries, cranberries, fiddleheads (species unknown), dandelions, yarrow, devil's club, and willow are all likely to occur in the Bitter Creek valley. Table 20.10-25 cross-references these plants' likely habitats with the ecosystem VCs assessed by IDM.

Table 20.10-25: TSKLH Harvested Plants by Ecosystem VC

Plants	Ecosystem VC
Huckleberries, blueberries	Alpine and Parkland Ecosystems Old and Mature Forested Ecosystems
Soapberries	Certain Floodplains
Cranberries	Alpine and Parkland Ecosystems Certain Wetlands Old and Mature Forested Ecosystems
Mushrooms	Unknown
Fiddleheads (species unknown)	Unknown (not identified during field surveys but may occur at the lower elevations closer to the ocean)
Dandelions	Variable
Yarrow	Old and Mature Forested Ecosystems (lower elevations)
Devil's Club	Old and Mature Forested Ecosystems Certain Wetlands
Willow	Alpine and Parkland Ecosystems Old and Mature Forested Ecosystems Wetlands and Floodplains BC CDC Listed Ecosystems

The Project is not anticipated to have any significant residual adverse effects on Vegetation and Ecosystems VCs in the areas where TSKLH traditionally gather plants including floodplains (where TSKLH may potentially harvest soapberries) or wetlands (where TSKLH may potentially harvest cranberries, Devil's Club, and Willow).

The residual effect on plant resources may only be partially reversible or irreversible; however, the existing cultural value is low (in IDM's understanding).

Increased access to the valley as a result of the construction of the Project's Access Road may increase the opportunity to gather plants in the valley.

The low current use of the Bitter Creek valley by TSKLH members combined with the lack of significant residual effects on plant resources means that it is unlikely that the Project will adversely affect TSKLH's plant harvesting.

Therefore, the Project has a low likelihood of resulting in low magnitude residual effects to TSKLH's CULRTP due to changes in TSKLH's ability to harvest plants for traditional purposes. The extent would be discrete, as it would be confined to the Bitter Creek valley, of continuous frequency, and the duration would be long-term, as it would last for the life of the Project. The residual effect would be reversible upon reclamation of the Project and have a high context, as the Bitter Creek valley is a small portion of the area in which TSKLH practice their Aboriginal rights. The effect would be not significant.

IDM's confidence in this determination is moderate due to the limited data available on TSKLH's specific traditional practices in the Bitter Creek valley. In comparison to the traditional use value of the regional area, the Bitter Creek valley has low traditional use value and the Project will not likely result in alienation of lands from Aboriginal traditional use due to residual effects to plant resources.

MNBC

The residual effect on plant resources may only be partially reversible or irreversible, however the existing cultural value is low (in IDM's understanding).

Increased access to the valley as a result of the construction of the Project's Access Road may increase the opportunity to gather plants in the valley.

Due to the lack of current use of the Bitter Creek valley by Métis citizens combined with the limited extent of Project effects on plant resources, it is unlikely that the Project will affect MNBC's plant harvesting.

Therefore the Project has a low likelihood of resulting in low magnitude residual effects to MNBC's CULRTP due to changes in Métis citizens' ability to harvest plants for traditional purposes. The extent would be discrete, as it would be confined to the Bitter Creek valley, of continuous frequency, and the duration would be long-term, as it would last for the life of the Project. The residual effect would be reversible upon reclamation of the Project and have a high context, as the Bitter Creek valley is a small portion of the area in which Métis citizens practice their Aboriginal rights. The effect would be not significant.

IDM's confidence in this determination is moderate due to the limited data available on MNBC's specific traditional practices in the Bitter Creek valley. In comparison to the traditional use value of the regional area, the Bitter Creek valley has low traditional use value and the Project will not likely result in alienation of lands from Aboriginal traditional use due to residual effects to plant resources. Summary of Residual Effects Assessment

The Project has a low likelihood of resulting in low magnitude residual effects on TSKLH's and MNBC's CULRTP due to environmental changes to Fish, Fish Habitat, Wildlife, Wildlife Habitat, or Vegetation and Ecosystems resulting in changes to TSKLH's or MNBC's ability to harvest fish, wildlife, birds, or plants for traditional purposes. The residual effects would be discrete, long-term, continuous, reversible, and have a high context. The residual effects would be not significant.

Residual effects and the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence evaluations are summarized in Table 20.10-26.

Table 20.10-26: Summary of the Residual Effects Assessment for CULRTP

Potential Effect	Pathway Valued Components	Applicable Phase(s)	Mitigation Measure(s)	Residual Effect(s)	Likelihood *(High, Moderate, Low)*	Significance *(Significant, Not Significant)*	Confidence *(High, Moderate, Low)*
Potential environmental changes to wildlife (including birds) and wildlife habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest wildlife for traditional purposes	Wildlife and Wildlife Habitat	Construction Operation Closure and Reclamation Post-Closure	See Table 20.10-11	Magnitude: Low Geographic Extent: Discrete Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	Low	Not Significant	Moderate
Potential environmental changes to fish and fish habitat resulting in changes to TSKLH's or Métis citizens' ability to harvest fish for traditional purposes	Fish and Fish Habitat	Construction Operation Closure and Reclamation	See Table 20.10-12	Magnitude: Low Geographic Extent: Discrete Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	Low	Not Significant	Moderate

Potential Effect	Pathway Valued Components	Applicable Phase(s)	Mitigation Measure(s)	Residual Effect(s)	Likelihood *(High, Moderate, Low)*	Significance *(Significant, Not Significant)*	Confidence *(High, Moderate, Low)*
Potential environmental changes to Vegetation and Ecosystems resulting in changes to TSKLH's or Métis citizens' ability to harvest plants for traditional purposes	Vegetation and Ecosystems	Construction Operation Closure and Reclamation	See Table 20.10-13	Magnitude: Low Geographic Extent: Discrete Duration: Long-term Frequency: Continuous Reversibility: Reversible Context: High	Low	Not Significant	Moderate

20.10.9 Cumulative Effects

Cumulative effects are the result of Project residual effects interacting with residual effects of other physical activities (i.e., anthropogenic developments, projects, or activities). The potential for cumulative effects arises when residual effects of the Project affect the same VC or IC that is affected by the effects of other past, existing, or reasonably foreseeable projects or activities.

The potential residual effects brought forward to the cumulative effects assessment for TSKLH's and MNBC's CULRTP are:

- Potential residual effects to wildlife resources resulting in changes to TSKLH's and MNBC's ability to trap and hunt for traditional purposes;
- Potential residual effects to fish resources resulting in changes to TSKLH's and MNBC's ability to fish for traditional purposes; and
- Potential residual effects to plant resources resulting in changes to TSKLH's and MNBC's ability to harvest plants for traditional purposes.

No residual effects are anticipated regarding potential changes to access or potential changes to cultural value based on changes to Air Quality, Visual Quality, and Noise; therefore, they have not been brought forward to this cumulative effects assessment.

20.10.9.1 Cumulative Effects Assessment Boundaries

The spatial boundary of the cumulative effects assessment is the CULRTP RSA (Figure 20.10-1).

The temporal boundaries for the assessment of cumulative effects on TSKLH's and MNBC's CULRTP encompasses the periods during which the proposed Project-related residual effects are expected to interact with residual effects of other past, present, or reasonably foreseeable future projects and activities within the RSA.

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

Within the RSA, there are a number of human activities as well as current infrastructure and reasonably foreseeable projects that may spatially or temporally overlap with residual effects of the Project (Table 20.10-27; Figure 20.10-2, Figure 20.10-3).

Historically, the area has experienced logging and mining activities that are likely to continue. Public recreation, hunting, fishing, and trapping also occur and will continue to occur into the future.

Table 20.10-27: List of Projects and Activities Considered in the Cumulative Effects Assessment

Project/Activity	Project Life	Location	Proponent
Stewart Bulk Terminals	Currently Operating	Stewart	Stewart Bulk Terminals Ltd.
Stewart World Port	Currently Operating	Stewart	Stewart World Port
Highway 37A	Currently Operating	Stewart	MOTI
Long Lake Hydroelectric Project	Currently Operating	25 km east of Stewart	Long Lake Hydro Inc.
Bitter Creek Hydro Project	Proposed	15 km northeast of Stewart	Bridge Power
Commercial recreations	Ongoing	Regional	Various
Forestry	Ongoing	Regional	Various
Guide outfitting	Ongoing	Regional	Various
Mineral exploration	Ongoing	Regional	Various
Transportation	Ongoing	Regional	Various
Trapping	Ongoing	Regional	Various

Figure 20.10-2: Past, Present, and Future Project with Potential for Cumulative Effects

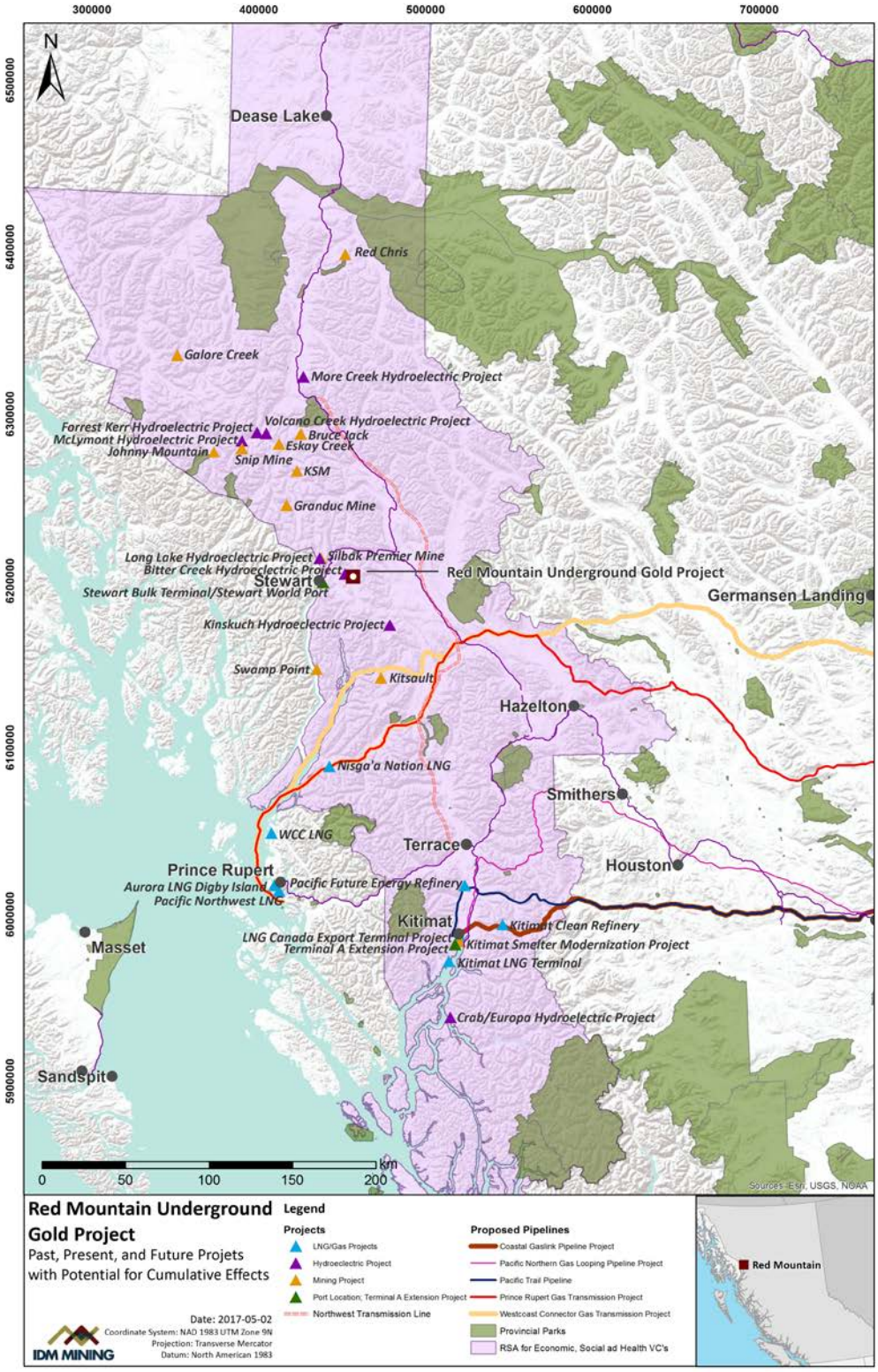
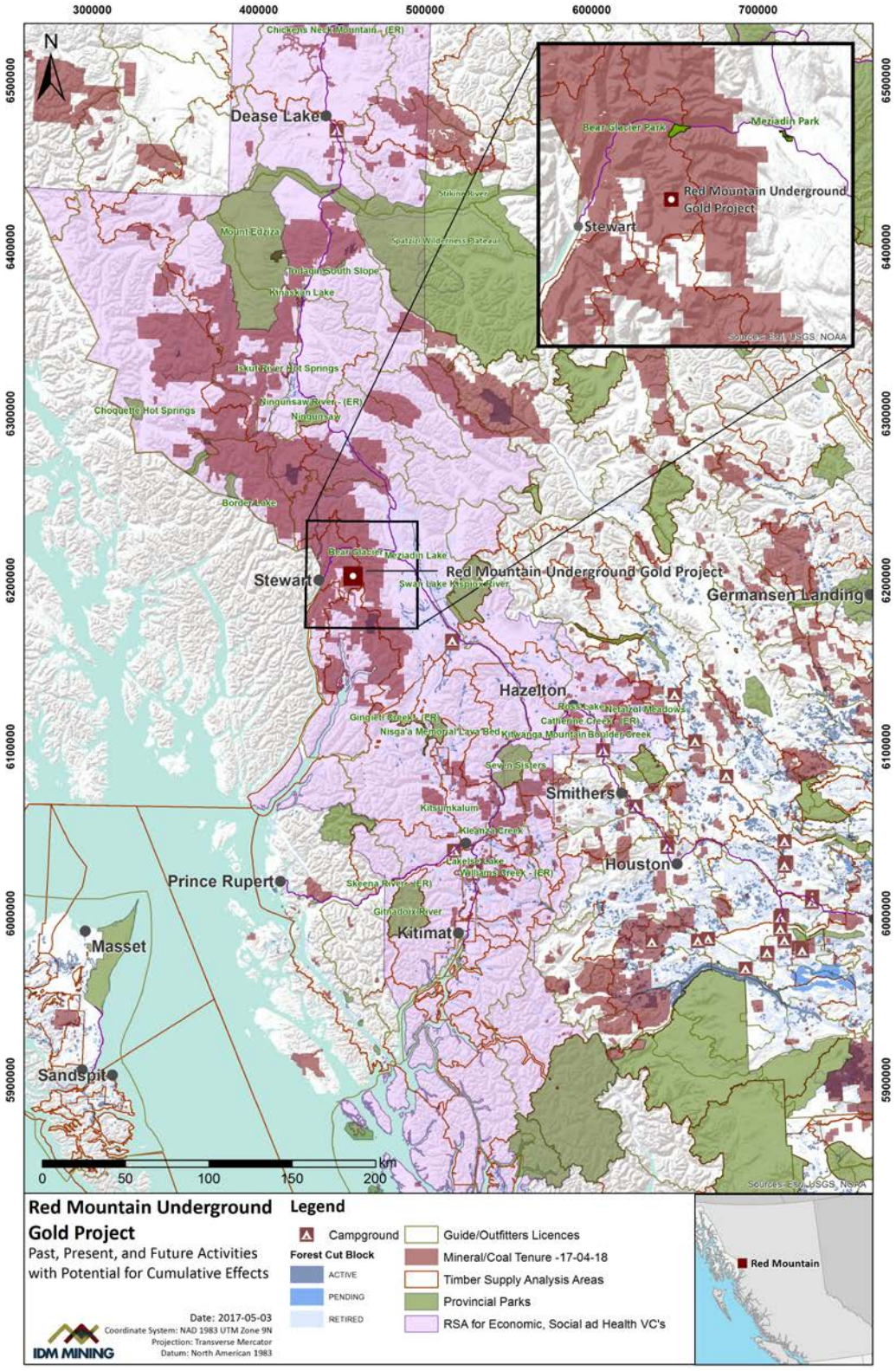


Figure 20.10-3: Past, Present, and Future Activities with Potential for Cumulative Effects



20.10.9.3 Potential Cumulative Effects to Wildlife Resources

Three potential residual effects were identified for wildlife resources (habitat availability, habitat distribution, and mortality risk); however, not all residual effects apply to each species. The key species for TSKLH's and MNBC's CULRTP have been identified as mountain goat, moose, grizzly bear, furbearers, and migratory birds. The potential for cumulative effects on these key species is discussed below.

20.10.9.3.1 Mountain Goat

Three residual effects (habitat availability, habitat distribution, and mortality risk) could potentially have a cumulative effect on Mountain Goat. The majority of existing disturbance in the RSA occurs at lower elevations within the Bear River valley, with relatively little disturbance occurring within effective mountain goat habitat. Since the total existing, present, and proposed disturbance footprint represents such a small portion of the RSA (0.7%), significant cumulative effects associated with habitat availability for mountain goat are not expected to occur.

Based on current information, none of the past or future projects would cause a disruption of movement for mountain goats because they are not located in suitable goat habitat. Only the current Project has the potential to effect mountain goat habitat distribution; therefore there is not an interaction with other projects and habitat distribution is not a residual cumulative effect.

Two potential sources of mortality risk for mountain goats are associated with the Project: the new road access in the Bitter Creek valley, which could facilitate better access into the area for licensed and unlicensed hunters, and vehicle collision risk. Specific mitigation measures to minimize mortality from these sources are expected to be effective to limit potential mortality risk to mountain goats and the magnitude is predicted to be very low. Mortality risk caused by vehicle collision and hunting from past, current, and future projects and activities is not expected to result in an additive cumulative effect. The majority of roadways and traffic occurs at lower elevations within the Bear River valley and outside of effective mountain goat habitat. This also limits hunter access to higher elevation mountain goat habitat. Therefore, the residual cumulative effect was determined to be not significant.

20.10.9.3.2 Moose

Two residual effects (habitat availability and mortality risk) are predicted to have a potential cumulative effect on moose. The Project-related residual effect of habitat availability will interact with habitat alteration from past, current, and future activities, which will result in a low magnitude change in habitat availability. The total existing, present, and proposed disturbance footprint represents 0.7% of the Wildlife RSA. Of this, many of the disturbances such as older cut blocks and transmission lines currently provide shrub and early seral forest conditions commonly used by moose. No significant cumulative residual effect associated with habitat availability for moose is expected to occur.

It is expected that the cumulative probability of moose direct mortality due to vehicle collision or from hunting in the wildlife RSA will be very low. Moose harvest data indicates that no moose have been harvested in Wildlife Management Unit no. 6-14 since 2011.

Moose direct mortality due to vehicle collision in the wildlife RSA are most likely to occur along Highway 37A. Overall traffic rates are not expected to have substantive effect on the moose mortality risk within the wildlife RSA. Therefore, this residual cumulative effect was determined to be not significant.

20.10.9.3.3 Grizzly Bear

Grizzly Bear was assessed for potential cumulative effects of habitat availability and mortality risk. The Project-related residual effect of habitat availability will interact with habitat alteration from past, current, and future activities, which will result in a low magnitude change in habitat availability. The total existing, present, and proposed disturbance footprint represents 0.7% of the wildlife RSA. Of this, many of the disturbances such as older cut blocks and transmission lines currently provide shrub and early seral forest conditions including berry producing habitats that are commonly used by grizzly bears for foraging. No significant cumulative residual effect associated with habitat availability for Grizzly Bear is expected to occur.

Roads are considered of particular concern to grizzly bears primarily due to increased human access, which can result in increased mortality due to conflict, hunting pressure, and vehicle collision, in addition to habitat-related effects. Although no absolute thresholds have been determined to define a road density that is acceptable to grizzly bears (Ross 2002), roads are known to have a negative effect on grizzly bears when they reach a density of approximately 0.6 km/km^2 (BC MOE 2012). The effect gets more pronounced once road density increases over approximately 1.0 km/km^2 (BC MOE 2012). Currently, the road density within wildlife RSA is 0.04 km/km^2, which is less than the negative threshold effect of 0.6 km/km^2 by one order of magnitude. The Bitter Creek Hydro Project will not increase the road density within the wildlife RSA since it will use the same access road as the Project.

Use of the existing Highway 37A and the Bitter Creek Hydro Project are the other Projects in the RSA that could contribute to an increase in human – bear conflict. The Highway 37 and 37A Traffic Impact Study (Volume 7, Appendix 1-C) assessed the amount of existing traffic volume within the wildlife RSA to have an average annual daily traffic volume of 256 trips/day for Highway 37A, with a potential 3% increase in daily volume on this highway due to the Red Mountain Project. This same assessment calculated a possible 1% increase in vehicle collisions due to the Red Mountain Project. No specific details on the traffic effect due to the proposed Bitter Creek Hydro Project is currently available, but it is estimated that this project would either have a similar or less of an increase in annual daily traffic volume and less than a one percent increased risk of vehicle collisions along Highway 37A.

A study completed in Southern Alberta documented a behavioural response by grizzly bears to road traffic where bears avoided medium (>20 and ≤100 vehicles per day) and high (>100 vehicles per day) volume roads but did use low (≤20 vehicles per day) volume roads where available and did cross these roads more frequently (Northrup et al. 2012). It is hypothesized that grizzly bears already avoid crossing Highway 37A due to its traffic volume which signifies low probability of an increase in grizzly bear mortality risk due to the current and foreseeable future projects.

It is expected that the cumulative residual effect of Grizzly Bear direct mortality due to possible increase in conflict with humans or vehicle collision is very low. The cumulative residual effect is considered low in magnitude and regional in extent. In support of this determination, direct mortality will be long in term in duration, will occur at sporadic intervals, and is irreversible. The cumulative effect of mortality on Grizzly Bear is not expected to adversely affect the population found within the wildlife RSA. The cumulative residual effect is not significant.

20.10.9.3.4 Furbearers

Three residual effects (habitat availability, habitat distribution, and mortality risk) are predicted to have a potential cumulative effect on furbearers, specifically marten and wolverine. The residual effect of habitat availability could interact with habitat availability caused by habitat alteration from past, current, and future activities, which will result in a small loss of habitat. Since the total existing, present, and proposed disturbance footprint represents a small portion of the wildlife RSA (0.7%), the residual cumulative effect of habitat availability for furbearers was determined to be not significant.

The residual effect of habitat distribution could interact with habitat distribution caused by disruption to movement from past, current and future activities. In BC, road densities greater than 2 km/km^2 are considered lower quality habitat for furbearers such as wolverine, and road densities greater than 3 km/km^2 are considered not to support wolverines (Lofroth and Krebs 2007). Currently, the road density within wildlife LSA and RSA is 0.04 km/km^2 and the addition of future foreseeable projects will not substantially increase that density. Considering these thresholds and the large home ranges and low densities of wolverine, habitat distribution was not considered to be a residual cumulative effect for wolverine. Habitat distribution was considered as a residual cumulative effect for marten and it was determined to be not significant due to the magnitude and duration of the effect.

The residual effect of mortality risk for marten could interact with mortality risk caused by vehicle collision and incidental take during vegetation clearing from past, current, and future projects and activities resulting in an additive cumulative effect. Direct mortality to marten from vehicle collisions is expected be infrequent since marten are known to avoid areas that lack overhead cover and roads (Poole et al. 2004). This statement is supported by mortality records of marten along highways. The Bulkley-Stikine District mortality records database lists three vehicle-marten collisions occurring between 1983 and 2007 (Sielecki 2004, 2010) and in Banff National Park, marten were part of the 2% small vertebrate road kills (Clevenger et al. 2003). Since the total existing, present, and proposed disturbance footprint represents a small portion of the wildlife RSA (0.7%), of which the proportion of effective marten reproduction habitat would be considerably smaller, significant cumulative effect associated with mortality during vegetation clearing is not expected to occur. Residual cumulative effect of mortality risk for marten was determined to be not significant.

20.10.9.3.5 Migratory Breeding Birds

One residual effect, habitat availability, is predicted to have a potential cumulative effect on migratory breeding birds. The residual effect of habitat availability will interact with habitat availability caused by habitat alteration from past, current, and future activities, which will

result in a small loss of habitat. The total existing, present, and proposed disturbance footprint represents 0.7% of the wildlife RSA. In general, the assessed migratory bird species have high natural resilience to imposed stresses, and can respond and adapt to the effect, especially given the amount of available habitat within the RSA. It is unlikely that the assessed cumulative change in habitat availability would pose a risk to the long-term persistence and viability of migratory breeding birds at the regional level (i.e., wildlife RSA). The cumulative residual effect of habitat availability on migratory breeding birds was determined to be not significant.

20.10.9.4 Potential Cumulative Effects to Fish Resources

There is the potential for the residual environmental effects identified for Fish Habitat and Dolly Varden to result in cumulative effects on TSKLH's and MNBC's ability to harvest fish for traditional purposes. The only past, present, reasonably foreseeable future project that could cumulatively interact with the residual effects of the Project is the Bitter Creek Hydro Project being developed by Bridge Power. The Bitter Creek Hydro Project overlaps spatially with the Red Mountain Project as both are proposed for the Bitter Creek valley. The Bitter Creek Hydro Project is in the early stages of development and is proposed to have a 40-year operational life. Based on information available, the cumulative effects assessment assumes that the Bitter Creek Hydro Project will begin construction during the Operations Phase of the Red Mountain Underground Gold Project.

Construction of the Access Road for the Red Mountain Underground Gold Project may result in residual effects to fish habitat for Dolly Varden. These residual effects were assessed as not significant as the footprint was small and local in nature, and not sufficient to have any adverse effects to the Dolly Varden population. If construction of additional access roads or power lines within riparian zone were to occur as part of the Bitter Creek Hydro Project, there may be additional loss of fish habitat, including through watercourse crossings of clear-water side channels. Fish habitat within Bitter Creek supports Dolly Varden, and although this habitat is not limiting to the population, additional construction within the area may result in the gradual loss of fish habitat, and construction of both Projects within a short window may increase the potential effects on fish habitat through sedimentation.

The mitigation measures outlined for the residual effects on fish and fish habitat are highly effective and would be applicable to both the Bitter Creek Hydro Project and the Red Mountain Underground Gold Project. No additional mitigation measures are proposed, although sediment and erosion control measures should remain in place until construction from both projects is completed and soils next to watercourses are stabilized. For any in-water works for the Bitter Creek Hydro Project, any loss of fish habitat would be offset if required under the *Fisheries Act*. This would ensure that there would be no net loss to fish habitat or the Dolly Varden population.

With the implementation of the existing mitigation measures, no significant cumulative effects on fish and fish habitat are predicted to occur due to the Project.

20.10.9.5 Potential Cumulative Effects to Plant Resources

There is the potential for residual cumulative environmental effects on vegetation and ecosystems to result in changes to TSKLH's and MNBC's ability to harvest plants for traditional purposes.

The residual effects identified for plant resources include:

- Loss and alteration of ecosystem abundance, distribution, and/or function for Alpine and Parkland Ecosystems, where TSKLH may potentially harvest huckleberries, blueberries, cranberries, and willow;

- Loss and alteration of ecosystem abundance, distribution, and/or function for Old and Mature Forested Ecosystems, where TSKLH may potentially harvest huckleberries, blueberries, cranberries, yarrow, Devil's club, and willow; and

- Loss and alteration of ecosystem abundance, distribution, and/or function for BC CDC listed Ecosystems, where TSKLH may potentially harvest willow.

Due to the localized nature of potential residual effects on plant resources, the only past, present, or reasonably foreseeable project that could result in cumulative effects on vegetation and ecosystems is the Bitter Creek Hydro Project being developed by Bridge Power. The Bitter Creek Hydro Project overlaps spatially with the Project as both as both proposed for the Bitter Creek valley. The Bitter Creek Hydro Project is in the early stages of development and is proposed to have a 40-year operational life. Based on information available, this cumulative effects assessment assumes that the Bitter Creek Hydro Project will begin construction during the Operations Phase of the Project.

The potential cumulative effects on vegetation and ecosystems are summarized and characterized in Table 20.10-28.

Table 20.10-28: Characterization of Potential Cumulative Effects on Plant Resources

Residual Effect	Valued Component	Project Phase(s)	Summary of Residual Effects Characterization (context, magnitude, geographic extent, duration, frequency, reversibility)	Likelihood (High, Moderate, Low)	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Loss and alteration of ecosystem abundance, distribution, and/or function	Alpine and Parkland Ecosystems	Construction Operation Closure and Reclamation	Magnitude: Low Geographic Extent: Regional Duration: Long-term Frequency: Continuous Reversibility: Partially Reversible Context: Low	High	Not Significant	Low to Medium
Loss and alteration of ecosystem abundance, distribution, and/or function	Old and Mature Forested Ecosystems	Construction Operation Closure and Reclamation	Magnitude: Low Geographic Extent: Regional Duration: Permanent Frequency: Continuous Reversibility: Partially reversible Context: Low	High	Not Significant	Moderate
Loss and alteration of ecosystem abundance, distribution, and/or function	BC CDC Listed Ecosystems	Construction Operation Closure and Reclamation	Magnitude: Moderate Extent: Beyond Regional Duration: Long-term to Permanent Frequency: Continuous Reversibility: Irreversible Context: Low	High	Not Significant	Moderate

The lack of potential significant cumulative effects on plant resources coupled with the low use of the Bitter Creek valley by TSKLH and MNBC for harvesting traditional use plants (based on IDM's understanding), it is unlikely that potential cumulative effects on plants would affect TSKLH's and MNBC's ability to harvest plants for traditional purposes.

20.10.9.6 Cumulative Effects Interaction Matrix

A cumulative effects interaction matrix, summarizing potential cumulative interactions between the residual effect of the Project, TSKLH's and MNBC's CULRTP, and each past, current, and foreseeable future projects presented in Section 20.10.9 is summarized in Table 20.10-29.

Table 20.10-29: Interaction with Effects of other Past, Present, or Reasonably Foreseeable Future Projects and Activities

Residual Effects	Current and Ongoing Projects and Activities										Future Projects
	Stewart Bulk Terminals	Stewart World Port	Highway 37A	Long Lake Hydro Project	Commercial Recreation	Forestry	Guide Outfitting	Mineral Exploration	Transportation	Trapping	Bitter Creek Hydro Project
Wildlife Resources	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fish Resources	N	N	N	N	N	N	N	N	N	N	Y
Plant Resources	N	N	N	N	N	N	N	N	N	N	Y

Notes:
Y = Yes, interaction exists between the residual effect of the Project and the other past, current, or future project/activity
N = No, interaction does not exist between the residual effect of the Project and the other past, current, or future project/activity

20.10.9.7 Summary of Cumulative Effects Assessment

The potential environmental effects of the proposed Project are generally confined to the Bitter Creek valley. Due to the isolation and size of the valley, very few other projects have the potential to cumulatively interact with the potential residual effects of the Project.

The few potential cumulative effects that have been identified for wildlife, fish, and plant resources have been determined to be not significant. This finding, coupled with TSKLH's and MNBC's low level of use of the Bitter Creek valley for traditional purposes (based on IDM's understanding), suggests that the Project has a low likelihood of resulting in a low magnitude cumulative effect on TSKLH's and MNBC's CULRTP. The cumulative effects would have a discrete geographic extent (i.e., confined to the Bitter Creek valley), endure for the life of the Project (i.e., long-term), be of continuous frequency, be reversible upon reclamation of the Project, and have a high context given the relative size of the Bitter Creek valley to the larger areas where TSKLH and MNBC practice their Aboriginal rights. The effect

would be not significant. IDM's confidence in this determination is high given the quantity and quality information available on TSKLH's and MNBC's CULRTP within the northwest region of the province.

20.10.10 Follow-up Programs

The Project has been designed to minimize, mitigate, and manage potential adverse effects on the environment. Where a residual effect and/or cumulative effect has been identified, a description of a follow-up strategy is provided. The purpose of Project monitoring plans is to confirm that the mitigation and management of potential adverse effects are effective and functioning as intended.

20.10.10.1 Wildlife Resources

IDM has identified a follow-up strategy to evaluate the accuracy of effects predictions and effectiveness of proposed mitigation measures in regards to wildlife VCs. The strategy focuses on implementation of the Wildlife Management Plan (WMP; Chapter 29, Section 29.26). The purpose of the WMP is to minimize the effects of the Project's activities on wildlife and wildlife habitat, monitor the results of mitigation to ensure effectiveness, and adaptively manage for any unanticipated effects resulting from the Project. The WMP is intended to continue wildlife use in areas adjacent to the Project footprint and within the broader Bitter Creek valley while reducing the potential for Project-related injury or mortality to wildlife. The WMP provides guidance to protect and limit disturbances to wildlife and wildlife habitat from Project activities. These include implementation of widely recognized best management practices and development of procedural mitigation measures during project planning to minimize anticipated effects.

In the event that original predictions of effects and mitigation effectiveness are not as expected, adaptive management principles and strategies will be implemented. Adaptive management will require consideration of monitoring results, management reviews, incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes. Mitigation and monitoring strategies for wildlife will be updated to maintain consistency with action plans, management plans, and best management practices that may become available during the life of the Project. Key stakeholders, Aboriginal Groups, government agencies will be involved, as necessary, in developing effective strategies and additional mitigation.

20.10.10.2 Fish Resources

The Aquatic Effects Monitoring Program (AEMP) forms part of the Aquatic Effects Management and Response Plan (Chapter 29, Section 29.5) for Project Construction, Operation, Closure and Reclamation, and Post-Closure. The AEMP will include the following:

- Monitoring streams at locations potentially affected by the Project and at reference areas well away from Project activities;
- Monitoring surface water quality, sediment quality, and aquatic biology;

- Monitoring fish populations and fish tissues; and

- If effluent (as defined in Canadian Metal Mining Effluent Regulations (MMER)) is discharged to the environment, then additional sampling for MMER requirements will be conducted (effluent characterization; acute toxicity testing; site characterization studies (including surface hydrology); sublethal toxicity testing).

If fisheries offsetting is needed to counterbalance serious harm to fish, this will be outlined in a Fisheries Offsetting Plan to be approved by DFO. If required, this Fisheries Offsetting Plan will include a monitoring plan that would be developed at the permitting phase.

20.10.10.3 Vegetation Resources

Effects to ecosystem abundance, distribution, and ecosystem function will be avoided and minimized through a Vegetation and Ecosystems Management Plan (VEMP; Chapter 29, Section 29.24). The VEMP is designed to provide environmentally responsible, realistic, and operationally feasible guidance for ecosystem and vegetation management. The protection measures described in the VEMP will be coordinated with the protection measures outlined in the following associated plans (Chapter 29):

- Air Quality and Dust Management Plan (Section 29.4);
- Aquatic Effects Management and Response Plan (Section 29.5);
- Erosion and Sediment Control Plan (Section 29.9);
- Terrain and Soil Management Plan (Section 29.23);
- Wildlife Management Plan (Section 29.26); and
- Closure and Reclamation (Volume 2, Chapter 5).

Effects to Vegetation and Ecosystem VCs will be avoided and minimized through an invasive plant strategy, which includes the following actions:

- Conducting pre-construction invasive plant surveys within the Project footprint to determine the presence/absence of invasive plants;

- Removal of existing invasive plant populations to prevent the spread to adjacent areas; and

- Establishment of an early detection, inventory, control, and monitoring and follow up program in accordance with Provincial guidance (https://www.for.gov.bc.ca/hra/plants/publications.htm) and expert recommendations.

The need for any corrective actions or installation of additional control measures will be determined on a case-by-case basis through monitoring. An Adaptive Management Plan will be in place outlining the response framework, and appropriate management plans will be developed for each rare plant and lichen species, as needed. Adaptive management will require consideration of monitoring results, management reviews, incident investigations, shared traditional or local knowledge, new or improved scientific methods, regulatory changes, or other Project-related changes. Mitigation and monitoring strategies for Vegetation and Ecosystems VCs will be updated to maintain consistency with management

plans, and best management practices that may become available during the life of the Project. Key stakeholders, Aboriginal Groups, government agencies will be involved, as necessary, in developing effective strategies and additional mitigation.

20.10.11 Conclusion

Based on the results of the CULRTP effects assessment, the Project is not likely to result in significant residual or cumulative adverse effects on TSKLH's or MNBC's CULRTP, including consideration of potential changes to the availability of fish, wildlife, or birds trapped or hunted for traditional purposes, potential changes to the availability of traditional use plants, potential changes to access to the Bitter Creek valley, and potential changes to atmospheric conditions (i.e., Air Quality, Noise, and Visual Quality). IDM is confident that TSKLH's and MNBC's CULRTP can continue.

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