monitor the concentrations of COPCs in water, mine-disturbed soils and vegetation growing on mine-disturbed soils. If concentrations appear to be increasing, then a formal risk evaluation will be conducted for the VECs of potential concern.

7.13.7.3 Access Road and Concentrate/Diesel Pipelines

COPCs

Metals from Acid Rock Drainage (ARD)

The access corridor is expected to pass through areas with exposed bedrock that will need to be blasted for road construction. Through exposure of a greater surface area, this may increase the amount of ARD that already exists along these rock faces. However, the ARD in these areas is expected to be of negligible concern to wildlife receptors, for two main reasons:

- Many of the areas consist primarily of rock and have limited vegetation for foraging of rock.
- Many of the areas are very steep, limiting access for most wildlife.

Effects on water in the receiving environment down-gradient of the ARD will be of greater importance. However, the large amount of precipitation in the area is likely to substantially dilute the metals concentrations in surface water, subsequently decreasing the concentrations that wildlife receptors may be exposed to. As described above, risks to wildlife via the drinking water exposure pathway are generally not the "driver" of wildlife risks. Metals from ARD in these areas are therefore not retained as COPCs for ongoing monitoring.

Metals from Road Dust

Dust from traffic along the access road will contain naturally occurring concentrations of metals. Since the concentrations are not expected to change from baseline concentrations along the road route, metals are not retained as COPCs for this mine component.

Road Dust Suppressants and Road Salts

The large amount of precipitation that occurs in the area will limit the amount of dust generated by traffic on the road. In addition, as part of the waste management plan, generation of the dust and airborne metals will be kept low in the summer months by limiting traffic and speed limits and by applying liquid calcium chloride as a dust suppressant. The use of road salt to improve traction on the road in the winter is also a possibility (Section 8.15, Access Road Management).

Mammals that may be attracted to dust suppressants and road salts may thus be at risk of mortality from collisions with vehicles (Section 7.13.9 Mortality). However, it is unlikely that mammals will be adversely affected by ingestion of the dust suppressant or road salts. In addition, birds are not retained as a VEC of potential concern because they are not expected to be attracted to these chemicals. Likewise, the western toad will not be attracted to road salts or dust suppressant chemicals. However, the western toad is particularly sensitive to environmental chemicals and risks potential dermal exposure to these chemicals if they end up in aquatic environments adjacent to the road. As such, although population level effects are considered to be negligible, western toads are retained as VECs of potential concern (Table 7.13-22).

Pipeline Chemicals

In the event of a pipeline breach, chemicals in the concentrate and diesel pipelines will be released into the environment. If a spill were to occur, then the spill contingency and emergency response plan should mitigate most environmental damage (Emergency Response and Spill Management, Section 8.11). The proposed emergency shutoff valves in the concentrate and diesel pipeline will be designed to minimize the amount of materials released in the event of a spill. Thus, the chemicals associated with the concentrate and diesel pipelines are not retained as COPCs for ongoing monitoring. However, in the event of a major spill, soil, water and vegetation within the spill area will be monitored to ensure that the chemical levels are within the regulatory guidelines (Wildlife Effects Monitoring Program, Section 10.5).

Chemicals Transported Along the Road

Chemicals transported by truck along the access road could be released into the environment in the event of a motor vehicle accident. Such chemicals include gasoline, lubricants and flocculants and reagents such as potassium amyl xanthate (PAX), methyl isobutyl carbinol (MIBC) and lime (CaO) used in mineral processing. Spills will be mitigated per the (Emergency Response and Spill Management, Section 8.11). Part of the spill response plan is immediate cleanup, which will minimize if not eliminate effects on wildlife receptors. Thus, the chemicals to be transported by vehicles along the access road are not retained as COPCs that require ongoing monitoring. However, in the event of a major spill, soil, water and vegetation within the spill area will be monitored to ensure that the chemical levels are within the regulatory guidelines (Wildlife and Wildlife Habitat Effects Monitoring Program, Section 10.5). Therefore, while small amounts of these chemicals could be released into the environment during transport, effects on the VECs would be negligible.

In the event of a chemical spill, the time that elapses between occurrence and subsequent cleanup represents the potential for acute effects on VECs in the vicinity of the spill. However, these potential effects cannot be evaluated at this time because the volume of the spill and the concentrations that may enter the environmental media are unknown. Other information required in evaluating this risk, such because the location of the spill or the time of year, is also unknown. As such, these COPCs do not require ongoing monitoring. However, in the event of a spill a risk assessment that evaluates acute exposure to VECs will be considered.

Summary

Based on this evaluation, road dust and dust suppressants have been retained as COPCs for the access road and concentrate/diesel pipelines. The VECs of potential concern include grizzly bear, mountain goat, moose, hoary marmot, American marten and western toad.

7.13.7.4 Filter Plant

COPCs

Chemicals used in Filter Plant Process

The filter plant will consist of the following equipment: concentrate stock tank, two pressure filters, filtrate thickener, reactor clarifier, two sand filters or low-pressure Larox filters, and

flocculant, lime and sulphuric acid systems. There will also be a large diesel storage tank for the diesel pipeline, concentrate loadout facilities and an AST for jet fuel storage.

All chemicals used or stored at the filter plant will meet the requirements of the Materials Management (Section 8.9), Emergency Response and Spill Management (Section 8.11) and Waste Management Program (Section 8.14). In the event of a spill or malfunction, these products will be cleaned up immediately and will be properly disposed of. Thus, these chemicals are not considered COPCs that require ongoing monitoring. However, in the event of a major spill, soil, water and vegetation within the spill area will be monitored to ensure that the chemical levels are within the regulatory guidelines (Wildlife and Wildlife Habitat Effects Monitoring Program, Section 10.5). While small amounts of these chemicals could be released into the environment through general use, the release of such small quantities will likely have no effect on the VECs.

In the event of a chemical spill, the time that elapses between occurrence and subsequent cleanup represents the potential for acute effects on VECs in the vicinity of the spill. However, these potential effects cannot be evaluated at this time because the volume of the spill and the concentrations that may enter the environmental media are unknown. Other information required in evaluating this risk, such because the location of the spill or the time of year, is also unknown. As such, these COPCs do not require ongoing monitoring. However, in the event of a spill a risk assessment that evaluates acute exposure to VECs will be considered.

Repeated small spills at high-use areas could affect soils and potentially vegetation and wildlife. High-use areas include fuelling points, vehicle repair facilities, fuel storage tanks, lube bays and vehicle storage sites. These sites should be monitored for ongoing chemical accumulation, potential mobilization of chemicals away from the high-use areas and cleanup on mine closure.

Metals

Concentrations of metals in the effluent discharged into the Iskut River will meet regulatory requirements (Project Description, Section 5.7.2.3) and are expected to pose no risk to wildlife receptors in the vicinity of the filter plant. In addition, the filter plant will be fenced, which will prevent VECs such as bears and moose from entering the area.

Summary

Based on this evaluation, no COPCs have been retained for the filter plant. As such, no VECs are identified as potential for concern.

7.13.7.5 Aerodrome Facilities

COPCs

Equipment Maintenance Chemicals

Chemicals used or stored at the aerodrome facilities will likely include emergency aircraft fuel, diesel, gasoline and small amounts of lubricants and grease for the maintenance of vehicles used to plough the runway. The use and storage of these chemicals at this location will meet the requirements of the Materials Management (Section 8.9), Emergency Response and Spill

Management (Section 8.11) and Waste Management Program (Section 8.14). As such, these chemicals are not retained as COPCs for ongoing monitoring.

De-icing Compound

An aircraft de-icing compound such as ethylene glycol and/or propylene glycol will be used during the winter months. Many different formulations and combinations of these compounds are currently used for runway and aircraft de-icing (WHO, 2000). These compounds have short half lives (0.3 to 3.5 days), with little or no capacity to bind to particulates, and are mobile in soil.

To date most of the toxicological literature on aircraft de-icing chemicals has focused on aquatic receptors, since surface water is the predominant environmental end-point. Thus, terrestrial VECs are not likely to be exposed to these glycols to any great extent. If VECs were exposed, then the concentrations in the environmental media would not likely be high enough to cause adverse effects, since terrestrial species generally show low sensitivity to these compounds (WHO, 2000). For instance, waterfowl showed no-observed-effect level (NOAEL) when dosed with ethylene glycol at 1,221 mg/kg body weight. Reported lethal doses for poultry are at around 8,000 mg/kg body weight. These studies indicate low toxicity to birds. Amphibians also show low sensitivity, with an acute toxicity value of 17,000 mg/L for *Rana brevipoda* tadpoles.

Therefore, the other constituents in de-icing compounds are considered most likely to be responsible for the toxicity observed in aquatic life as a result of exposure. However, the small volumes of the chemicals that will be used at the air access facilities will have no effects on the wildlife VECs identified, provided that the Materials Management (Section 8.9), Emergency Response and Spill Management (Section 8.11) and Waste Management Program (Section 8.14) are followed.

Summary

Based on this evaluation, no COPCs have been retained for the air access facilities. As such, no VECs are identified as potential for concern.

7.13.7.6 Conclusions

The Galore Creek Valley is considered the predominant mine component that will require ongoing monitoring for metals, sulphate and nitrates, which were retained as COPCs for this area. These chemicals will be monitored in soil, vegetation and water as part of the monitoring program that will be established during the project permitting phase. If the concentrations of any of these chemicals are shown to increase over time due to mine activities, then a formal risk evaluation of grizzly bear, American marten, hoary marmot and bats is recommended.

The main access road also contains potential COPCs in the form of road salts for traction control during the winter, liquid calcium chloride as a dust suppressant when required and general dust effects when suppressants are not in use. Soil and vegetation will be monitored for potential adverse effects.

7.13.8 Reduction in Wildlife Productivity

7.13.8.1 Introduction

Wildlife productivity, also known as reproductive success, is the number of young that each female produces that reach reproductive age. Often, effects such as habitat alteration, disturbance to feeding and breeding habits and sensory disturbance do not cause mortality of adults, but reduce their physical condition and thus their reproductive success. Effects on adult survival are outlined in the previous sections (7.13.2 to 7.13.7), including habitat alteration, disturbance to feeding and breeding habitats and sensory disturbance.

Researchers working on the dynamics (rise and fall) of wildlife populations have found that there are two key components to reproductive success. The first, and most important, is adult female survival. The number of years a female survives determines how many young she will likely reproduce; even small changes in average female lifespan can result in rapid population change. For instance, massive outbreaks of rats in Asia are often caused by small increases in female lifespan alone. Female lifespan is also a relatively inflexible component of population dynamics because animals will generally move or change their feeding habits once they reach reproductive age.

The second major component that drives population dynamics is birth rate and survival of young. These factors are less critical than adult female survival, but are more variable. Birth rate and juvenile survival depend initially on good female condition, and juveniles are more susceptible to environmental and biological effects. For instance, females in good condition will often have more, fatter, healthier offspring with an increased chance of surviving to adulthood. Females in poor condition will produce fewer (by re-absorbing foetuses) or low-quality young. When adult females are displaced into lower-quality habitat, the young may be subject to lower feeding rates and thus lower body mass. Many animals need a minimum body size to successfully survive the winter. Poor-quality habitats with little refuge from predators may also increase juvenile mortality, as juveniles are often preferred prey.

Thus, many activities related to project development may not be lethal for adults but may have an effect on reproductive success and thus population sizes. This section assesses the potential for changes to reproductive success for each of the wildlife VECs.

7.13.8.2 Grizzly Bear

Activity and noise associated with construction and operation of the aerodrome within the Porcupine River Valley may disturb grizzly bear feeding during the salmon-spawning period. The effects of this disturbance, which are discussed in more detail in Disturbance of Feeding, Breeding and Denning Habitats or Behaviours (Section 7.13.5), could induce reduced reproductive success of individuals within the coastal grizzly bear population because of poorer physical condition. However, baseline studies suggest that females do not feed on salmon to the same extent as males (*Galore Creek Grizzly Bear Study Baseline Report 2004/2005*, Appendix 6-M), thus limiting potential effects on reproduction. The probability and magnitude of effects on individuals or populations cannot realistically be predicted.

To minimize disturbance to grizzly bear feeding, construction activities within 2 km of identified salmon-spawning channels will be scheduled outside of the salmon-spawning period (August to early November) where possible. During operations, helicopter flight paths will avoid hovering or flying over identified spawning channels (Section 7.13.5; Wildlife Management Plan, Section 8.13). Monitoring of the grizzly bear population will be an important component of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5), which will be designed to identify potential issues and promptly implement appropriate mitigation and adaptive management measures where necessary.

Even with these mitigation plans, however, there is a high probability of some disturbance to feeding as a result of aerodrome activities. Given the importance of the salmon resource to the coastal grizzly bear population and the uncertainty about effects on breeding success resulting from this disturbance, the potential for significant adverse effects is assessed as considerable (Table 7.13-23). This is discussed further in Significance of Adverse Residual Effects, Section 7.13.10.

7.13.8.3 Mountain Goat

Disturbance of goat habitat, particularly in areas used for kid rearing, in the Galore Creek Valley and along the access corridor could result in reduced mountain goat reproductive success. The physiological effects of stress may reduce fecundity and survival of kids, and goat condition could decline due to increased disturbance during winter or abandonment of high-quality habitats at key times of year, reducing nutritional intake and exposing goats to greater risk of depredation.

The effects of disturbance to feeding and goat natal habitats are discussed in Disturbance of Feeding, Breeding and Denning Habitats or Behaviours (Section 7.13.5) and Sensory Disturbance (Section 7.13.4). Disturbance to natal habitats in the Galore Creek Valley and along the access corridor during project operations were assessed as being considerable. The effects of this disturbance on mountain goats may extend beyond the lifetime of the project; mountain goats do not disperse widely and may not re-colonize suitable habitats for several decades. However, it is difficult to predict how disturbance and shifts in habitat will affect the reproductive success of mountain goats.

Where possible, construction and blasting activities within 2 km of natal habitats will be scheduled to avoid the goat kidding season (April 15 to June 15). In addition, pre-determined helicopter flight paths will be planned that avoid natal and high-quality goat habitats (Wildlife Management Plan, Section 8.13). Monitoring of the mountain goat population within the project study area will be part of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5).

The potential effects of disturbance on mountain goat reproductive success are not well understood, and the potential effects of the project are uncertain. However, the potential levels of disturbance from the project, combined with the sensitivity of mountain goats to disturbance, results in a considerable potential for significant effects (Table 7.13-23). This is discussed further in Significance of Adverse Residual Effects, Section 7.13.10.

Table 7.13-23
Reduction in Wildlife Productivity Effect Assessment Table

VEC	Mine Component description of mine component	Summary of Effect description of effect	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Local Landscape Regional Transboundary	Resilience Reversible Short-term Reversible Long-term Irreversible	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation description of proposed mitigation	Summary of Residual Adverse Effects description of residual adverse effect	Potential for Residual Adverse Effect to be Significant Negligible Considerable
Grizzly Bear	Porcupine Aerodrome (P)	Disturbance to grizzly bear feeding on salmon along the Porcupine River during fall may reduce the fitness of individuals, potentially reducing their reproductive productivity	Construction	Adverse	Medium-term	Unknown	Landscape	Reversible short-term	Continuous	Unknown	During the salmon spawning period (August to early November): construction within 2 km of identified salmon spawning reaches will be avoided; helicopter flight paths will avoid flying or hovering over salmon spawning areas; aircraft flights from the Porcupine Aerodrome will be scheduled at regular and consistent intervals; monitoring (Wildlife Effects Monitoring Plan)	Potential lowering of reproductive success of the local coastal population as a consequence of reduced fitness resulting from avoidance of critical feeding habitat, local population level effects are uncertain	Considerable
Mountain Goat	Galore Creek Valley (A-I); Access Road, Transmission Line and Pipelines (J-L); Heliport (Q)	Disturbance to goats associated with Galore Creek Valley, Scotsimpson Creek (tunnel portal) and Sphaler Creek may result in physiological effects that could reduce fecundity	Construction	Adverse	Medium-term	Unknown	Landscape	Reversible long-term	Continuous	Unknown	Avoidance of construction activities within 2 km of natal areas during the goat kidding season (April 16 to June 15) where possible. Pre-determined helicopter flight paths will avoid goat natal areas and high quality habitat where possible; monitoring (Wildlife Effects Monitoring Plan)	Uncertain - effects of disturbance on reproductive productivity are not well understood	Considerable
Moose	Porcupine Aerodrome (P)	Disturbance to moose wintering within the Porcupine River Valley may result in reduced fitness of pregnant cows during severe winters	Construction	Adverse	Medium-term	Low	Local	Reversible short-term	Continuous	Low	Monitoring (Wildlife Effects Monitoring Plan)	Uncertain - effects of disturbance on reproductive productivity are not well understood, however, population level effects are unlikely	Negligible
American Marten	Galore Creek valley (A-I); Access Road, Transmission Line, and Pipelines (J-L); Porcupine Aerodrome; Heliport (P,Q)	Direct and indirect habitat loss may result in environmental stress leading to a lowering of reproductive productivity	Construction	Adverse	Far-future	Low	Local	Reversible long-term	Continuous	Moderate	Maintenance of coarse woody debris adjacent to degraded habitat; deactivation and revegetation at mine closure	Reproductive productivity of a small number of individuals may be reduced due to loss of habitat; the sustainability of the marten population will not be affected	Negligible
Hoary Marmot	Mine Pits, Tailings and Waste Facility (A,C); Galore Creek Valley (B,E-I); ; Access Road, Transmission Line, Pipeline (J-L)	Direct loss of habitat may lead to environmental stress resulting in a reduction in reproductive success	Construction	Adverse	Medium-term	Low	Local	Reversible short-term	Continuous	Moderate	Deactivation and revegetation at mine closure	Reproductive productivity of small number of individuals may be affected by the loss of a very small area of habitat; sustainability of the population will not be affected	Negligible
Bats	Mine Pits, Tailings and Waste Facility (A,C); Galore Creek Valley (B,E-I); Access Road, Transmission Line, Pipeline, Facilities at Bob Quinn, Porcupine Aerodrome (J-M, P)	Direct loss of forage habitat and sensory disturbance may lead to environmental stress resulting in a reduction in reproductive success	Construction	Adverse	Far-future	Low	Local	Reversible long-term	Continuous	Moderate	Use the minimum level of illumination required; minimize operating time of lighting, use reflective structures rather than lights where possible, down-shielding of lights; revegetation at mine closure	Reproductive productivity of a small number of individuals may be affected by loss of forage habitat and sensory disturbance; sustainability of population is not anticipated to be affected	Negligible
Birds													
Songbirds	All Areas	Disturbance from construction and vegetation clearance during the bird nesting season may result in in a reduction in reproductive productivity	Construction	Adverse	Short-term	High	Local	Reversible short-term	Continuous	High	Vegetation clearance will occur outside of the general bird breeding season (April 15 to June 15) wherever possible	Some disturbance during the breeding season will likely occur, resulting in a reduction in reproductive productivity for some individuals, sustainability of populations is unlikely to be affected	Negligible
	All Areas	Reduction in reproductive productivity as a result of habitat loss and noise disturbance of nesting in association with project operation	Operation	Adverse	Far-future	Low	Local	Reversible long-term	Continuous	Moderate	Vegetation clearance will occur outside of the general bird breeding season (May 15 to July 31) wherever possible	Shift in breeding habitat and reduction in reproductive productivity to some individuals as a result of noise disturbance to nesting, population level effects are unlikely	Negligible
Raptors	All Areas	Habitat loss, disturbance (*e.g.* , bald eagles feeding on salmon along the Porcupine River) and direct mortality (*e.g*. from transmission line) have the potential to reduce reproductive productivity.	Construction	Adverse	Far-future	Low	Local	Reversible long-term	Continuous	Moderate	As construction progresses along the access road alignment, potential raptor nesting habitats and previously identified cliff nesting sites will be surveyed for raptor nesting activity ahead of construction activity; vegetation clearance will occur outside of the general bird breeding season (May 15 to July 31) wherever possible, unnecessary low-level aircraft flights over areas of feeding eagles, particularly by helicopters, will be avoided	Some individuals may experience a reduction in reproductive productivity, however the sustainability of populations is not anticipated to be affected	Negligible

(continued)

Table 7.13-23
Reduction in Wildlife Productivity Effect Assessment Table (completed)

VEC	Mine Component description of mine component	Summary of Effect description of effect	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Local Landscape Regional Transboundary	Resilience Reversible Short-term Reversible Long-term Irreversible	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation description of proposed mitigation	Summary of Residual Adverse Effects description of residual adverse effect	Potential for Residual Adverse Effect to be Significant Negligible Considerable
Waterfowl	Access Road, Transmission Line and Pipelines (J-L); Porcupine Aerodrome (P)	Reduction in reproductive productivity resulting from disturbance of nesting in association with the construction and operation of the mine access road, transmission line and pipeline	Construction	Adverse	Medium-term	Low	Local	Reversible short-term	Continuous	Moderate	None	Some individuals may be disturbed along the Porcupine River Valley, potentially affecting their reproductive success, population level effects are unlikely	Negligible
Harlequin Duck	Access Road, Transmission Line and Pipelines (J-L)	Reduction in reproductive productivity resulting from disturbance of nesting in association with the construction and operation of the mine access road, transmission line and pipeline	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Continuous	Moderate	Where possible avoid construction of bridge crossings along More Creek and road construction along Scotsimpson Creek during the sensitive breeding period of May to July; woody debris and riparian nesting vegetation within a 50m buffer of the access road right of way will be maintained wherever possible	Breeding success of a small number of pairs may be reduced in a given year, and there is the potential for pairs to abandon some breeding streams, population level effects are unlikely	Negligible
Trumpeter Swan	Porcupine Aerodrome (P)	Reduction in reproductive productivity as a result of noise disturbance of nesting in association with the construction and operation of the Porcupine Aerodrome	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Continuous	Moderate	None	Reduction in reproductive productivity as a result of noise disturbance of nesting in association with the construction and operation of the Porcupine River airstrip, the sustainability of the regional population is not anticipated to be affected	Negligible
Western Toad	Mine Pits, Tailings and Waste Facility (A,C); Access Road, Transmission Line and Powerlines (J-L)	Reduction in reproductive productivity as a result of mortality (especially during construction), habitat loss/alteration and disruption to movement between terrestrial and breeding habitats.	Construction	Adverse	Long-term	Moderate	Local	Reversible long-term	Continuous	High	Where possible, a buffer zone of at least 30 m will be established between construction activities and breeding habitat; deactivation of mine components and re-vegetation	Reduction in reproductive productivity at some breeding locations may have localized effects, but the sustainability of the population within the study are is not anticipated to be affected	Negligible

7.13.8.4 Moose

Feeding patterns or behaviours of moose wintering within the Porcupine River Valley may be disturbed by the construction and operation of the Porcupine aerodrome.

Moose are susceptible to disturbance primarily during the winter, when food is relatively unavailable and of poor quality, deep snow impedes movement and individuals are generally in poor condition. Milder winters may have negligible effects on the condition of pregnant cows, but the increased disturbance associated with severe winters could lead to lower birth rates. The potential effects of disturbance are discussed further in Disturbance of Feeding, Breeding and Denning Habitats or Behaviours (Section 7.13.5). Any effects on reproductive success are anticipated to be local in extent, of low magnitude and reversible over the short term.

Monitoring of the moose population, including winter surveys every three to four years, will form a component of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5). This will allow potential problems to be identified and appropriate measures to be taken, although cause-and-effect relationships would be difficult to establish.

Overall, no measurable reductions in reproductive success or population-level effects are anticipated for moose in the study area. The effects are therefore considered negligible (Table 7.13-23).

7.13.8.5 American Marten

The loss and alteration of habitat may affect the reproductive success of American marten; this is discussed in detail in Habitat Alteration (Section 7.13.2).

Studies report that environmental stress can reduce ovulation in American marten, with up to 50% of reproductive females failing to breed (Thompson and Colgan, 1987). Most studies use forest clearing rates of >40% as an indication of environmental stress, however, whereas much less clearing will be done for the Galore Creek Project. The effects on marten in terms of reduced food supply or increased stress are therefore considered too low to affect breeding success. However, local populations could be affected by increased predation of young in openings created by the access corridor and the mine area.

To mitigate for the loss of habitat, coarse woody debris will be retained adjacent to degraded habitats wherever possible, and revegetation will be carried out at mine closure (Wildlife Management Plan, Section 8.13, and Reclamation and Closure Plan, Chapter 14).

Overall, the reproductive success of a small number of individuals may be affected by loss of habitat, but the magnitude of this effect is assessed as low and localized. No substantial effects are anticipated on the regional population, and natural variability dictated by fluctuations in prey-base will likely outweigh any effects at the local level. Effects on American marten are therefore deemed to be negligible (Table 7.13-23).

7.13.8.6 Hoary Marmot

Disturbance and habitat loss may increase stress, decrease physical condition and thus decrease reproductive success of hoary marmots. However, the distance between project activities and marmot habitat will likely mitigate potential interactions.

Most of the suitable habitat identified for hoary marmot in the study area lies at elevations well above the alignment of the access road and the Galore Creek Valley infrastructure, and only small amounts of this habitat will be directly affected by development (Habitat Alteration, Section 7.13.2). Effects on feeding behaviours or habitats as a result of disturbance from project development are expected to be negligible (Disturbance of Feeding, Breeding and Denning Habitats or Behaviours, Section 7.13.5). Any reductions in reproductive success are therefore expected to be negligible for hoary marmot in the study area (Table 7.13-23).

7.13.8.7 Bats

The reproductive success of bats may be affected by environmental stress resulting from a loss of forage habitat and by sensory disturbance from project activities. Only a small amount of forage habitat will be lost as a result of the project, however, and given the availability of other suitable habitat within the study area, this is expected to have negligible effects (Habitat Alteration, Section 7.13.2). The effects of sensory disturbance are also expected to be low, particularly during the foraging periods of the bats found in the study area (Section 7.13.4, Sensory Disturbance). Potential effects on reproduction as a result in changes to foraging behaviour are therefore expected to be negligible.

Reclamation at mine closure will be designed to restore habitat of comparable value to that lost during mine development and operation,, and lighting at the project facilities will be designed to minimize sensory disturbance. Lighting controls will include limiting the level and operational time of illumination required for a given task, and down-shielding the lights (Wildlife Management Plan, Section 8.13).

The overall potential for effects on bats in association with project development is expected to be low. While some individuals may be temporarily displaced during construction, no long-term reductions in reproductive success are anticipated for bats in the study area. Effects are therefore considered negligible (Table 7.13-23).

7.13.8.8 Birds

Songbirds

Vegetation clearance and noise disturbance to nesting birds during the breeding season could have some effects on the reproductive success of songbirds during the construction phase of the project. Reduced breeding success could result from nest abandonment, egg mortality due to exposure and increased predation of eggs and hatchlings, producing a localized but high-magnitude impact over the short term. Potential effects during the operations phase as a result of sensory disturbance would be of low magnitude but would continue over the life of the project.

To assist in mitigating the potential for effects to breeding birds, clearing of vegetation during construction and operations will primarily occur during the winter months. Where this is not possible, nesting sites will be avoided if encountered during construction (Wildlife Management Plan, Section 8.13).

With mitigation measures in place, effects on songbirds during project construction will be temporary and low in magnitude. Effects on the sustainability of populations are therefore anticipated to be negligible (Table 7.13-23). During the operations phase, continuous sensory disturbance may result in a shift in breeding habitat usage to avoid areas exposed to disturbance. However, this is also anticipated to have a negligible effect on reproductive success given the wide availability of alternative habitats (Table 7.13-23).

Raptors

Losses of habitat, disturbance from project construction and operations, and direct mortality have the potential to reduce raptor reproductive success. In particular, disturbance to bald eagles feeding on salmon spawning along the Porcupine River may act as an environmental stressor on this species. Raptors perching or nesting on transmission line structures may also be at risk from electrocution.

The effects of habitat loss on raptors, as discussed in Habitat Alteration (Section 7.13.2), are considered negligible because of the relatively small habitat areas that would be affected. Sufficient nesting habitat will be maintained, and effects on reproduction are therefore unlikely. The effects of sensory disturbance and direct mortality on raptors are also likely to be negligible (Disturbance of Feeding, Breeding and Denning Habitats or Behaviours, Section 7.13.5; Sensory Disturbance, Section 7.13.4; Mortality, Section 7.13.9).

As construction progresses along the access road alignment, previously identified cliff nesting sites will be surveyed for nesting activity ahead of construction activity. If active nests are found, then the B.C. Ministry of Environment will be consulted for further guidance. To assist in mitigating the potential for effects to breeding birds, clearing of vegetation during construction and operations will primarily occur during the winter months; where this is not possible, nesting sites will be avoided if encountered during construction; the design of the transmission line will minimize the risk of electrocution to perching or nesting birds; and unnecessary low-level aircraft flights, particularly by helicopters, over areas of feeding eagles will be avoided (Wildlife Management Plan, Section 8.13).

With mitigation measures in place, the reproductive success of some individuals may still be affected, but any reductions are likely to be within the range of natural variation, and no population-level effects are anticipated within the study area. Effects are therefore considered to be negligible (Table 7.13-23).

Waterfowl

Suitable waterfowl breeding habitat lies within 1 km of the access road in the Bob Quinn Lake area, along More and Sphaler creeks and along the Porcupine River Valley (Appendix 6-M). Reproductive success of waterfowl may therefore be affected by disturbance resulting from

construction and operations activities near these locations, including aircraft activity associated with the Porcupine aerodrome.

The suitable waterfowl breeding habitats in the vicinity of Bob Quinn Lake have already been disturbed by forestry activities. Since waterfowl were observed breeding in these disturbed areas during baseline surveys, the effects of the project on breeding waterfowl in this locality are anticipated to be negligible (Table 7.13-23). The lakes along More and Sphaler creeks suitable for breeding are screened from the access road by forest cover and are large enough that waterfowl will be able to move away from potential sources of disturbance related to the road. Effects of the project on breeding waterfowl on these lakes are therefore anticipated to be negligible (Table 7.13-23).

The highest abundance of waterfowl recorded during baseline studies was in wetlands at the confluence of the Porcupine and Stikine rivers. These areas are approximately 10 km from the airstrip, and therefore the effects of disturbance on waterfowl from aircraft activity are predicted to be negligible (Sensory Disturbance, Section 7.13.4). In addition, waterfowl have the ability to move their broods to waterbodies away from disturbance. As a result, no population-level effects are expected on the reproductive success of waterfowl along the Porcupine River Valley, and overall effects are considered negligible (Table 7.13-23).

Harlequin Duck

Suitable harlequin duck habitat for nesting and brood rearing is found along rivers and waterbodies adjacent to the access corridor, including More and Scotsimpson creeks (Appendix 6-O). Harlequin ducks may be disturbed during the courting and nesting season by the construction and operation of the access road along Scotsimpson Creek. Effects on breeding behaviour along Scotsimpson Creek or habitat quality along either Scotsimpson or More creeks could potentially affect reproductive success. This could include reduced survival or fertility as a result of disturbances to courtship behaviours; egg mortality due to exposure as disturbed females leave the nest repeatedly or for extended periods of time; increased predation of eggs and hatchlings in the absence of the female; nest abandonment; or inadequate food supply due to habitat degradation. Disturbance that separates young broods could also reduce duckling survival.

Disturbances pose a greater risk to Harlequin ducks than other waterfowl species for a variety of reasons. As female harlequin ducks begin incubation, males migrate to the coast, thus eliminating the possibility of re-nesting if nests should fail (Goudie *et al.,* 1994). Clutch failures would, of course, result in the loss of breeding production for the year. Given that a significant and variable population does not necessarily breed every year, this may not represent a deviation from baseline conditions. However, if chronic disturbances cause pairs to permanently abandon breeding streams, then reproductive success could be compromised for several years as pairs relocate to a new nesting area.

To assist in minimizing the potential for disturbance to breeding harlequin ducks, construction of road sections along Scotsimpson Creek will be avoided where possible during the sensitive courting, incubation and early brood-rearing period between May 1 and July 31. Woody debris

and riparian nesting vegetation within a 50 m buffer of the access road right-of-way will be maintained wherever possible, ensuring availability of suitable nesting habitat for breeding individuals. Mitigation of the potential for aquatic habitat degradation along Scotsimpson, or More Creek (where the older brood was observed in August, 2005), will be addressed as part of fisheries concerns (Fisheries Effect Assessment, Section 7.10).

With mitigation measures in place, potential effects on harlequin ducks are limited to the breeding success of a small number of pairs affected in any particular year. Overall, potential effects are unlikely to affect the sustainability of the population and are therefore assessed as negligible (Table 7.13-23).

Trumpeter Swan

During baseline studies, trumpeter swans were observed along the Porcupine River, and three breeding pairs were observed in wetlands at the confluence between the Stikine and Porcupine rivers (Appendix 6-O). Depending on the levels of disturbance, repeated disruption of nesting trumpeter swans in association with the construction and operation of the Porcupine aerodrome could result in reduced breeding success through nest abandonment, egg mortality due to exposure or increased predation of eggs and hatchlings.

Trumpeter swans will not re-nest; therefore, clutch failures as a result of disturbance will result in the loss of the breeding production for the year (Grant, 1991; Henson and Grant, 1991). Furthermore, given that trumpeter swans return to nesting marshes year after year, severe disturbances may result in pairs permanently abandoning a breeding marsh (Brechtel, 1982). This could result in a loss of breeding success for several years as pairs relocate to a new nesting territory.

Trumpeter swans exhibit extreme variation in cygnet and adult survival, clutch size, nest success and fledging rates among years and flocks (Mitchell, 1994). This will make it difficult to accurately assess the effects of aircraft disturbance on the pairs breeding in the area versus natural variation in reproductive success. The Pacific flyway population of trumpeter swans is, however, believed to be stable and increasing, and the number of pairs potentially affected, as estimated from observations during baseline studies in 2005, is a minimum of three. Effects from development are therefore likely to be restricted to the local population. Overall population-level effects are therefore predicted to be negligible (Table 7.13-23).

7.13.8.9 Western Toad

The loss and reduction in quality of suitable breeding habitat associated with the access corridor, mine pits and tailings impoundment has the potential to result in reduced reproductive success for western toad. The results of project development will likely include permanent loss of small areas of wetland habitat, the formation a barrier to movement and some direct mortality (Habitat Alteration, Section 7.13.2; Disruption to Movement, Section 7.13.3; Mortality, Section 7.13.9). However, because of the high availability of suitable habitats and the wide distribution of western toad in the study area, the sum of these effects is considered negligible.

The reproductive success of western toad can be reduced by changes in water chemistry, contamination that alters embryo development and a reduction in cover that exposes eggs to UVb light. Changes in drainage patterns that reduce water availability can lead in the worst-case scenario to waterbodies drying out prior to toad development. Disruption to movements between terrestrial habitat and breeding habitat can also reduce reproductive success.

To mitigate these potential effects, a buffer zone of at least 30 m will be established between construction activities and identified western toad breeding habitat where possible. Amphibian tunnels allowing safe movement between terrestrial and breeding habitats will be installed at appropriate locations along the access road (Wildlife Management Plan, Section 8.13).

Within the Galore Creek Valley, mine components will be deactivated at the end of operations and reclamation activities will be designed to restore comparable habitat upon closure. Monitoring of western toad populations along the access road will also form a component of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5) during project operations.

With mitigation measures in place, effects on western toad reproductive success are anticipated to be localized in extent. Given the wide distribution of western toad and the availability of suitable habitat within the study area, effects on sustainability of the population are anticipated to be negligible (Table 7.13-23).

7.13.9 Mortality

7.13.9.1 Introduction

This section assesses the potential for and effects of direct and indirect mortality of wildlife VECs as a result of project development. Direct mortality of wildlife could occur during activities such as construction of the access road, avalanche control associated with project development or as a consequence of issues such as the access road acting as an attractant, as discussed previously. Direct mortality of wildlife could also occur along Highway 37 as a result of vehicle traffic from the filter plant to Stewart. Records are kept of mortalities of several wildlife species along the highway, including grizzly bear, mountain goat, moose, marten and hoary marmot (Sielecki, 2004).

Indirect sources of wildlife mortality resulting from project activities potentially include increased hunting, range shifts due to persistent disturbances and disruption of hibernation. The primary source of indirect mortality identified for wildlife VECs in association with project development is increased hunting pressure – both legal and illegal – owing to greater access to the study area (Ross, 2002).

7.13.9.2 Direct Mortality

Grizzly Bear

The potential sources of direct mortality identified for grizzly bear in association with project development are vehicle collisions along the access road and Highway 37.

Access Road

The probability of vehicle collisions with grizzly bear is expected vary along the route of the mine access road. Areas likely to be of greater concern include sections where the alignment is relatively straight and vehicle speed limits are higher, or those where habitat is suitable for grizzly bears as identified by the Enhanced Suitability Mapping (Appendix 6-Q). Seasonal differences in behaviour may also make bears more vulnerable. When bears first emerge from dens in early spring, they tend to be less cognizant of potential danger than later in the summer (Shaun Freeman, Rescan Senior Wildlife Biologist, *personal observation*). For the interior population, good-quality habitat areas associated with the access road are found along More Creek in early spring and summer and near Round Lake during late spring and summer.

At the end of construction, bears may be attracted to forage on early seral stage vegetation becoming established in disturbed sites such as staging areas and gravel pits developed near lower-elevation areas of the access road along More Creek. Other attractants to the road could include vehicle-killed wildlife or waste discarded from vehicles.

The Wildlife Management Plan (Section 8.13) outlines provisions to prevent the seeding or planting of forage species that might be particularly attractive to wildlife. Speed limits will be kept to a minimum and road signs posted in areas where the road traverses suitable wildlife habitats. All carrion will be removed as soon as possible and disposed of in areas where wildlife attraction will not increase the risk of road mortality. An appropriate protocol will be put in place to ensure that food or food wastes are not discarded from vehicles. Monitoring of wildlife-vehicle interactions will be reviewed regularly and adaptive management implemented in identified problem areas.

After the implementation of mitigation, the potential for mortality of grizzly bear in association with vehicle collisions along the mine access road is expected to be low; despite mitigation, however, the possibility of bear collisions with project vehicles is a residual effect. These mortalities are unlikely to affect the overall grizzly bear populations levels in the study area, and the residual effects are deemed to be negligible (Table 7.13-24).

Highway 37 to Stewart

Wildlife accidents involving grizzly bears have shown a general increasing trend along the Highway 37 from 1983 to 2002 (Sielecki, 2004). Truck traffic on the highway in association with the project could contribute to grizzly bear mortalities during the life of the mine. To minimize this potential, all traffic associated with the project will adhere to speed limits along Highway 37 at all times.

Despite adherence to speed limits, the possibility of bear collisions with project vehicles is a residual effect. These mortalities are unlikely to affect overall grizzly bear population levels along the Highway, and the residual effects are therefore deemed to be negligible (Table 7.13-24).

Mountain Goat

The potential sources of direct mortality identified for mountain goat in association with project development are vehicle collisions along the access road and Highway 37, and as a result of avalanche control.

Access Road

Direct mortality from vehicle collisions is anticipated to have a negligible effect on the local population of mountain goat in the study area (Table 7.13-24). Suitable goat habitat is predominantly located at higher elevations than the access road. An exception is the entrance to the More Creek canyon across the Iskut River, where the road will cross suitable winter habitat at lower elevations. However, mountain goat sensitivity to disturbance may ensure that they remain a safe distance away from transportation and development infrastructure, significantly limiting the numbers lost from direct mortality. The Wildlife Management Plan (Section 8.13), outlined briefly in the section above, will assist in minimizing potential mortality of goats along the access road.

Road cuts may create lick areas that act as attractants to goats (Section 7.13.6, Feature Acting as an Attractant); this has occurred in areas along Highway 1 in the Rocky Mountain Parks. These licks bring goats into close proximity with roads, thus increasing the potential for collisions with vehicles. The creation of any of these areas along the access road will be monitored. Where identified, steps will be taken to make them less attractive if they increase the likelihood of vehicle collisions with goats.

Highway 37 to Stewart

There is a negligible likelihood that the increased traffic on Highways 37 and 37a associated with the project will increase the mortality risk to mountain goats because most of this route is located well away from suitable goat habitat (Table 7.13-24). Highway 37 does not travel through or near any suitable goat habitat, and Highway 37a only transects a few kilometres of suitable habitat at the height of land near Yvonne Peak. This assessment is supported by the complete absence of vehicle incidents involving mountain goats along these highways from 1983 to 2002 (Sielecki, 2004).

Avalanche Control

During winter, mountain goats in the study area may occupy escape terrain near areas prone to avalanche, including areas along the access road where avalanche control will be undertaken. It is therefore possible that goats could be incidentally killed during avalanche control activities. Monitoring of the mountain goat population in the study area will form an important component of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5). Incidental observations of mountain goats during avalanche control procedures (*e.g.,* survey flights) will be recorded where possible, to provide information on the locations of goats in relation to avalanche terrain. The likelihood of goat mortality in association with avalanche control is expected to be negligible (Table 7.13-24).

Moose

The potential sources of direct mortality identified for moose in association with project development are vehicle collisions along the access road and Highway 37.

Table 7.13-24
Mortality Effect Assessment Table

VEC	Mine Component description of mine component	Summary of Effect description of effect	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Local Landscape Regional Transboundary	Resilience Reversible Short-term Reversible Long-term Irreversible	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation description of proposed mitigation	Summary of Residual Adverse Effects description of residual adverse effect	Potential for Residual Adverse Effect to be Significant Negligible Considerable
Grizzly Bear	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Moderate	Provisions to prevent the seeding or planting of forage species that might be particularly attractive to wildlife; low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; road signs posted in areas where the road traverses suitable wildlife habitats; all carrion removed from roadside as soon as possible; protocol to ensure food or food waste not discarded from vehicles; monitoring and adaptive management of wildlife-vehicle interactions	Possibility that individual bears may be killed as a result of collisions with Project vehicles despite mitigation	Negligible
	Highway 37 to Stewart (O)	Direct mortality due to collisions with vehicles	Construction	Adverse	Medium-term	Low	Regional	Reversible short-term	Periodic	Moderate	Adherence to speed limits of Project vehicles traveling along the Highway	Possibility that individual bears may be killed as a result of collisions with Project vehicles despite adherence to speed limits	Negligible
Mountain Goat	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Provisions to prevent the seeding or planting of forage species that might be particularly attractive to wildlife; low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; road signs posted in areas where the road traverses suitable wildlife habitats; monitoring and adaptive management of wildlife-vehicle interactions	Potential for mortalities is expected to be low as very little goat range overlaps with the access road	Negligible
	Highway 37 to Stewart (O)	Direct mortality due to collisions with vehicles	Construction	Adverse	Medium-term	Low	Regional	Reversible short-term	Periodic	Low	Adherence to speed limits of Project vehicles traveling along the Highway	Potential for mortalities is expected to be low as very little goat range overlaps with the Highway	Negligible
	Access Road (J)	Direct mortality in association with avalanche control	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Moderate	Record incidental sightings of mountain goat during avalanche control survey flights	Potential for mortalities is expected to be low	Negligible
Moose	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Moderate	Provisions to prevent the seeding or planting of forage species that might be particularly attractive to wildlife; low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; road signs posted in areas where the road traverses suitable wildlife habitats; monitoring and adaptive management of wildlife-vehicle interactions	Possibility that individual moose may be killed as a result of collisions with Project vehicles despite mitigation	Negligible
	Highway 37 to Stewart (O)	Direct mortality due to collisions with vehicles	Construction	Adverse	Medium-term	Low	Regional	Reversible short-term	Periodic	Moderate	Adherence to speed limits of Project vehicles traveling along the Highway	Possibility that individual moose may be killed as a result of collisions with Project vehicles despite adherence to speed limits	Negligible
American Marten	All components (A-N, P, Q)	Direct mortality due to destruction of active dens during construction	Construction	Adverse	Short-term	Low	Local	Reversible short-term	One Time	Moderate	Timing construction outside the active breeding period from March to May is unlikely to be feasible in all instances	Where incidental mortality does occur, population level effects are not expected	Negligible
	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Negligible	Regional	Reversible short-term	Periodic	Low	Drainage culverts along the access road will provide a habitat linkage for marten; low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; road signs posted in areas where the road traverses suitable wildlife habitats; monitoring and adaptive management of wildlife-vehicle interactions	Possibility that individual marten may be killed as a result of collisions with Project vehicles despite mitigation	Negligible
	Highway 37 to Stewart (O)	Direct mortality due to collisions with vehicles	Construction	Adverse	Medium-term	Negligible	Local	Reversible short-term	Periodic	Low	Adherence to speed limits of Project vehicles traveling along the Highway	Possibility that individual marten may be killed as a result of collisions with Project vehicles despite adherence to speed limits	Negligible

(continued)

Table 7.13-24
Mortality Effect Assessment Table (continued)

VEC	Mine Component description of mine component	Summary of Effect description of effect	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Local Landscape Regional Transboundary	Resilience Reversible Short-term Reversible Long-term Irreversible	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation description of proposed mitigation	Summary of Residual Adverse Effects description of residual adverse effect	Potential for Residual Adverse Effect to be Significant Negligible Considerable
Hoary Marmot	All components (A-N, P, Q)	Direct mortality due to destruction of active dens during construction	Construction	Adverse	Short-term	Negligible	Local	Reversible short-term	One Time	Low	Timing construction outside the denning period is unlikely to be feasible	Where incidental mortality does occur, population level effects are not expected	Negligible
	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Negligible	Regional	Reversible short-term	Periodic	Low	Low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; road signs posted in areas where the road traverses suitable wildlife habitats; monitoring and adaptive management of wildlife-vehicle interactions	Possibility that individual hoary marmot may be killed as a result of collisions with Project vehicles despite mitigation	Negligible
	Highway 37 to Stewart (O)	Direct mortality due to collisions with vehicles	Construction	Adverse	Medium-term	Negligible	Local	Reversible short-term	Periodic	Low	Adherence to speed limits of Project vehicles traveling along the Highway	Possibility that individual hoary marmot may be killed as a result of collisions with Project vehicles despite adherence to speed limits	Negligible
Bats	All components (A-N, P, Q)	Direct mortality during construction and operations vegetation clearing	Construction	Adverse	Medium-term	Low	Local	Reversible Short term	Periodic	Low	Clearing of vegetation outside the May 15 to July 31 window where possible (related to avoiding the general bird breeding period) as winter hibernacula are unlikely to occur in the development area	Where incidental mortality does occur, population level effects are not expected	Negligible
Birds													
Songbirds	All components (A-N, P, Q)	Direct mortality during construction vegetation clearing	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Moderate	Clearing of vegetation outside the general bird breeding period from May 15 to July 31 where possible	Where incidental mortality does occur, population level effects are not expected	Negligible
	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; monitoring and adaptive management of wildlife-vehicle interactions	Where incidental mortality does occur, population level effects are not expected	Negligible
	Transmission Line (K)	Direct mortality due to collisions and electrocutions with transmission line	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Increasing visibility of transmission line	Where incidental mortality does occur, population level effects are not expected	Negligible
Raptors	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Low traffic volumes since concentrate travels via pipeline; speed limits implemented along the road; all carrion removed from roadside as soon as possible; protocol to ensure food or food waste not discarded from vehicles; monitoring and adaptive management of wildlife-vehicle interactions	Where incidental mortality does occur, population level effects are not expected	Negligible
	Transmission Line (K)	Direct mortality due to collisions with transmission line	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Moderate	Implementation of design features to reduce the risk of collisions and electrocutions with the transmission line, including increasing the visibility of the line; monitoring for effects and adaptive management will also be undertaken where areas with a higher incidence of bird strikes are identified	Where incidental mortality does occur, population level effects are not expected	Negligible
	Porcupine Aerodrome (P)	Direct mortality due to collisions with aircraft	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Moderate	Monitoring of bird-strikes as part of the Wildlife Effects Monitoring Plan	Where incidental mortality does occur, population level effects are not expected	Negligible
Waterfowl	Transmission Line (K)	Direct mortality due to collisions with transmission line	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Moderate	Implementation of design features to reduce the risk of collisions and electrocutions with the transmission line, including increasing the visibility of the line; monitoring for effects and adaptive management will also be undertaken where areas with a higher incidence of bird strikes are identified	Where incidental mortality does occur, population level effects are not expected	Negligible
	Porcupine Aerodrome (P)	Direct mortality due to collisions with aircraft	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Moderate	Monitoring of bird-strikes as part of the Wildlife Effects Monitoring Plan	Where incidental mortality does occur, population level effects are not expected	Negligible

(continued)

Table 7.13-24
Mortality Effect Assessment Table (completed)

VEC	Mine Component description of mine component	Summary of Effect description of effect	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Local Landscape Regional Transboundary	Resilience Reversible Short-term Reversible Long-term Irreversible	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation description of proposed mitigation	Summary of Residual Adverse Effects description of residual adverse effect	Potential for Residual Adverse Effect to be Significant Negligible Considerable
Harlequin Duck	Transmission Line (K)	Direct mortality due to collisions with transmission line	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Implementation of design features to reduce the risk of collisions and electrocutions with the transmission line, including increasing the visibility of the line; monitoring for effects and adaptive management will also be undertaken where areas with a higher incidence of bird strikes are identified	Where incidental mortality does occur, population level effects are not expected	Negligible
	Porcupine Aerodrome (P)	Direct mortality due to collisions with aircraft	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Low	Monitoring of bird-strikes as part of the Wildlife Effects Monitoring Plan	Where incidental mortality does occur, population level effects are not expected	Negligible
Trumpeter Swan	Transmission Line (K)	Direct mortality due to collisions with transmission line	Operation	Adverse	Medium-term	Low	Local	Reversible short-term	Periodic	Low	Implementation of design features to reduce the risk of collisions and electrocutions with the transmission line, including increasing the visibility of the line; monitoring for effects and adaptive management will also be undertaken where areas with a higher incidence of bird strikes are identified	Where incidental mortality does occur, population level effects are not expected	Negligible
	Porcupine Aerodrome (P)	Direct mortality due to collisions with aircraft	Construction	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Low	Monitoring of bird-strikes as part of the Wildlife Effects Monitoring Plan	Where incidental mortality does occur, population level effects are not expected	Negligible
Western Toad	All components (A-N, P, Q)	Direct mortality due to destruction of hibernating individuals during construction	Construction	Adverse	Short-term	Low	Local	Reversible short-term	One Time	Moderate	Timing construction outside the hibernation period is unlikely to be feasible in all instances	Where incidental mortality does occur, population level effects are not expected	Negligible
	Access Road (J)	Direct mortality due to collisions with vehicles	Operation	Adverse	Medium-term	Moderate	Local	Reversible short-term	Periodic	Moderate	Culverts; speed limits; Toad tunnels; Adaptive Management when migration routes are identified	Where incidental mortality does occur, population level effects are not expected	Negligible
Indirect Mortality													
Grizzly Bear	Access Road (J)	Increased accessibility increasing hunting pressure on grizzly bear population	Construction Phase	Adverse	Medium-term	Low	Landscape	Reversible short-term	Periodic	Low	Road gated and access controlled; Project area designated a no–shooting/no-hunting zone and no personal firearms will be permitted within project areas	None	Negligible
Mountain Goat	Access Road (J)	Increased accessibility increasing hunting pressure on mountain goat population	Construction Phase	Adverse	Medium-term	Low	Landscape	Reversible short-term	Periodic	Low	Road gated and access controlled; Project area designated a no–shooting/no-hunting zone and no personal firearms will be permitted within project areas	None	Negligible
	Galore Creek Valley (A-I)	Goats associated with Galore Valley: Indirect Mortality; due to consequences of unfamiliarity with new area if individuals shift home range	Construction Phase	Adverse	Long-term	High	Landscape	Reversible Long-term	Continuous	Unknown	Monitoring and Adaptive Management	Unknown - population level effects of disturbance not well understood	Considerable (Unknown but potential significant effect on sub-population exists)
Moose	Access Road (J)	Increased accessibility increasing hunting pressure on moose population	Construction Phase	Adverse	Medium-term	Low	Landscape	Reversible short-term	Periodic	Low	Road gated and access controlled; Project area designated a no–shooting/no-hunting zone and no personal firearms will be permitted within project areas	None	Negligible
American Marten	Galore Creek Valley (A-I)	Indirect mortality due to competition between displaced individuals seeking new range	Construction Phase	Adverse	Short-term	Low	Local	Reversible short-term	One time	Unknown	None	Unknown if the current Galore Valley population is at a maximum carrying capacity	Negligible
Hoary Marmot	Galore Creek Valley (A-I) and Access Road (J)	Indirect mortality due to competition between displaced individuals seeking new range	Construction Phase	Adverse	Short-term	Negligible	Local	Reversible short-term	One time	Unknown	None	Unknown if there will be antagonistic interactions that could incur mortality; unlikely to affect many individuals since so little habitat is altered	Negligible
Bats	All components (A-N, P, Q)	Disturbance of hibernacula resulting in indirect mortality	Construction Phase	Adverse	Short-term	High	Local	Reversible short-term	One time	Low	None	Probability of effect occurring very low as hibernacula unlikely to occur in study area	Negligible

Access Road

Moose-vehicle collisions occur throughout the species range and are highlighted as a problem from both wildlife management and traffic safety perspectives (Sieler, 2005). Moose occupy habitats along the west and east ends of the proposed access road, presenting the risk of moose-vehicle collisions along the road.

In general, ungulate-vehicle collisions tend to be aggregated in both time and space: temporal patterns include changing food availability, seasonal migrations and snow cover; while spatial factors include location of preferred foraging habitat, landscape topography and road and traffic characteristics. Increased collision risk with animals is also associated with linear landscape features that funnel animals alongside or across roads, such as riparian corridors, transmission lines and steep slopes and ridges. Risk is also correlated with moose density (Sieler, 2005). On the basis of these factors, collision risk can be predicted at a preliminary level for moose in association with the mine access road.

During winter months moose are typically restricted by snow depth to habitats at lower elevations within the More Creek Valley and Bob Quinn area at the eastern end of the access road, and within the Porcupine River Valley at the western end (Appendix 6-L). Collision risk during winter will therefore be restricted to sections of the road in these areas. During the summer, moose in the eastern part of the study area move to suitable habitats at higher elevations in the lower More Creek Valley. Highly suitable habitats occur throughout the majority of the area encompassing a 2 km road route buffer along this lower portion of the road. Collision risk can therefore be expected to increase accordingly as moose move to forage in these habitats during the summer.

Numerous adult moose tracks were observed near Roca Camp along More Creek by ground crews in July and August 2005. The tracks may be attributable to a moose population wintering in the lower Mess Creek area. Confirmation would require further survey(Appendix 6-L), but the presence of moose in this area suggests that the potential for vehicle collisions also exists along this section of the access road.

The Wildlife Management Plan (Section 8.13) outlined briefly above will assist in minimizing potential mortality of moose along the access road. Despite mitigation, the possibility of moose collisions with project vehicles is a residual effect. These project-related mortalities are unlikely to affect overall moose population levels in the study area, and the residual effects are therefore deemed to be negligible (Table 7.13-24).

Highway 37 to Stewart

Wildlife accidents involving moose, while variable from year to year, have shown a general increasing trend along the Highway 37 since the early 1990s (Sielecki, 2004). Truck traffic on the highway in association with the project could contribute to moose mortalities. To minimize this potential, all traffic associated with the project will adhere to speed limits along Highway 37 at all times.

Despite adherence to speed limits, the possibility of moose collisions with project vehicles is a residual effect. These mortalities are unlikely to affect the regional moose populations, and the residual effects are therefore deemed to be negligible (Table 7.13-24).

American Marten

The potential sources of direct mortality identified for American marten in association with project development are den destruction during construction and vehicle collisions along the access road and Highway 37.

Construction Mortality

Unweaned juveniles in dens could potentially be killed during construction of the access road and mine facilities, particularly where construction occurs from March to early May in areas of active denning. It is unlikely that construction can be scheduled outside the active denning period in all instances.

Marten are known to move kits to other dens during disturbance events. If localized disturbance during project construction induced this behaviour, then potential for mortality would be minimized. In any case, population-level effects are not expected despite any incidental mortality of kits during construction. Effects on marten as a result of direct mortality during construction are therefore expected to be negligible (Table 7.13-24).

Access Road

The exposure of American marten to vehicle collisions could be very low along the access road because marten tend to avoid open areas and are known to use culverts to access habitats on either side of roads. Although marten may be attracted to road-killed carrion, the Wildlife Management Plan (Section 8.13) specifies that all carrion will be removed and disposed of in areas where wildlife attraction will not increase the risk of road mortality. Despite mitigation, the possibility of marten collisions with project vehicles is a residual effect. Such mortalities are unlikely to have population-level effects in the study area, and residual effects on marten are therefore deemed to be negligible (Table 7.13-24).

Highway 37 to Stewart

Data on vehicle strike mortality along Highway 37 collected by the Ministry of Transport between 1983 and 2002 documented only three marten (Sielecki, 2004). Based on these results, traffic along the highway in association with the project is not expected to increase vehicle incidents with marten. Effects on marten along the Highway are therefore expected to be negligible (Table 7.13-24).

Hoary Marmot

The potential sources of direct mortality identified for hoary marmot in association with project development are den destruction during construction and vehicle collisions along the access road and Highway 37.

Construction Mortality

Construction and pit development in Galore Creek Valley could destroy marmot burrows and their inhabitants, particularly if construction occurs when marmot are hibernating. The population densities of marmot are variable and patchy among colonies and so are difficult to measure. Densities ranging from approximately 2 to 15 animals per km^2 have been reported (Nowak, 1991).

Given the range in marmot densities and the small amount of habitat that will be lost in the Galore Creek Valley (Section 7.13.2, Habitat Alteration), no more than 30 to 40 individuals would be expected to be killed during construction. This number is highly speculative and is probably an overestimate. There are no baseline values for resident populations in Galore Creek Valley, and it is unlikely that all of the suitable habitat that will be lost is actually used by marmot. Despite any incidental mortality of marmots during construction, however, no population-level effects are expected. Effects on marmot as a result of direct mortality during construction are therefore deemed to be negligible (Table 7.13-24).

Access Road

Most of the suitable habitat for hoary marmot identified in the study area occurs at elevations well above the alignment of the access road. Based on the small home range size and sedentary nature of hoary marmot, it is considered unlikely that marmot will use the access road. The risk of marmot mortality as a result of vehicle collisions is therefore expected to be negligible (Table 7.13-24).

Highway 37 to Stewart

Data on vehicle strike mortality along Highway 37 collected by the Ministry of Transport between 1983 and 2002 documented only two marmot (Sielecki, 2004). Based on these results, increased traffic along the highway in association with the project is not expected to increase vehicle incidents with marmot. Effects on marmot along the Highway are therefore expected to be negligible (Table 7.13-24).

Bats

The primary source of direct mortality identified for bats is incidental destruction of roosts during vegetation clearing activities associated with construction. Day roosts of both little brown myotis and western long-eared myotis are typically found in tree cavities and crevices, or beneath exfoliating bark in both living trees and dead snags (Nagorsen and Brigham, 1995).

Construction Mortality

Colony sizes of roosting bats are generally small (Kunz and Lumsden, 2003), but nursery colonies may support hundreds of bats (*e.g.*, little brown myotis, Nagorsen and Brigham, 1995). However, the conditions required to support a nursery colony include very warm (>30°C) temperatures, which are unlikely to occur in areas of project development and vegetation clearing.

In addition, no hibernacula (hibernating locations) are expected to occur within areas of development, with the exception of small numbers of little brown myotis in the warmer areas of

the CWH BEC zone or in geothermally influenced areas where the temperature would remain above freezing (Nagorsen and Brigham, 1995). Therefore, even where vegetation clearing did incidentally affect a bat roost, it is unlikely that large numbers of bats would succumb to mortality.

To assist in mitigating the potential for effects to breeding birds, clearing of vegetation during construction and operations will primarily occur during the winter months (Wildlife Management Plan, Section 8.13). This will assist in mitigating the potential for mortality of day-roosting bats in the study area. The effects of mortality in association with vegetation clearing are therefore expected to be negligible (Table 7.13-24).

Birds

Songbirds

The potential sources of direct mortality identified for songbirds in association with project development are vegetation clearing during construction, vehicle collisions along the access road and collisions and electrocution with the transmission line.

Construction Mortality

Mortality of songbird adults and eggs or young in nests could result where vegetation clearing is done during the breeding period. To assist in mitigating the potential for effects to breeding birds, clearing of vegetation during construction and operations will primarily occur during the winter months. Where this is not possible, nesting sites will be avoided if encountered during construction (Wildlife Management Plan, Section 8.13). The effects of mortality in association with vegetation clearing are therefore expected to be negligible (Table 7.13-24).

Access Road

Small birds do periodically collide with moving vehicles along roads. The potential therefore exists for mortalities along the access road. However, both traffic volumes and vehicle travelling speeds on the access road will be low relative to those along highways. Accordingly, mortalities are also expected to be low and not to result in population-level effects for songbirds in the study area; the effects are therefore considered to be negligible (Table 7.13-24).

Transmission Line

In general, large birds such as raptors are considered to be more at risk of collisions and electrocutions with transmission lines than smaller songbirds (Bevanger, 1994; 1998). However, general design features such as increasing the visibility of the line will be implemented in some locations to reduce the risk of collisions (Wildlife Management Plan, Section 8.13). Mortalities that do occur are not expected to result in population-level effects for songbirds in the study area, and overall effects associated with the transmission line are therefore considered to be negligible (Table 7.13-24).

Raptors

The potential sources of direct mortality identified for raptors in association with project development are vehicle collisions along the access road, collisions and electrocution with the

transmission line and collisions with aircraft in the Porcupine River Valley. Collisions with windows and structures could also occur but are anticipated to be negligible sources of mortality.

Access Road

The potential attraction of several raptor species to roadsides for hunting or feeding on carrion (Section 7.13.6, Feature Acting as an Attractant) increases the risk of vehicle collisions for these species. Attraction of raptors to the road right-of-way for hunting rodents and small birds will also increase the vulnerability of individuals to vehicle strikes (DeLong, 2000). The Wildlife Management Plan (Section 8.13) specifies that all carrion will be removed and disposed of in areas where wildlife attraction will increase the risk of road mortality. Both traffic volumes and vehicle traveling speeds on the access road will be low relative to those along highways. Accordingly, mortalities of raptors hunting along the access road are also expected to be low. Despite any incidental mortality of raptors as a result of vehicle collisions, no population-level effects are expected, and the effects are therefore considered to be negligible (Table 7.13-24).

Transmission Line

Raptor collisions with transmission lines are well documented in the literature. Birds with large wingspans, such as raptors, are less manoeuvrable and are therefore considered most vulnerable to collisions with transmission lines.

Raptors can also be electrocuted along transmission lines that have low clearances between energized components, allowing simultaneous contact of the wings and body parts with conductors and/or ground wires while the birds are perching on towers. Raptors such as osprey may also be attracted to transmission line poles for nesting, thus increasing the risk of electrocution. Electrocution of perching and nesting raptors is addressed in Section 7.13.6 (Feature Acting as an Attractant).

Once construction is complete, raptors could collide with the transmission line for the project anywhere along its length. Areas with relatively high raptor activity include the lower More Creek area above the canyon, the upper Sphaler Creek area and particularly the Porcupine River Valley (Appendix 6-O). On the other hand, raptor abundance in the study area, particularly along the access road, is low, and collisions and electrocutions are therefore unlikely to have population-level effects on raptors occurring within the study area. Further, in a review of bird strike data for numerous avian species, APLIC (1994) indicated that collisions with power lines are not a biologically significant source of mortality and usually affected less than 1% of local populations.

However, primarily for reasons of power system reliability, appropriate mitigation will be implemented that will concurrently lower the risk of incidents for raptors. Collisions and electrocutions can cause the lines to short out, leading to downtime while repairs are made and also increasing the risk of fire. To help reduce the risk of collisions and electrocutions (Wildlife Management Plan, Section 8.13), the visibility of the line will be increased in certain locations; increased visibility has been found to markedly reduce the incidence of bird strikes (Bradely, 2006). Incidental observations of raptor mortalities will help identify areas of higher bird strikes and allow appropriate adaptive management. Despite any incidental mortality of raptors that does

occur along the transmission line, no population-level effects are expected, and residual effects are therefore considered to be negligible (Table 7.13-24).

Aerodrome

Collisions between birds and aircraft are a common problem throughout North America. Not only do they result in wildlife mortalities, but such collisions also pose a safety risk to flight personnel and passengers. Bird groups most commonly involved in aircraft strikes include raptors and waterfowl (Barras and Wright, 2002).

Some data indicate that the most vulnerable group of raptors may be recently fledged or immature birds that are generally inexperienced, curious, fearless and relatively weak flyers attracted to open spaces around airports for hunting. Because of their undeveloped evasive behaviours, they are at greater risk of being struck by aircraft (Anderson and Osmek, 2005). In contrast, there is evidence that adult birds, particularly those that hold breeding territories in the vicinity of airports, develop an expertise in avoiding aircraft over time. Breeding raptors, particularly red-tailed hawks, will also defend their territories and drive other raptors away, thereby potentially lowering the risk of collisions between aircraft and inexperienced birds. Adult raptors that only migrate through an area are likely to be at greater risk of collisions (Anderson and Osmek, 2005).

Several species of raptor were identified during baseline studies within the Porcupine River Valley, including red-tailed hawk, merlin, American kestrel, bald eagle, gyrfalcon and peregrine falcon (Appendix 6-O). Of these, red-tailed hawk and merlin are considered likely to breed within the valley. The risk of collisions may therefore increase at the time of fledging, which is approximately July in B.C. (Campbell *et al.*, 1990).

The peregrine falcon sighting in fall 2005 suggests that this individual was migrating south. This is noteworthy because it may be indicative of higher raptor activity in the valley during spring (April and May) and fall (August and September) migration. Bald eagles were also particularly common at the confluence of the Porcupine and Stikine rivers during fall when spawning salmon were abundant. The risk of raptor collisions with aircraft is therefore likely to increase during these migration periods.

Waterfowl are abundant in the Porcupine River Valley, particularly at the confluence of the Porcupine and Stikine rivers. A number of species were recorded breeding in the area, and several other species were identified migrating through the area during spring and fall (Appendix 6-O).

The risk of bird-aircraft collisions is therefore considered high within the valley. While bird strikes are not expected to lead to population-level consequences for those species identified, and overall effects are deemed negligible (Table 7.13-24), monitoring and appropriate adaptive management is essential given the human safety concern associated with bird-aircraft collisions. This is outlined in the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5).

Waterfowl

The potential sources of direct mortality identified for waterfowl in association with project development are collisions and electrocutions with the transmission line and collisions with aircraft in the Porcupine River Valley.

Transmission Line

Waterfowl in the study area may also be at risk of collision and electrocution with the transmission line, particularly in the Porcupine River Valley where waterfowl abundance is relatively high. Design features will be implemented to reduce the risk of collisions and electrocutions with the transmission line, as outlined briefly above and in the Wildlife Management Plan (Section 8.13). Incidental observations of waterfowl mortalities will help identify areas of higher bird strikes and allow appropriate adaptive management. Despite any incidental mortality of waterfowl that does occur along the transmission line, no population-level effects are expected, and any residual effects are therefore considered to be negligible (Table 7.13-24).

Aerodrome

As discussed above, raptors and waterfowl are the species groups most commonly involved in strikes with aircraft. Population-level effects are not expected if and where incidental mortality of waterfowl does occur in association with aircraft strikes, and any residual effects are therefore considered to be negligible (Table 7.13-24).

Harlequin Duck

The potential sources of direct mortality identified for harlequin duck in association with project development are collisions and electrocution with the transmission line and collisions with aircraft in the Porcupine River Valley. However, given the relatively low abundance of harlequin duck in the study area, the risk of mortality from these sources is considered to be low compared to the risk for waterfowl and raptors. With the implementation of mitigation (outlined briefly above and in the Wildlife Management Plan, Section 8.13), the potential for direct mortality of harlequin duck from these sources is expected to be negligible (Table 7.13-24).

Trumpeter Swan

The potential sources of direct mortality identified for trumpeter swan in association with project development are collisions and electrocution with the transmission line and collisions with aircraft in the Porcupine River Valley. However, given the relatively low abundance of trumpeter swan in the study area, the risk of mortality from these sources is considered to be low compared to the risk for waterfowl and raptors. With the implementation of mitigation (outlined briefly above and in the Wildlife Management Plan, Section 8.13), the potential for direct mortality of trumpeter swan from these sources is expected to be negligible (Table 7.13-24).

Western Toad

The potential sources of direct mortality identified for western toad in association with project development are construction-related activities and vehicle collisions along the access road.

Construction Mortality

Western toads hibernate for three to six months each year. Hibernating burrows for this species have been identified as deep enough to prevent freezing (up to 1.3 m under ground) and moist enough to prevent desiccation (Wind and Dupuis, 2002). Individuals could potentially be killed during construction of the access road and mine facilities during the hibernation period. It is unlikely that construction can be scheduled outside this period in all instances. While localized effects are expected in the Galore Creek Valley, population-level consequences throughout the study area are not expected during construction. Effects on western toad as a result of direct mortality during construction are therefore expected to be negligible (Table 7.13-24).

Access Road

The use and potential attraction of western toad to the access road is discussed in Section 7.13.6 (Feature Acting as an Attractant). The proposed placement of specialized toad tunnels or amphibian culverts under the road will facilitate the movements (Wildlife Management Plan, Section 8.13) of toads or toadlets. Monitoring for western toad mortality along the road will also form a component of wildlife monitoring and adaptive management along the road during operations (Wildlife and Wildlife Habitat Effects Monitoring Program, Section 10.5).

In British Columbia, amphibian tunnel systems are present and functioning at two localities along a new section of the Inland Island Highway on Vancouver Island (Fitzgibbon, 2001). The tunnels planned for the Galore Creek Project will mitigate the potential for western toad mortality associated with the access road and vehicle traffic, maintaining negligible effects on the population (Table 7.13-24).

7.13.9.3 Indirect Mortality

Grizzly Bear

The potential source of indirect mortality identified for grizzly bear in association with project development is an increase in hunting pressure resulting from greater accessibility to the project area.

Increased Hunting Pressure

Review of the literature indicates that indirect mortality of grizzly bears as a result of roads and increased hunting pressure is of far greater magnitude and concern than direct morality (Ross, 2002). Although the existing bear population appears to be sustainable while subjected to the low mortality rates currently recorded as being caused by humans (Appendix 6-M), the access road will open up an area that to date has been relatively inaccessible.

Hunting of grizzly bears is regulated by quota in British Columbia, and over-harvest due to hunter kills in the area is considered unlikely. Further, the access road will be gated and radio-controlled, eliminating the possibility of unauthorized access into the area; and will be decommissioned upon mine closure. The project area, including all camps and the mine site, will be designated a no-shooting/no-hunting zone, and no personal firearms will be permitted. The only exception will be for authorized personnel who may be required to use weapons for protection in the event of wildlife encounters in which human safety is compromised (Wildlife

Management Plan, Section 8.13). The potential for indirect mortality of grizzly bear as a result of increased hunting pressure is therefore expected to be negligible (Table 7.13-24).

Mountain Goat

The potential sources of indirect mortality identified for mountain goat in association with project development are an increase in hunting pressure resulting from greater accessibility to the project area, and displacement of individuals in the Galore Creek Valley.

Increased Hunting Pressure

Limiting access to the development to all but authorized individuals will ensure no substantial increase in goat harvesting or disturbance from other human activity such as recreational snowmobile use (Wildlife Management Plan, Section 11.13). Further, most of the suitable habitat occupied by goats during the legally recognized hunting season (August 1 to October 15) is well beyond the access corridor and would still be difficult to reach. Air access via the aerodrome facility in the Porcupine River Valley is passible, but the valley is located a substantial distance from occupied goat range. (Note that fixed wing is the only type of aircraft that can legally be used for hunter access.) The potential for indirect mortality of mountain goat as a result of increased hunting pressure is therefore expected to be negligible (Table 7.13-24).

Displacement of Individuals in the Galore Creek Valley

Chronic disturbance of ungulates can have several effects, including displacement of individuals or groups, earlier-than-usual migration or changes in rates of movement (Van Dyke and Klein, 1996). The level of disturbance planned in the Galore Creek Valley could result in the displacement of mountain goats that use the habitats in this area (see Section 7.13.4 Sensory Disturbance and Section 7.13.5 Disturbance of Feeding, Breeding and Denning Habitats or Behaviours). A distribution shift could increase the probability of mortality for individuals unfamiliar with predation risks and forage opportunities in a new range. While some of the sources of disturbance (*e.g.*, helicopters) can be mitigated, it will not be feasible to mitigate for industrial and blasting noise in the valley. Monitoring of the mountain goat population in the valley will form an important component of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5). However, the potential for indirect mortality as a consequence of range shifts in the Galore Creek Valley is considered considerable (Table 7.13-24). This is discussed further in Significance of Adverse Residual Effects, Section 7.13.10.

Moose

The potential source of indirect mortality identified for moose in association with project development is an increase in hunting pressure resulting from greater accessibility to the project area.

Increased Hunting Pressure

Although the construction and operation of the mine access road could increase hunting pressure on moose in the study area, the road will be gated and radio-controlled, eliminating the possibility of unauthorized access into the area. The project area, including all camps and the mine site, will be designated a no-shooting/no-hunting zone, and no personal firearms will be permitted. The only exception will be for authorized personnel who may be required to use

weapons for protection in the event of wildlife encounters in which human safety is compromised (Wildlife Management Plan, Section 8.13). The potential for indirect mortality of moose as a result of increased hunting pressure is therefore expected to be negligible (Table 7.13-24).

American Marten

The potential source of indirect mortality identified for American marten in association with project development is displacement of individuals in the Galore Creek Valley.

Displacement of Range in the Galore Creek Valley

Marten in the Galore Creek Valley may be displaced as suitable habitat is removed and individuals are exposed to predation or competition in occupied territories. If it occurs at all, however, this is likely to be a temporary effect during the construction phase. Population-level consequences are not anticipated, and thus the effects are expected to be negligible (Table 7.13-24).

Hoary Marmot

The potential source of indirect mortality identified for hoary marmot in association with project development is displacement of individuals in the Galore Creek Valley.

Displacement of Range in the Galore Creek Valley

Hoary marmots in Alaska do not appear agonistic toward any colony residents, but may be aggressive in intercolonial encounters (Holmes, 1979). For displaced individuals these antagonistic interactions could induce enough stress to incur mortality. However, given the low level of marmot habitat alteration expected during project development, this situation is unlikely and would potentially influence only very few individuals. The effects of range displacement are therefore expected to be negligible (Table 7.13-24).

Bats

The potential source of indirect mortality identified for bats in association with project development is disturbance of hibernation.

Disturbance of Hibernation

Hibernating bats are most at risk when disturbance occurs during late winter. Mortality rates of bats are typically highest at the end of hibernation, when individual fat reserves are low and activity associated with disturbance could cause starvation. Frequent disturbance also contributes to a higher probability of mortality during hibernation because bat metabolic rates increase with each disturbance, increasing the rate of consumption of fat reserves (Raesly and Gates, 1987) and leaving too little to see the individual through until the end of hibernation.

Locations of wintering bats in the study area are unknown, and where bats may be hibernating, if at all, cannot be predicted accurately. Little brown myotis, the most widely distributed and hardy species of bat identified in the study area, requires hibernacula that remain above freezing with a humidity of 70% to 90% (Nagorsen and Brigham, 1995). Hibernacula for this species are therefore only likely to occur in the warmest parts of the study area, in the CWH BEC zones outside areas of

direct impact. There are no records of western long-eared myotis hibernating within B.C. (Nagorsen and Brigham, 1995). It is therefore considered unlikely that this species hibernates in the study area. The potential for disturbance of hibernating bats resulting in mortality is therefore expected to be negligible (Table 7.13-24).

7.13.10 Significance of Adverse Residual Effects

Two wildlife VEC species, grizzly bear and mountain goat, may be subject to adverse residual effects resulting from the infrastructure and activities associated with the Galore Creek Project. Residual adverse effects for the two species are summarized in Table 7.13-25.

7.13.10.1 Grizzly Bear

One of the critical habitats for grizzly bears in the assessment area is the salmon-foraging channels within the Porcupine River Valley. The Porcupine aerodrome will produce substantial noise from fixed-wing and helicopter aircraft that may disturb grizzly bears foraging in this habitat. Several mitigation steps will be undertaken to minimize the magnitude of disturbance associated with the Porcupine aerodrome (Wildlife Management Plan, Section 8.13). First, construction within 2 km of salmon-foraging reaches will be avoided during the salmon-spawning period (August to early November).

Second, helicopter flight paths will be oriented to avoid flying or hovering over identified salmon-spawning channels. Third, aircraft flights from the Porcupine aerodrome will be scheduled at regular and consistent intervals to increase the predictability of disturbance and the possibility of bear habituation. Despite these measures, however, activity and noise associated with the aerodrome may disrupt individuals that congregate for salmon feeding in the Porcupine River Valley (Table 7.13-25, Effect 1).

Predicting the degree to which individuals will react to disturbance is extremely uncertain. However, if there is extensive avoidance of salmon spawning in the Porcupine Valley, then some individuals may be affected by reduced intake of fish forage and consequent decrease in fat reserves, leading in turn to decreased probability of winter survival. Furthermore, reduced fat reserves could result in lower reproductive success (Table 7.13-25, Effect 2).

Alternatively, individuals may be extremely motivated to access the spawning salmon and may not respond adversely to disturbance within the Porcupine Valley.

The potential residual effects of disturbance to salmon foraging by grizzly bear as a result of activities related to the Porcupine aerodrome were assessed as uncertain because future grizzly bear behaviour cannot be reliably predicted. Monitoring of the grizzly bear population, including the monitoring of any changes to feeding on salmon along the Porcupine River, will be undertaken as part of the Wildlife and Wildlife Habitat Effects Monitoring Program (Section 10.5). This will allow any potential effects to be identified and appropriate adaptive management to be initiated.

Table 7.13-25
Assessment of the Significance of Residual Adverse Effects on Wildlife VECs

	Mine Issue	VEC	Description of Residual Adverse Effect	Descriptor Criteria for Residual Adverse Effects			Significance of Residual Adverse Effect
				Magnitude	Geographic Extent	Duration	
Grizzly Bear:							
1	Potential disruption of feeding on salmon by grizzly bears in the Porcupine River Valley	Grizzly Bear	Unknown - potential that avoidance of salmon-spawning area may cause reduced fat reserves and incur winter survival consequences	Moderate	Landscape	Medium Term	UNCERTAIN
2	Potential reduction in reproductive success as a consequence of feeding disturbance	Grizzly Bear	Unknown - potential lowering of reproductive success due to reduced condition resulting from avoidance of critical feeding habitat	Moderate	Landscape	Medium Term	UNCERTAIN
Mountain Goat:							
GALORE VALLEY EFFECTS							
3	Disturbance to feeding habitats due to development in Galore Creek Valley	Mountain Goat	Unknown - potential for shift in distribution if individuals do not habituate; potential mortality associated with range shift	Moderate	Landscape	Long Term	UNCERTAIN
4	Reduction in reproductive productivity of goats at Galore Valley	Mountain Goat	Unknown - potential for disturbance from mine operations in Galore Valley to cause reduced foraging time and incur reproductive consequences	Moderate	Local	Medium Term	UNCERTAIN
5	Indirect mortality due to development in Galore Creek Valley	Mountain Goat	Unknown - potential for shift in distribution if individuals do not habituate; potential mortality associated with range shift	Moderate	Landscape	Long Term	UNCERTAIN
6	Disturbance to natal habitats due to development in the Galore Creek Valley	Mountain Goat	Unknown - potential for individuals to avoid traditional natal areas; population-level effects uncertain	Moderate	Landscape	Medium Term	UNCERTAIN
ACCESS ROAD EFFECTS							
7	Disturbance to feeding habitats due to construction of access road, transmission line and pipeline	Mountain Goat	Unknown - any animals that do not habituate may return to prior range after construction	Moderate	Landscape	Short Term	UNCERTAIN
8	Disturbance to natal habitats due to access road, transmission line and heliport	Mountain Goat	Unknown - potential for individuals to avoid traditional natal areas; population-level effects uncertain	Moderate	Landscape	Medium Term	UNCERTAIN
PROJECT EFFECTS							
9	Sensory disturbance due to industrial noise	Mountain Goat	Potential for shifts in habitat range; potential mortality associated with range shifts	Low	Local	Medium Term	NON-SIGNIFICANT
10	Sensory disturbance due to noise from avalanche control and blasting	Mountain Goat	Potential for shifts in habitat range; potential mortality associated with range shifts	Moderate	Local	Medium Term	UNCERTAIN

7.13.10.2 Mountain Goat

Mountain goats are particularly susceptible to noise and visual disturbances. There are several project activities that could disturb and adversely affect sub-populations, despite mitigation procedures. The magnitude of these effects is difficult to predict because they depend on individual behavioural responses. It is also important to recognize that disturbance effects may be cumulative. For instance, blasting noises and road traffic may not independently disturb goats, but the combination of the two could elicit disturbance response. The areas of anticipated goat disturbance associated with the project are the Galore Creek Valley and along the access road. Accordingly, the potentially adverse residual effects of disturbance were grouped into two geographically defined subsets.

The main group of effects is associated with the mine site operations in the Galore Creek Valley (Table 7.13-25, Effects 3 to 6); the group associated with construction and maintenance of the access road (Table 7.13-25, Effects 7 and 8) is smaller. Sensory disturbances associated with industrial noise, blasting and avalanche control will affect both of these regions (Table 7.13-25, Effects 9 and 10). However, the disturbance attributed to noise will be greater in the Galore Creek Valley than in the areas along the access road.

Predicting the magnitude of goat responses to disturbance is extremely uncertain (Table 7.13-25, Effects 3 and 4); there are examples of mountain goat habituating to industrial and road disturbances (see sections 7.13.4, Sensory Disturbance and 7.13.5, Disturbance of Feeding, Breeding and Denning Habitats and Behaviour). A proposed series of mitigation strategies aimed at minimizing potential disturbance effects are described in the Wildlife Management Plan (Section 8.13). For example, vegetation buffers will be maintained for sound attenuation. Where possible, construction activities will be avoided within 2 km of natal areas during the goat kidding season (April 15 to June 15). Aircraft disturbance will be mitigated by planning pre-determined helicopter flight paths to avoid goat natal areas and high-quality habitat.

Even with substantial mitigation measures, there is potential for some individual goats or groups of goats to be disturbed and to abandon their current home range for at least part of the year. These range shifts may increase the probability of adult mortality and/or decrease the rate of juvenile survivorship (Table 7.13-25, Effect 5 to 8). Displaced goats may be unable to locate sufficient food resources or habitats that are safe from predators. Displacement effects could be limited to a short time period until individuals gain experience in a new area, or could last for the life of the project. However, the population-level effects of disturbance on survivorship and fecundity are not well understood. The significance of these potential effects therefore remains uncertain.

Sensory disturbance due to noise from industrial activity (Table 7.13-25, Effect 9) and noise from avalanche control and blasting (Table 7.13-25, Effect 10) will likely affect some mountain goats. The degree to which individuals will habituate to these sources of noise is uncertain. It is anticipated that there will be some response to noise in at least the first year of construction. This response could be as insignificant as a brief pause in behaviour, or could involve individuals or groups of goats relocating to new ranges, as discussed above. There is a high likelihood of habituation to industrial noise (Table 7.13-25, Effect 9), since the noise will be consistent and

multiple mitigation measures will be undertaken. Considering the high likelihood of habituation after the first year, the anticipated low magnitude of effect, the local extent and the medium duration, this effect is assessed as non-significant. However, the degree to which goats will habituate to noise from avalanche control and blasting (Table 7.13-25, Effect 10) is uncertain because this type of noise will be less consistent and is distributed over a wider area. Mitigation such as visual/audible warnings of blasting events may substantially aid in habituation. However, the effects remain uncertain.

The assessment of residual effects for mountain goat needs to consider the potential additive effect of multiple disturbances. However, habituation may mitigate these interactions after the first few years of operations. Given the uncertain assessment for most of the residual adverse effects, the project will have a strong commitment to ongoing monitoring, assessment and adaptive management (Wildlife and Wildlife Habitat Effects Monitoring Program, Section 10.5). These plans will utilize the baseline estimates of abundance, kid production and range to assess the level of habituation to disturbance. The efficacy of mitigation measures will be evaluated, and adaptive management will evolve to refine and improve mitigation measures in successive years.

7.14 Archaeological and Heritage Resources Effects Assessment

7.14.1 Introduction

7.14.1.1 Effects Assessment Scope

Archaeological sites in British Columbia are protected under the *Heritage Conservation Act* (1996). Under Section 13 of this *Act*, it is illegal to damage or alter burials and rock art judged to have historical or archaeological value, and sites that contain physical evidence of human activities prior to 1846, or to remove heritage objects associated with any of the above sites. Penalties for such actions are specified in Section 36 of the *Act* and comprise fines and/or imprisonment.

This effects assessment was designed to identify any archaeological and heritage resources that may be affected by development of the Galore Creek Project, to develop mitigation strategies to avoid or reduce potential effects and to assess the significance of any residual effects.

7.14.1.2 Methods

Literature Review

To provide proper context for study results, a literature review was conducted, focusing on ethnographic and historic documents as well as previous archaeological studies. Various sources were consulted, including the University of Alberta libraries (which include the Canadian Circumpolar Institute) for published sources such as early Geological Survey of Canada reports, environmental studies, ethnographic monographs on the Tahltan and historic accounts written by early travelers and miners; site data files at the Archaeology Branch in Victoria for information on previously recorded sites; and reports on past archaeological studies in the region obtained from the B.C. Provincial Heritage Library and Points West's in-house library.

Baseline Studies

Overview

The initial step in conducting the archaeological overview was to consider the known information on past people's activities and results of previous archaeological studies. It should be noted that some attempts were made to include traditional knowledge in the archaeological studies. A single brief meeting was held with Tahltan Elder Ed Asp to look over project maps, and he identified some possible traditional camp locations. Some traditional knowledge maps were briefly viewed but did not appear to contain any known sites or trails within the specific project study area.

Preliminary overview field investigations were conducted in 2004 to more firmly define terrain potential for archaeological resources (Prager, 2005). Additional overview assessments of the selected and surveyed access road route, Porcupine aerodrome and associated facility locations, and the proposed transmission line route were conducted in 2005 (Appendix 6-R).

The overview field examinations consisted of low and slow helicopter over-flights, together with some limited on-ground examinations, of the mine area, proposed locations for associated facilities and each access road option. Terrain features such as creek or river crossings and confluences, rock outcrops and knolls were circled and viewed from all directions, and the archaeological potential of all terrain to be affected was rated. Topographic features suggestive of some potential for past human uses were identified and marked on maps; notes were made as to the specific aspects of interest.

Archaeological Inventory and Assessment

The field component of the archaeological inventory and assessment was conducted in 2005 with the prime objective of locating and assessing any archaeological resources within the proposed development zones (Hall and Prager, 2006). The access road option under consideration was surveyed and flagged prior to initiation of archaeological investigations. Consequently, field examinations were focused on the specific proposed access road right-of-way and associated facilities, and the mine and ancillary facilities within the Galore Creek Valley. Investigations consisted of: (1) a series of helicopter over-flights with limited pedestrian surveys in order to ascertain the archaeological potential of the terrain encompassed by the proposed developments, (2) pedestrian surveys of selected portions of the proposed developments and (3) a subsurface testing program that included 413 shovel tests. Ground reconnaissance was conducted in all areas judged to be of moderate to high archaeological potential, and at least 10% of low-potential areas were sampled. Closely spaced transects were walked and shovel testing done wherever some potential for buried remains was identified. Where sites were found, shovel testing was carried out to determine site content and extent in order to assess significance and identify appropriate mitigation measures.

7.14.1.3 Spatial Boundaries

Spatial boundaries for this environmental assessment of heritage resources are two tier. Because past inhabitants were nomadic and the study area is part of a larger cultural area, a larger region must be considered when interpreting study results and assessing site significance. For the purposes of this study, that regional area is roughly bounded by the Stikine River on the west and north and the Iskut River on the south and east. The project study area is confined to the Porcupine, Sphaler, More and Galore Creek valleys and limited by the Stikine River on the west and the Iskut River on the east (Figure 7.14-1). Because archaeological sites are generally of limited extent, effects assessment boundaries were restricted to the zone of disturbance within the Galore Creek Valley and associated facilities and within a 30 m wide corridor along the proposed access road route that was examined.

7.14.1.4 Temporal Boundaries

Temporal boundaries are also two fold. For the purposes of interpretation and significance assessments, the temporal range covers the past 9,000 years, as the period of possible human habitation. From the project perspective, the temporal range comprises the entire lifespan of the project, from initiation of construction to post-closure.

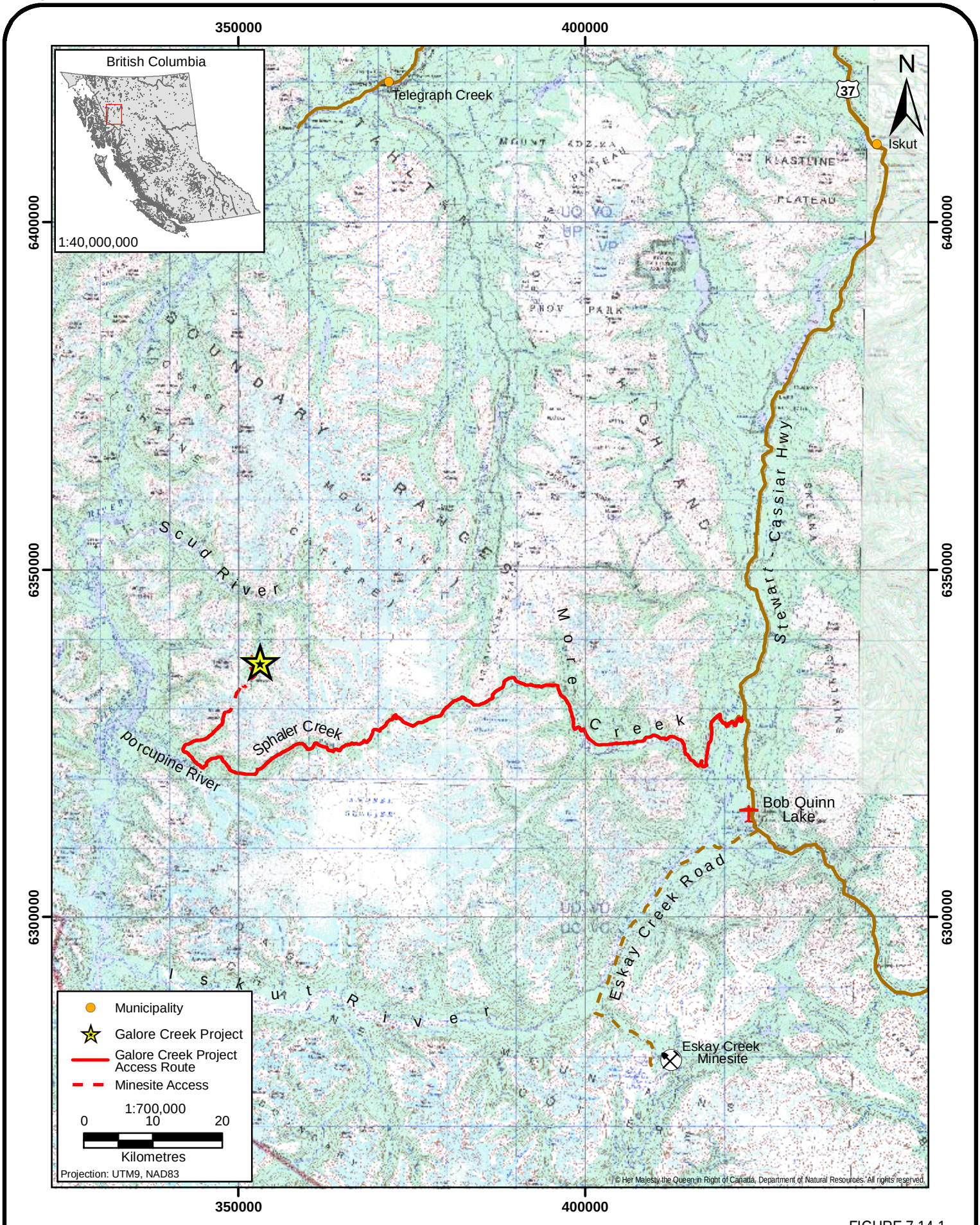


FIGURE 7.14-1

Location of the Galore Creek Project

NovaGold Canada Inc.

Rescan™

7.14.1.5 Assessment Limitations

The major study limitations are a lack of data on archaeological resources in this study area and gaps in the ethnographic data. Ethnographic studies were not initiated in the region until the early 20th century, by which time a considerable amount of integration had already taken place, and many of the elders with traditional knowledge had succumbed to one of the many epidemics. Furthermore, those studies were relatively brief and were concentrated in the vicinities of the major population centres, well removed from the peripheral use zones such as this study area represents. No archaeological studies had been conducted within the specific study area prior to initiation of this study and, with one exception (Mount Edziza), very little was known about immediately adjacent areas. The few studies conducted in the surrounding areas were very specifically focused. Consequently, because a specific contextual framework for study results does not yet exist, it has been necessary to extrapolate from other neighbouring regions to assess and interpret study results.

7.14.2 Existing Conditions

The Galore Creek Project is situated in the Boundary Range of the Coast Mountains, within the Canadian Cordillera physiographic region (Clague, 1989). Except for the highest peaks of the Coast Mountains, the entire region was covered by a massive ice sheet during the most recent glacial age. The ice sheet is thought to have receded relatively rapidly and to have reached the limits of glaciation existing at present by 9,500 years ago (Ryder and Clague, 1989). This is therefore the earliest time the area would have been available for human habitation.

The region is characterized by great variations in topography and climate, which govern distribution of crucial plant and animal resources and, consequently, have significant bearing on human use patterns. This area is typified by glaciers and glacial moraine, alpine vegetation, subalpine parkland ecotone and heavy forests. The study area is within the Stikine volcanic belt (Clague, 1989), and several volcanoes, numerous cinder cones and expanses of basalt and obsidian lavas occur throughout the project area. Obsidian was a highly desired raw material for making stone tools because its flaking can be easily controlled; good quality basalt was also used. Mount Edziza and the adjacent northern portion of the Spectrum Range have obsidian deposits of suitable quality for making stone tools. Artifact Valley and Raspberry Pass, just north of the study area, contain a number of rich lithic quarry/workshop sites (Fladmark, 1985).

The Tahltan people who currently live in the Stikine region are an Athapaskan-speaking Dene group who originated in the interior and moved into the Stikine region about 300 years ago. By all historic and ethnographic accounts, the Tahltan settled in the upper reaches of the Stikine drainage system, primarily between the mouths of the Tuya and Tanzilla rivers and Glenora Creek, but used a considerably larger territory to the northwest, north, east, south and southeast for hunting (Emmons, 1911; Duff, 1969). The Tahltan traditionally claimed the Stikine Valley and tributaries to the mouth of the Iskut River, as well as all of the Iskut drainage system, as their hunting grounds (Dawson, 1889). Emmons (1911) recorded that the lower Stikine (below Glenora) was only occasionally used by the Tahltan, however, and shared it with the Tlingit people living on the coast at the mouth of the Stikine. Teit (1906) noted the absence of any permanent settlement between Glenora and the Stikine mouth, likely owing to the generally inhospitable climate, almost impenetrable vegetation and lack of animal resources compared to

the Stikine Plateau. He also reported that Tahltan parties on trips to and from the coast occasionally hunted in the country adjoining the Stikine River (Teit, 1906).

Before the fur trade influenced their seasonal activities, the Tahltan generally congregated at fishing sites along the Stikine and major tributaries to catch and dry fish from June until September, then dispersed into small groups of generally two families (Emmons, 1911) to hunt from October to May (MacLachan, 1981; Albright, 1982), moving camp as frequently as necessary to pursue game resources. The Tahltan were originally big game hunters when they lived in the central interior, exploiting caribou, moose, wood buffalo, black and grizzly bear, bighorn sheep and mountain goat. Caribou were of prime importance and were probably one of the major reasons the Tahltan settled on the Stikine Plateau, where caribou were abundant. However, the people quickly adapted their lifestyle to take advantage of the plentiful salmon resources of the Stikine drainage system. A wide variety of plant materials acquired from the river valleys to the alpine were used for food, medicines and the construction of dwellings and implements (Albright, 1982; Emmons, 1911).

Gold was discovered in the Stikine Valley in 1861, and led to some sporadic prospecting activities in the region. This was followed by a greater influx of people during the Cassiar gold rush in 1874, and again during the Klondike gold rush of 1898.

No archaeological studies had been conducted or sites identified in the project study area before July 2005. Earlier work in the region includes several research studies to the north (Fladmark, 1985; French, 1980; Smith, 1970) and some limited development-related studies to the east and southeast (Ham, 1988; Rousseau, 1990; Simonsen, 2002; Wilson *et al.*, 1981). In total, these studies have recorded nearly 300 archaeological sites in the upper Stikine drainage basin north of Glenora, along the Tahltan River and in the vicinity of Mount Edziza. Those in the upper Stikine consist largely of fishing and fish-processing sites along the rivers and hunting sites on the plateaus. Those associated with Mount Edziza are obsidian quarrying and processing sites and some camps, possibly related to the hunting of high-elevation animal resources such as mountain goat or marmot or procuring specific alpine plants. The two recorded sites closest to the study area are HeTq-1 and HfTw-1 (Appendix 6-R). The former is a collapsed log cabin recorded on the south side of the Iskut River, east of the mouth of McLymont Creek, which contained associated debris and a magazine fragment dating to the mid-1930s. The other site is a pictograph described as two red-painted designs on a rock point only a few feet above the medium water level on the west side of the Stikine River, near the mouth of the Anuk River (Kerr, 1948).

Given the information gathered on the distribution of available resources, the past uses of the general region and the types and distributions of previously recorded archaeological sites, it has been hypothesized that the degree of use of the immediate study area would have been relatively light and would have represented peripheral presence rather than intensive activity centres. Thus, any sites identified would be expected to be characterized by small, short-term camps. Archaeological features within the study area are hypothesized to consist of lithic workshop sites related to the proximity and relatively easy access to the Mount Edziza obsidian outcrops, and more recent Tahltan sites associated with hunting or plant resource gathering. Considering the

high levels of snowfall and lack of readily available food, winter use of this area is considered highly unlikely, and sites would therefore represent spring, summer or fall use.

Archaeological surveys conducted in 2005 along the proposed access road route and within the Galore Creek Valley resulted in the discovery of six sites: three archaeological sites characterized by lithic scatter, a recent helicopter crash site and two Tahltan cultural heritage sites (Table 7.14-1; Plates 7.14-1 through 7.14-5).

Table 7.14-1
Heritage Sites Recorded in the Galore Creek Project Area

Site #	Type/Content	Location	Status
HgTs-1	lithic scatter/obsidian bifaces + debitage	Sphaler headwaters	to be avoided
HgTs-2	lithic scatter/obsidian+chert debitage	More Creek headwaters	to be avoided
HgTs-3	helicopter crash/metal, glass, plastic frags.	Sphaler uplands	to be affected
HgTr-1	lithic scatter/obsidian + basalt flakes	Upper More valley	out of limits
TCH-T1	cabin/wood remains, stumps	Sphaler uplands	to be avoided
TCH-T2	lean-to/wood poles + wire lashing	Sphaler uplands	outside ROW

Plate 7.14-1 One of the artifacts found at HgTs-1.

Plate 7.14-2 George Kaufman and Don Asp testing at HgTs-2 looking north.

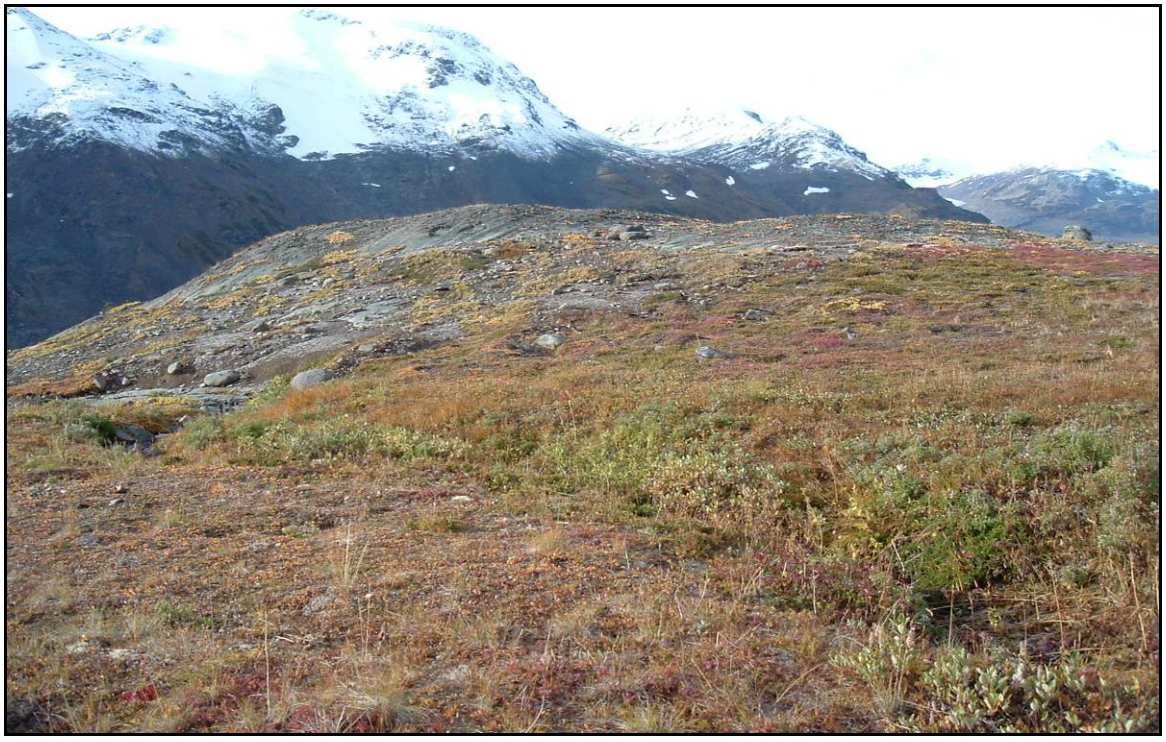


Plate 7.14-3 View of HgTr-1 looking south.

Plate 7.14-4 Don Asp and George Kaufman at Cabin remains at TCH-T1.

Plate 7.14-5 Don Asp at lean-to remains at TCH-T2.

These sites are all in the uplands within the subalpine zone; no sites were found in the lower valleys (Figure 7.14-2). This confirms a number of aspects of the background information, particularly that people chose the easier travel routes above the thick vegetation, and probably did not spend much time in the lower valleys because of the comparatively difficult conditions. The location of HgTr-1 on the upper side-slope of the More Valley is noteworthy in suggesting that travel routes were chosen primarily on the basis of degree of vegetation cover and that the degree of slope was a secondary factor. The nature of the lithic sites, their content and their proximity indicate a likely association with the Mount Edziza-Spectrum Range obsidian deposits and also suggest a possible route of travel to the south from those areas along the Mess and More/Sphaler valleys. Another noteworthy feature of these sites is their generally sparse nature, suggesting short-term use, probably indicating brief hunting and/or tool repair stops. The fact that there are both lithic sites and Tahltan sites indicates continuity of use of these upper areas, albeit at low frequency. The sites most likely date to early summer or fall, when animals were present, travel was relatively easy and berries were ripe.

Sites HgTs-1 and HgTs-2 were both within the proposed access road right-of-way. Since their discovery, the road route has been realigned to avoid direct impacts, but the sites are still in close proximity; therefore, care must be taken to avoid indirect effects. HgTs-3 is also within the proposed right-of-way. This site is a recent helicopter crash site, and most of the remains have been removed, leaving only a few bits of plastic, glass and metal. Due to the sensitive nature of crash sites, a site alteration permit will be necessary to proceed with construction through this site. Site HgTr-1 is located well above the current road right-of-way. Therefore, direct impacts are not expected. However, if slope stability work is required in the vicinity, this site may require additional work.

One of the two Tahltan cultural heritage sites, cabin remains labelled site TCH-1, was originally within the proposed road right-of-way. The site has been recorded and assessed by shovel testing, mapping and photography, and the road centre-line was moved so that the site is now on the edge of the right-of-way. Because it is too recent to be protected under the *Heritage Conservation Act*, no further action is necessary. Site TCH-2 is a lean-to and is interpreted to be even more recent, given the presence of the wire lashing the poles together. It is a short distance just outside of the road right-of-way; because of its age, it is not protected under the *Heritage Conservation Act* and no further action is necessary other than the detailed recording already completed.

In summary, all documentary and archaeological evidence suggests that this particular area was peripheral to the intensive use areas of Mount Edziza, the upper Stikine drainage system and the Klappan Plateau. Consequently, although it has been shown that archaeological resources are present in the study area, the number of artefacts and types of sites are not as significant as those found in the regions to the north and east.

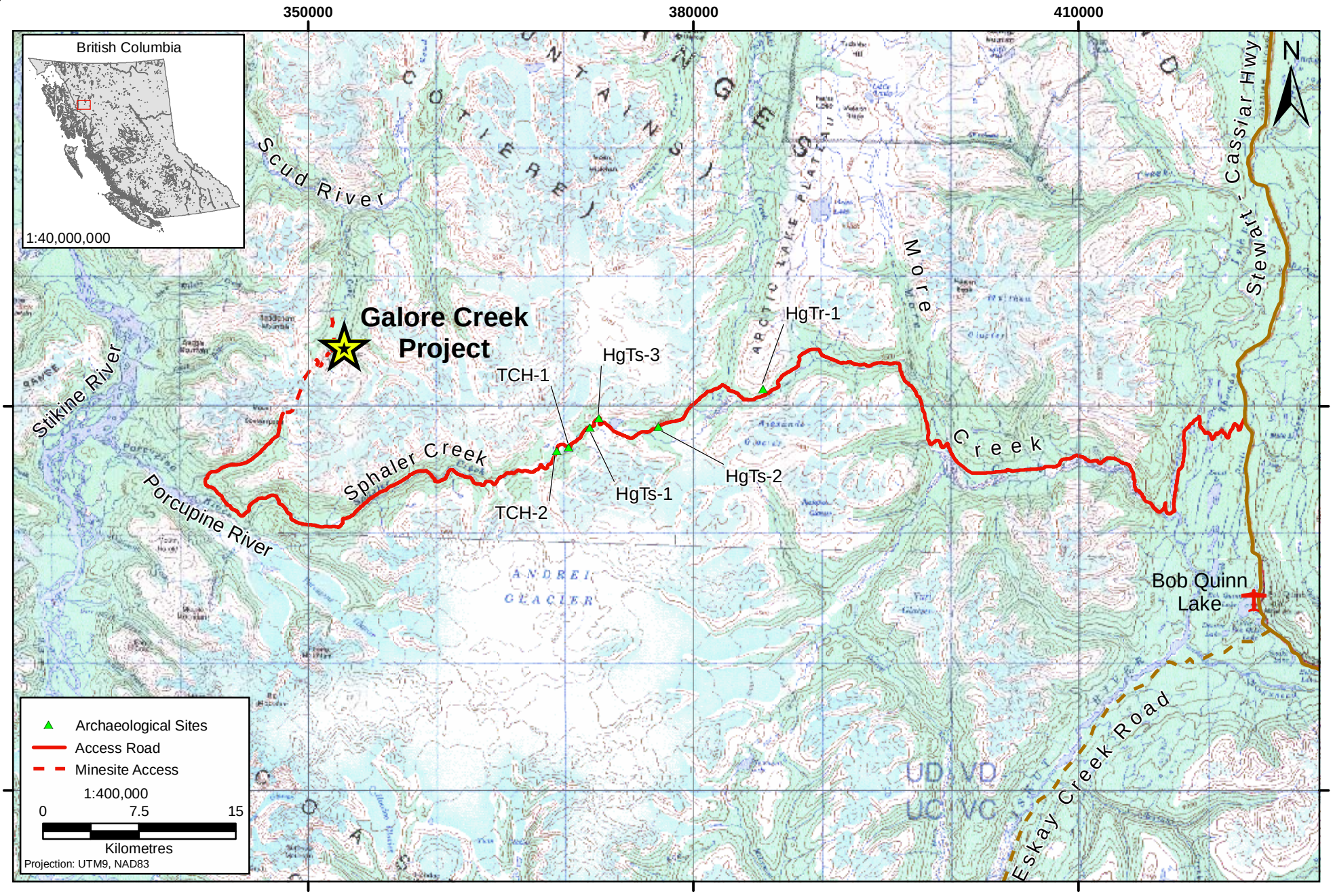


FIGURE 7.14-2

Location of Heritage Sites Recoirded in the Galore Creek Project Area

NovaGold Canada Inc.

Rescan™

7.14.3 Likely Future Conditions

The status of the archaeological sites in the Galore Creek Valley area without the project is unlikely to change. There is little potential for disturbance, since this area reportedly no longer forms part of intensive traditional subsistence patterns; this is supported by the results of this study. The main sources of occasional disturbance would be animal travel or gnawing, erosion and occasional human visitors.

7.14.4 Environmental Effects Assessment

Environmental effects on archaeological sites are considered negative, permanent and irreversible. Once a site is disturbed or destroyed, cultural information is lost. However, because archaeological sites are of limited spatial extent, they can often be readily avoided, once the locations are known. For these reasons, it is crucial to conduct inventory surveys to identify site locations. It should be noted that despite the consequences of site disturbances, potential development in this part of B.C. is leading to the discovery, recording and investigation of many sites, thus contributing to the scientific and cultural knowledge of the region.

7.14.4.1 Definitions

Several factors have been rated during the environmental effects analysis to arrive at the overall environmental effects assessment.

Magnitude represents the degree to which the entire site assemblage and/or representations of different site types available within the archaeological site inventory or "population" is lost or affected:

- High: An entire group of sites or site types is lost.
- Medium: Good representations or significant proportions of sites assemblage or site types are lost.
- Low: A small proportion of site assemblage types is lost.
- Negligible: Little or no part of the available site population is lost.

Geographic extent refers to the location of the effect. For archaeological sites, these are localized and generally occur within or in close proximity to the component of the development under consideration.

Timing refers to when the effect occurs by project phase.

Duration. For effects on archaeological sites, this is permanent.

Resilience. Effects on archaeological sites are generally irreversible.

Frequency refers to the number of times an effect may occur. For archaeological sites this may be only once per site, where it is totally destroyed, or it could be periodic, where repeated impacts affect only a portion of the site each time (*e.g.*, a feature is disturbed if one or a few artifacts are removed or displaced).

Probability of occurrence is rated as high, moderate, low, nil or unknown, depending on the likelihood of the effect and the degree of uncertainty based on previous scientific research and experience.

7.14.4.2 Effects during Project Phases

The primary adverse effects of the project on heritage resources can be expected to result from construction of associated infrastructure. Clearing and levelling of the ground, together with erection of buildings and other facilities, are the primary sources of disturbance within the camp, process plant site and pit areas and along the road right-of-way and transmission line corridor. As a result of such activities, one site (HgTs-3) has been identified that will be affected by proposed development of the access corridor. Three of the other heritage sites (HgTs-1, HgTs-2, TCH-T1) will be avoided during construction.

Since no sites were recorded within the mine and camp areas that were examined, no archaeological conflicts are anticipated as a result of construction activities. Construction of the road right-of-way is unlikely to directly disturb any additional archaeological sites. However, any associated quarries or borrow sites may affect as-yet unidentified sites. Furthermore, careful attention must be paid to areas that might require slope stability work such as cut-and-fill zones. This could affect sites such as HgTr-1, which is well above the currently proposed right-of-way. Any large cut-and-fill zones will need to be assessed before the ground work is undertaken. Construction of the transmission line may also affect as-yet undiscovered archaeological sites; further assessment is required in that area as well as the areas of the airstrip in the Porcupine valley and the heliport near Round Lake. These are all facilities that were proposed after the 2005 field investigations.

The operation of the mine, *per se*, is unlikely to have further direct effects on archaeological resources because there are no known archaeological sites within the Galore Creek Valley and the potential for sites is generally low. Increased human activity during the operations phase will be the most likely potential cause of indirect effects to archaeological sites. Three of the recorded archaeological sites are immediately adjacent to the access road right-of-way; therefore, there is some possibility of indirect effects resulting from such activities as road maintenance, snow stockpiling or people wandering off the road. The presence of higher numbers of people in a confined area can increase the potential for disturbance of sites at some distance from the actual development zone. People living and working in an area with limited after-hours recreational possibilities may wander around the area looking for sites, may pick up artifacts or disturb features, or may unknowingly drive snowmobiles or ATVs over sites.

As long as the decommissioning process during the closure and post-closure phases does not require any new areas of borrow or fill material, and no new areas of surface disturbance are created, no additional adverse effects to archaeological sites are expected other than the ongoing potential for indirect effects noted above during the operations phase.

7.14.4.3 Environmental Design and Mitigation

Protection and preservation of heritage resources is the primary goal of all concerned. Avoidance is the preferred option for archaeological site protection. Whenever possible, development activities

will avoid sites. Archaeological site surveys will be done as early in the planning for any new developments as is possible so that site avoidance can be built into initial project proposals. Sometimes infrastructure cannot be easily relocated or redesigned. In such cases, it may be necessary to enhance simple avoidance with increased monitoring or site protection or, as a last resort, to salvage archaeological remains before they are affected. It is certainly desirable to limit the destruction of archaeological resources as much as possible, since those resources are non-renewable, and site avoidance should always be the first preference. However, in cases where avoidance is not feasible, every effort is made to thoroughly document and collect a sample of the cultural information contained in an archaeological site. Only certain very significant sites will need to be preserved, together with representative examples of all other site types.

Sites located very near or within a development area may be protected when complete avoidance is not feasible. Site protection can involve the creation of a buffer zone in which no development will occur, the erection of physical barriers, capping a site with sediments or monitoring by a qualified individual.

7.14.5 Residual Environmental Effects

Residual effects are those predicted to remain after application of mitigation measures. With regard to heritage resources, these are effects that may occur once archaeological inventory of the development footprint has been completed, archaeological sites within proposed development areas have been recorded, assessed and mitigated, and education programs and communication procedures have been implemented.

7.14.5.1 Significance Criteria

The following significance definitions have been used for the analysis of residual environmental effects on heritage resources.

- Major (significant): total loss of the majority of the information contained within an archaeological site
- Moderate (significant): partial loss and/or displacement of the information within an archaeological site
- Minor (not significant): disturbance of archaeological site deposits with retrieval of information by systematic data recovery or monitoring of disturbance activity; loss of a very small proportion of a site's content
- Negligible (not significant): low likelihood of disturbance or loss of heritage resources.

7.14.5.2 Residual Effects of Project Phases

Loss of heritage resources in the construction phase is rated as a minor residual effect (Table 7.14-2). Three of the sites recorded within the development footprint will have been mitigated by avoidance. Site HgTs-3 is a special situation and will be affected by road construction after a site alteration permit has been obtained.

Table 7.14-2
Summary of Residual Adverse Environmental Effects: Archaeological and Heritage Resources

Project Phase (timing)	Residual Adverse Environmental Effect	Magnitude	Geographic Extent	Duration	Significance
Construction	Loss or disturbance of heritage resources	minor	development footprint	permanent	not significant
Operations	Disturbance or loss of heritage resources	minor	adjacent to facilities/ROWs	permanent	not significant
Closure	none expected	negligible	development footprint	permanent	not significant
Post-Closure	none expected	negligible	development footprint	permanent	not significant
Accidental Events	Disturbance or loss of heritage resources	minor	localized	permanent	not significant
The Project Overall	Loss or disturbance of heritage resources	minor	within or adjacent to development footprint	permanent	not significant

Systematic inventory for archaeological resources within the development footprint should reduce the probability for encountering unrecorded archaeological resources to a negligible rating. Inventory is still remaining to be completed for the proposed transmission line corridor and associated facilities, aerodrome, heliport and any borrow/quarry sources or stockpile areas that have not yet been identified. If additional archaeological sites are identified, then appropriate mitigation measures will be applied where necessary. The residual environmental effects of the construction phase on heritage resources within the areas examined thus far are considered not significant.

During the operations phase, indirect adverse effects are possible. Relocation of the access road right-of-way has already mitigated impact for the three sites recorded within the original right-of-way. The sites are no longer within the direct impact zone but are close enough that indirect effects are possible. These could include road maintenance activities such as snow stockpiling and removal, and people either inadvertently driving over sites or purposely visiting sites adjacent to the road. Such actions could also affect as-yet unrecorded sites outside of the development footprint that was assessed. Mitigation for these possible impacts can consist of identifying specific “no-go” zones around site areas and ensuring that all personnel, including road maintenance, are informed of these zones. It is important that specific site locations be kept confidential; therefore, the reasons for the zones to be avoided should not be divulged. Furthermore, orientation programs for all employees and site visitors should include appropriate education regarding the importance of leaving all archaeological resources in place as well as the penalties for contravention. Assuming such measures are implemented, the residual effects of the operations phase on archaeological resources would be considered not significant.

Residual effects on archaeological resources during closure and post-closure phases are considered negligible unless new borrow or quarry sources are needed or a larger area of surface disturbance is required during reclamation activities. In such cases, archaeological inventory will be necessary to ensure that no unrecorded archaeological resources are present in any areas not previously examined. Overall, the residual effects of the closure and post-closure phases on archaeological resources are considered not significant.

Accidental or unplanned events such as spills, rock slides and avalanches may affect areas adjacent to the development footprint that have not been assessed for archaeological resources. Immediate emergency actions may be required, and proper archaeological investigations may not be possible prior to such activities. Consequently, residual effects in such instances could be minor to moderate if emergency actions are necessary before mitigation can be applied. Development of communication and emergency archaeological response procedures, together with education of personnel, will help to reduce this possibility. With such procedures in place, residual effects of accidents or unplanned events are considered not significant.

7.15 Socio-Economic Effects Assessment

7.15.1 Introduction

This Socio-Economics Effects Assessment chapter is derived from the *Socio-Economic Impact Assessment* which can be found in full at Appendix 6-S. The Socio-Economic Impact Assessment was conducted and completed by Calibre Strategic Services. The impact assessment approach and methodology was developed by Rescan Environmental Services.

7.15.1.1 Effects Assessment Scope

Development and infrastructure associated with the Galore Creek Project will affect local communities, as well as key service centres from where employees and goods and services are sourced. The spatial boundaries of the effects assessment consists of a primary impact area, which includes the communities of Dease Lake, Iskut, Stewart and Telegraph Creek, and a secondary impact area, of Smithers and Terrace. A tertiary impact area, which represents the region, is also considered.

The Galore Creek Project will directly and indirectly impact on the study area communities. The key socio-economic issues, in terms of VECs, which are associated with the project were identified in Section 4.16. These VECs were derived from, and represent, the issues identified in the baseline study and community consultation (see Appendix 6-S). The key issues in each study community and the associated VECs are summarised below in Table 7.15-1.

Table 7.15-1
Geographical Distribution of VECs and Sub-component Issues

VECs	Dease Lake	Iskut	Telegraph	Stewart	Smithers, Terrace
Economic Development					
Community Growth	X			X	
Community Governance	X				
Traffic				X	
Population and Housing	X	X		X	X
Municipal Infrastructure	X	X		X	X
Port Facilities				X	
Employment Opportunities					
Awareness of Opportunities	X	X	X	X	X
Access to Employment	X	X	X	X	
Career Advancement	X	X	X	X	
Construction Contracts	X			X	X
Trucking Contracts	X			X	X
Port Service Contracts				X	
Direct Employment	X	X	X	X	X
Indirect Employment	X	X	X	X	X

(continued)

Table 7.15-1
Geographical Distribution of VECs and Sub-component Issues (completed)

VECs	Dease Lake	Iskut	Telegraph	Stewart	Smithers, Terrace
Employment Incomes					
Employment Incomes	X	X	X	X	X
Business Opportunities					
Awareness of Contracts	X	X	X	X	X
Access to Contracts	X	X	X	X	
Capacity Building	X	X	X		
Construction Contracts	X			X	X
Operations Contracts	X			X	X
Closure Contracts	X			X	X
Trucking Contracts	X			X	X
Port Facilities				X	
Community Health					
Community Health	X	X	X		
Work Rotations	X	X	X		
Drug/Alcohol Abuse	X	X	X		
Family Stress	X	X	X	X	
Housing	X	X	X		
Indices of Hardship	X				X
Education					
Pre-employment	X	X	X		
Skills Training	X	X	X		
Apprenticeships	X	X	X		
Capacity Building	X	X	X		
Cultural Strengthening/Tahltan Culture					
Facilities	X	X	X		
Traditional Activities	X	X	X		
Family	X	X	X		
Language	X	X	X		
Access of Employees to Cultural Events	X	X	X		
Cross-cultural Awareness	X	X	X		
Ceremonies	X	X	X		
Fishing and Hunting	X	X	X		
Recognition of Tahltan Names	X	X	X		
Communications					
Communications	X	X	X	X	X
Tahltan Communications	X	X	X		
Employment Opportunities	X	X	X	X	X
Contract Opportunities	X	X	X	X	X
Public Information	X	X	X	X	X
Traffic					
Traffic Volume, Noise				X	
Traffic Hazards				X	
Wilderness				X	

The Galore Creek mine components that may have an effect on an identified socio-economic VEC are identified below in Table 7.15-2. For socio-economics, the mine components were focused on those relating more closely to communities and human activities. The table helps identify any direct linkages between mine components and socio-economic VECs.

7.15.1.2 Methodology

This effects assessment follows the same approach and methodology described in Section 7.1.

The descriptor criteria definitions tailored for socio-economics are provided in Table 7.15-3.

In addition to these, two other criteria were considered to better reflect the complexity of the socio-economic environment. These are a) level of impact i.e. individual, family/household, community and region, and b) type of impact i.e. direct, indirect and induced.

In general, the measurement of socio-economic impacts has always struggled with quantification and attempts to be as objective as possible. Much of the measurement issue focuses on the inexorability of change and the human response to change. People's perceptions of change are affected by their interpretations of the desirability of change, the pace at which change occurs and the ability to respond or adapt to the change. These perceptions provide for personal interpretations of the effect of change that are subjective to the individual but potentially quantitative to the collective if there are sufficient numbers of similar individual responses to make a collective response.

Quantification in some cases, such as jobs, is readily achieved. In other cases, however, quantification is less readily attained and is more likely to produce meaningless results, or worse, to mask uncertainty or introduce certainty where none exists. Misleading conclusions arise particularly when straight line cause-effect relationships are imputed. An example might be the impact of a mine on substance abuse. The mine is unlikely to have any impact on substance abuse. The mine will, however, employ people whose individual decisions to use or not use substances may lead to substance abuse issues. Such indirect impacts cannot be realistically quantified; quantification is too distant from the original decision; quantification becomes speculation.

The assessment of socio-economic impact may best be approached by considering original decisions as creating outwardly expanding ripples, each of which impact people who make further decisions based on their experience.

Like economic impacts which are typically considered to be direct, indirect and induced; so are social impacts. Like direct economic impacts, direct social impacts may be more or less reliably quantified, but as we move to indirect and induced, quantification becomes less meaningful.

The presentation of quantifiable direct socio-economic impacts to less quantifiable or unquantifiable indirect and induced impacts might best be illustrated as decision trees. These decision trees also serve to illustrate the inter-relatedness and connectedness of issues, decisions and impacts that characterize the Tahltan wellness model and Health Canada's health impact assessment methodology.

Table 7.15-2
Potential Issues to Socio-Economic VECs from Mine Development Components

		Valued Socio-Economic Component															
		Employment and Economy				Capacity Building		Health			Tahltan Cultural			Land Use		Highway Infrastructure	
	Mine Component	Employment Opportunity	Business Opportunity	Employment incomes	Community Growth	Education, Training	Community Infrastructure	Occupational Health and Safety	Substance abuse	Family stress	Recognition of Tahltan Culture	Traditional Activities	Cross-cultural Sensitivities	Wilderness	Guiding, Outfitting	Highway 37/37A Truck Traffic	Truck traffic and noise in Stewart
A	Mine, Mill and Other Facilities (Unless otherwise noted Below)	X	X	X	X	X		X									
B	Access Road to Mine Site	X	X	X								X		X	X		
C	Transportation of Concentrate and supplies	X	X	X	X	X										X	X
D	Workplace Conditions					X		X			X	X	X				
E	Work Rotations		X	X			X		X	X							
F	Contracting Practices	X	X	X	X	X	X										

Table 7.15-3
Socio-Economic Descriptor Criteria Definitions

Timing (Start Time of Effect)	Duration (of Effect; how long will effect last?)	Direction	Magnitude	Geographic Extent	Frequency	Probability of Occurrence
Construction Phase: effect starts during pre-construction and/or construction phases **Operations Phase**: effect starts during mine operation phase **Decommissioning and Closure Phase**: effect starts in mine decommissioning phase **Post Closure Phase**: Effect is initiated after mine closure (e.g. loss of employment)	**Short Term**: < 1 year, to be defined in text **Medium Term**: 1-3 years (define in text) **Long Term**: lasts between 3-30 years **Far Future**: lasts more than 30 years	**Positive:** effect creates conditions that are more desirable for individuals/households/communities relative to baseline conditions **Neutral**: effect creates conditions for individuals/households/communities that are neither better or worse relative to baseline conditions **Adverse**: effect creates conditions that are less desirable for individuals/households/communities relative to baseline conditions	**Negligible**: no detectable change from baseline conditions **Low**: differs from the average value/condition for baseline conditions, but within the range of existing variation **Moderate**: differs from the average value/condition for baseline conditions, approaches the limits of existing variation **High**: predicted to differ from baseline conditions so that there will be a detectable change beyond the range of existing variation (i.e., change of state from baseline conditions)	**Primary:** effect is limited to the primary communities (Iskut, Dease Lake, Telegraph Creek and Stewart) **Secondary**: effect on primary study area and secondary communities (Smithers, Terrace) **Regional**: effect on NW BC **Transboundary**: effect extends beyond NW BC (i.e. rest of BC, other provinces, Alaska)	**One time**: effect is a one-off event confined to one discrete period in time during the life of the Project and potentially beyond the life span of the Project **Periodic**: effect occurs intermittently but repeatedly over the life span of the Project and potentially beyond the life span of the Project **Continuous**: effect occurs constantly during the life of the Project and potentially beyond the life span of the Project	**Nil**: an effect has no probability of occurring **Low**: an effect is unlikely but could occur **Moderate**: an effect is likely but may not occur **Unknown**: the likelihood of occurrence of an effect can not be predicted (not enough information or evidence) **High**: it is certain that an effect will occur (based on previous studies and experiences)

Cassiar Iskut-Stikine Land and Resource Management Plan

Employment impact ratios and multipliers[1]

In addition, to the descriptors above are those used for employment impact ratios and multipliers.

Direct employment impact refers to the number of persons employed at a facility. For example, an industrial plant may have 100 employees. That would be the direct employment.

Indirect employment or indirect ratios are entirely concerned with any additional employment generated in the community because of other spending associated with the direct employment. However, the plant may also make other local purchases which lead to related employment – e.g. they may purchase some supplies from local retail stores, they may consult with local accountants or lawyers, or they may contract with local tradesmen for special jobs which their employees are not trained to handle. All of these hired services generate indirect employment. Strictly speaking, of course, it is not the direct employees themselves that generate the indirect employment but the other non-wage spending by the industry employing the direct workers.

Induced employment or indirect plus induced ratios, in addition to the indirect employment (account for) some portion of the non-basic employment in the community to the income source generating the direct employment. Suppose, for example, that of the identified 1000 non-basic jobs in a given community, and that Industry X's share of the after-tax basic income is 20%. The model will then assign 20% of the 1000, or 200, non-basic jobs to Industry X, increasing the employment impact ratio accordingly.

The social safety net (specifically, transfer payments like employment insurance and income assistance) comes into the picture because when there are major changes in a community's industrial structure, estimation of the total impacts of those changes depends on how the income changes translate into changes in spending, because it is spending by local residents that supports the non-basic sector. In the case of a mill closure for example, if it is assumed that employment income drops to zero and it is not replaced with anything, then we have to assume that spending also drops to zero with a correspondingly drastic effect on the non-basic sector. However, if, as normally happens in the short-run at least, employment income is replaced by transfer payments then the effect is not nearly so dramatic. The Safety Net case may also be thought of as the No-Migration case where everyone stays put and waits to see what will happen next – this is the likely Short-Run scenario. The No-Safety Net case is comparable in reality to a scenario where everyone who loses their job moves away from the community to seek work elsewhere – from the community's perspective their income and spending have dropped to zero. The No-Safety Net case is also what is more likely to happen in the long run.

BC Stats has identified the following employment impact ratios (multipliers) that will be employed in this socio-economic impact assessment. These are:

1 (Horne, 2004)

Indirect Employment Ratios (Multipliers) for Mining	
Primary Impact Communities	
Stikine (incl. Dease Lake, Iskut, Telegraph Creek)	1.25
Stewart	1.22
Secondary Impact Communities	
Smithers	1.31
Terrace	1.30

Indirect Plus Induced Employment Ratios (Multipliers) for Mining		
	With Safety Net	**Without Safety Net**
Primary Impact Communities		
Stikine (incl. Dease Lake, Iskut, Telegraph Creek)	1.31	1.40
Stewart	1.27	1.34
Secondary Impact Communities		
Smithers	1.48	1.67
Terrace	1.41	1.58

7.15.1.3 Assessment Limits

Due to the size of the communities in the primary impact area, much of the socio-economic data available for Dease Lake, Iskut, Telegraph Creek and Stewart has been agglomerated and masks differences between the communities. Even at the agglomerated level, such as Local Health Areas, data is often unavailable for confidentiality reasons. Labour force data provided by the Skeena Native Development Society is one notable exception to this generalization.

Community specific data for Smithers and Terrace are more readily available. Populations are great enough to preserve confidentiality. Nevertheless, data on socio-economic indicators and indices are still agglomerated to Local Health Areas and care must be taken in interpreting such agglomerated data.

To augment interpretation of the data, the socio-economic effects assessment referred to NovaGold's community liaison and consultation program to provide guidance in the identification of issues to be addressed in the effects assessment. NovaGold has benefited from the establishment of effective communications channels and networks with the Tahltan Nation since 2003. Two structures involving the Tahltan, government and NovaGold have been very important in identifying and documenting socio-economic issues. These structures have been the:

- Tahltan Heritage Resource Environmental Assessment Team (THREAT), and the
- Socio-Economic Working Group comprising representatives of NovaGold, First Nations, and representatives of provincial and federal environmental assessment agencies.

7.15.2 Existing Conditions

The *Northwest BC Mining Projects, Socio Economic Impact Assessment* prepared for BC Ministry Of Small Business And Economic Development in 2005 (G.E. Bridges and Associates, 2005), documented a range of socio-economic issues confronting Dease Lake and Dease Lake Reserve 9, Iskut and Telegraph Creek. These ranged from drug and alcohol abuse, lack of employment opportunities, economic development and overcoming the boom and bust economic cycle, lack of education and skills development, lack of recreational opportunity, lack of some health services, and others.

Data and extensive community interviews further elaborate on these issues and suggest that there are similarities and differences between the communities. Details of the existing baseline conditions can be found in Appendix 6-S..

7.15.3 Likely Future Conditions: No Galore Creek Project

If NovaGold's proposed Galore Creek mine development were not to proceed, current conditions and circumstances will continue unchanged.

Current employment at the Eskay Creek mine will terminate in 2007, potentially leaving employees without employment and income. Similarly, many of the existing social issues that affect the study communities will continue to exist, for example, substance abuse, spousal and family violence, suicides, family stress, low education attainment, housing shortages, lack of recreational opportunities and others.

Furthermore, whether the Galore Creek project proceeds or not, other developments are likely to proceed in the study area, for example:

- Construction and development of the Red Chris mine by bcMetals ,
- Continuing exploration activity:
  - Coal bed methane (Shell Canada),
  - Mount Klappan project (Fortune Minerals Limited), and
  - Kutcho Creek project (Western Keltic Mines Inc.)

Of these activities, the Red Chris development is the closest to receiving all necessary certificates, licenses and permits but development is subject to a Provincial government decision on the construction of an electric power supply.

Other major developments may also have a bearing on northwestern BC. These include the construction of the:

- 30 inch Gateway pipeline by Enbridge Pipelines Inc. from Edmonton to salt water near Prince Rupert with construction possibly occurring in 2008 and operational by 2009/10 (Enbridge Pipelines, 2005),
- Kitimat LNG Terminal, with construction planned for completion in 2008 (Kitimat LNG Terminal, 2005), and

- Fairview Container Terminal at Prince Rupert, with construction of the first phase starting in 2005, and phase II construction in 2007 for completion by 2010 (Prince Rupert Port Authority, 2005).

These projects, singly and cumulatively, will have demographic, employment, business, infrastructural, lifestyle and other impacts on northwestern BC whether the Galore Creek project proceeds or not.

Demography

On the basis of Local Health Area population projections and recognizing the caution necessary in interpreting projections of small area populations, BC Stats projections suggest total population increases as presented in Table 7.15-4 below.

Table 7.15-4
Primary Impact Communities, Population Projections to 2030

Community	Baseline	Projected to:	
		2010	2030*
Dease Lake	318	364	447
Dease Lake Reserve 9	66	85	103
Iskut	309	373	545
Telegraph Creek	325	389	567
Stewart	775	846	911

*** BC Stats cautions the reader that projections of populations of small communities and areas are unreliable. BC Stats notes, for example, that such populations fluctuate considerably because of resource dependencies, limited economic diversification and boom-bust cycles.**

The Red Chris project, if it proceeds, is expected to replace employment provided by the Eskay Creek mine and hence is not expected to have a notable demographic impact upon primary impact communities.

The possible development of the Red Chris project, its proximity to Iskut and the prospects of being able to live at home and commute to work, however, may serve to attract Tahltan who have, for purposes of employment, moved to other locations. The return of such expatriates is not expected to be significant, at least in the short to intermediate futures, because of:

- The distance from the Red Chris site to Dease Lake, Dease Lake Reserve 9, Telegraph Creek,
- Unwillingness of Tahltan residents of Smithers, Terrace and other communities to give up the greater residential, commercial, educational, health, recreational, and other opportunities available in those communities, and
- Shortages of housing and developable land for housing in Dease Lake, Dease Lake Reserve 9, Iskut and Telegraph Creek.

While the possible development of the Red Chris project may, by itself, not serve to attract Tahltan or other residents to the primary impact area, the mine may serve to restrain out-migration from the communities.

Economy

The economies of the primary impact communities and the economy of the Tahltan Nation are currently highly dependant upon public service employment and mining, and to a lesser extent tourism. Opportunities for local residents are limited and help explain the out-migration of approximately 60% of the Tahltan population.

Local Tahltan communities – Dease Lake, Iskut and Telegraph Creek – have developed economies to serve local populations. The economies of Iskut and Telegraph Creek are oriented towards the provision of residential and public services. Dease Lake possesses a range of commercial and industrial services to serve local requirements. The Dease Lake economy, however, is restrained by a small population such that many goods and services are provided from Terrace. The Dease Lake, Iskut and Telegraph Creek populations regularly and routinely travel to Terrace for consumer goods, building supplies, vehicle purchase, maintenance and repair, medical and dental services, business services and other goods and services. Similarly, local businesses acquire their supplies from Terrace suppliers. As a consequence, economic leakage from employment and business revenues is great. Indirect and induced impacts from economic activity is minimal beyond expenditures on accommodation, food, fuel and entertainment.

The Stewart economy is similarly restrained by its size. Although comprising larger tourism and industrial bases than the Tahltan communities, economic leakage from the Stewart economy is similarly great and indirect and induced impacts from economic activity are constrained by a small market.

In the absence of the Galore Creek project, the economies of communities in the primary impact area are expected to remain much as they are. Closure of the Eskay Creek mine may be substantially replaced by the opening of the Red Chris project, if it proceeds, but the replacement of one mine with another is not expected to have a notable impact on local economies.

The absence of Galore Creek also represents foregone opportunity and restrains the Tahltan objective of developing more sustainability into their communities. Galore Creek, as a second mine, presents the opportunity for local communities to build upon current levels of economic activity to generate a more sustainable economy through more secure and diversified employment, incomes and business opportunities. Galore Creek also presents the Tahltan with the opportunity to capitalize on impending labour shortages to advance skills training, apprenticeships and career development.

Employment

Mining has been a historic staple of employment both for the Tahltan and for the Stewart populations and fluctuations in mining activity have resulted in boom and bust cycles of economic activity. Currently Barrick Gold Corporation's Eskay Creek mine is the only

operating mine in the study area. Eskay Creek and its contractors have employed approximately 98 Tahltan members of whom approximately 70 reside in the communities of Dease Lake, Iskut and Telegraph Creek. Eskay Creek has also operated during a period which has experienced historic lows in exploration activity and investment. A resurgence of mining activity has resulted from an increase in ore prices and from the sale of mineral claims to new operating companies. The Red Chris development by bcMetals is the first of several developments being actively pursued.

If it were to proceed, the Red Chris development could substantially replace the employment and economic impact generated by Eskay Creek. Red Chris could potentially absorb the approximately 70 Eskay Creek employees resident at Dease Lake, Iskut and Telegraph Creek and these individuals would likely commute to the mine site.

In the absence of the Galore Creek project, employment in the mining sector will remain as it has been over the late 1990s through to 2007. It is likely, however, that logistics will preclude the six to ten residents of Stewart, now employed at Eskay Creek, from gaining employment at Red Chris. The District of Stewart may experience a decline in mining employment.

Northwestern BC will continue to rely on the economic use of mining, forestry, and environmental/scenery (tourism) resources for wealth and employment generation for the foreseeable future. Regional variations of this scenario will continue, with forestry and tourism contributing more to the local economy of Stewart than to the communities of Dease Lake, Iskut and Telegraph Creek. The resource based economy and particular reliance on mining has subjected the region to boom-bust economies, but major cyclical fluctuations in particular industries will continue to occur as markets, prices, exchange rates, technology and other factors affect resource production. The distance of the region from large markets suggests that further development of secondary and tertiary forms of economic activity will be a slow and long-term process.

With the exception of Terrace, larger communities sited adjacent to Highway 16 – Prince George, Smithers, Kitimat and Prince Rupert – have experienced demographic and economic growth in recent years. Terrace, Kitimat and Prince Rupert will benefit from the upcoming pipeline, gas storage and container port developments and the re-opening of forest products establishments. These developments will reduce unemployment and dependency on income assistance programs, enhance incomes, and generally provide an uplift to an economy which has been somewhat depressed. Smithers' economic base, more service oriented than those of Terrace, Kitimat or Prince Rupert, will continue to grow with local investments in tourism, and as Smithers expands its role as a mine service centre for northern BC.

Foregone Employment Income

The absence of the Galore Creek mine will represent for each year of operation foregone direct and indirect income to primary and secondary impact communities of approximately $44,130,000 in current dollars (Table 7.15-5).

Table 7.15-5
Estimated Annual Foregone Income (No Project)

Dease Lake, Dease Lake Reserve 9	$4,650,000
Iskut	$6,800,000
Telegraph Creek	$6,800,000
Stewart	$7,200,000
Secondary Impact Communities of Smithers, Terrace	$18,680,000
Total Primary and Secondary Impact Communities	**$44,130,000**

The absence of this income may be partly compensated for by the construction and opening of the Red Chris Mine if it were to be developed.

Nevertheless, not proceeding with the Galore Creek project will represent a reduction in employment opportunity and therefore income. This reduction in income may lead, in the absence of alternatives, to continued out-migration and/or to an increased need for income assistance programs.

Regional Unemployment

While Stats Canada 2001 data indicate unemployment rates in the primary impact area are somewhat higher than provincial averages, more recent anecdotal evidence in 2005 suggests that unemployment rates have declined because of employment in mining exploration, environmental, contract services, and construction.

Current unemployment may be exacerbated by the closure of the Eskay Creek mine in 2007, but alleviated by the possible opening of the Red Chris Mine in the same year. People with experience and skills appropriate to the mining industry appear to be available but are in short supply in the region.

Projected Shortages of Skilled Labour

Without the Galore Creek Project, projected shortages of skilled construction and operating labour may still occur unless stakeholders take steps to prevent future shortages either from occurring or from getting worse.

Impending shortages of labour, skilled and unskilled, have arisen from a multitude of considerations including an aging population, rapidly increasing numbers of retirees combined with, low numbers of people entering the labour market, attitudes towards trades and technical occupations and employment, and the national, provincial and local competing demands for labour.

In BC, some of these shortages will occur because of the level of construction occurring in the Lower Mainland in preparation for the 2010 Winter Olympic Games.

While public and private sector organizations often project skill shortages into the second decade of the 21st century, there is considerable debate as to the magnitude of the issue, the extent to which shortages fluctuate between regions, and which occupations are likely to be impacted the greatest. There does appear, however, to be something of a consensus on a small number of macro issues including:

- The most notable shortage of skilled labour will be in construction trades and technology industries;
- Labour shortages will be the greatest where skill levels are the greatest;
- Skilled labour will be drawn to the Lower Mainland and to the Okanagan because of demand and the probable willingness of employers to pay higher wages to attract employees;
- Current initiatives to address shortages of skilled construction and trades occupations may alleviate labour shortages in these areas by 2010.

Regardless of initiatives to increase the number of skilled trades and construction personnel in the near future, construction of Galore Creek between 2007 and 2010 is likely to be impacted by the large demand for skilled labour occasioned by construction associated with the 2010 Winter Olympics. The demand for skilled labour will likely translate into upward pressure on wages, salaries and benefits across the construction and trades industries across the province, including northwestern BC.

After 2010, the demand for skilled construction and trades labour will have abated, but the demand for skilled labour from other developments – in northwestern BC, the Prince Rupert container port, LNG facility, other mine developments – may serve to prolong demand/supply imbalances.

The BC Ministry of Economic Development has researched potential future skill shortages for numerous occupations including those in the mining industry (J. Mansfield, *pers. comm.*). Accounting for withdrawals from the labour force because of an aging population, and entry from educational institutions, apprenticeships, immigration, and people leaving provincial income assistance, the supply and demand balance for occupations in the mining industry revealed the following occupations under significant pressure (Table 7.15-6).

A similar list of shortages has been identified by the Mining Industry Training and Adjustment Council (MITAC) (MITAC, 2005).

The potential shortfalls in labourers skilled in mining and related occupations may occur whether or not the Galore Creek project proceeds. The objective of forecasting labour requirements is to highlight needs in advance of the event and to encourage stakeholders to adopt measures to prevent or minimize the shortage.

Table 7.15-6
Mining Related Occupations With Demand Likely to Exceed Supply

Sr Managers - Goods Production, Utilities, Transportation And Construction
Human Resources Managers
Facility Operation and Maintenance Managers
Primary Production Managers (Except Agriculture)
Financial And Investment Analysts
Executive Assistants
Purchasing Agents And Officers
Storekeepers And Parts Clerks
Dispatchers And Radio Operators
Geological And Mineral Technologists And Technicians
Industrial Instrument Technicians And Mechanics
Engineering Inspectors And Regulatory Officers
Ambulance Attendants And Other Paramedical Occupations
Contractors & Supervisors, Electrical Trades & Telecommunications Occupations
Contractors And Supervisors, Mechanic Trades
Contractors And Supervisors, Heavy Construction Equipment Crews
Steamfitters, Pipefitters And Sprinkler System Installers
Industrial Electricians
Stationary Engineers And Auxiliary Equipment Operators
Machinists And Machining And Tooling Inspectors
Ironworkers
Welders
Construction Millwrights And Industrial Mechanics
Heavy-Duty Equipment Mechanics
Heavy Equipment Operators (Except Crane)
Public Works Maintenance Equipment Operators
Truck Drivers
Railway Conductors And Brakemen/Women
Supervisors, Landscape And Horticulture
Supervisors, Mining And Quarrying
Underground Production And Development Miners
Underground Mine Service And Support Workers
Logging Machinery Operators
Mine Labourers
Supervisors, Mineral And Metal Processing
Supervisors, Petroleum, Gas And Chemical Processing And Utilities
Machine Operators, Mineral And Metal Processing
Concrete, Clay And Stone Forming Operators
Water And Waste Plant Operators
Machining Tool Operators
Labourers In Mineral And Metal Processing

The projection of skilled labour shortages ten or twenty years into the future is speculative. The best that can be realized is an understanding of actual and potential issues, what is being done to address them and to posit possible or probable scenarios that increase levels of awareness on the part of stakeholders so that they may be able to respond quickly and effectively to prevent or otherwise address shortages. These stakeholders include the mining industry, First Nations, government and organizations such as the BC Industry Training Authority.

Impending labour shortages provide significant opportunity for First Nation populations to capture employment opportunities which may not otherwise have existed.

Continued Development of the Tourism Industry

Continuing promotion of the tourism attributes of northwestern BC, and the increasing match between product and market suggest continued growth of the tourism industry in northwestern BC generally and around Stewart in particular. This may lead to additional investment, and additional employment opportunities.

Nevertheless, growth of the tourism industry in northwestern BC will be slow and remains one of potential.

Tourism in northwestern BC is largely road based with tourism along the Highway 37 corridor attracting visitors from Canada, the United States and overseas. Travellers choose the route as a destination or are en route to and from Alaska and the Yukon.

The Cassiar area is considered to have some of the best big game hunting in North America. There are 11 guide outfitters operating in the Cassiar-Stikine LRMP area and several just outside of it. Their industry depends on conservation of populations of sheep, mountain goats, caribou, bear and moose, and on the maintenance of intact wilderness (Rescan, 2005a). Equally important, tourism depends upon perceptions of wilderness and a small number of high income earners for sustainability.

Other than Stewart, the viability of the tourism sector in northwestern BC is questionable. The two guiding and outfitting establishments in the Galore Creek study area are available for sale; as is the one business operating adventure tours on the Stikine River.

The demand for wilderness tourism may increase, but the lack of travel infrastructure will restrain growth of the touring market. Seasonality and part-time employment may be expected to characterize the industry along Highway 37 for some years.

Unlike Highway 37 communities, tourism at Stewart is more diversified. Summer touring traffic is combined with a strong winter component. Over much of the 2000s tourist registrations at the Stewart-Hyder International Chamber of Commerce Tourist Information Office have fluctuated around 10,000. Even recognizing that at least 10% of the tourists do not visit the information centre (Red Chris Development Co. Ltd., 2004), registration data do not show recent growth in tourist numbers. While the Northwest Tourism region is taking an active role in promoting tourism in northwestern BC, Stewart is more likely to benefit from promotion than are Highway 37 communities.

Community Sustainability

The Tahltan Nation recognizes the potential of mining development as a tool for the advancement of community sustainability. Sustainability is a major theme in the Tahltan's approach to mining as expressed in "*Out of Respect*" (Tahltan First Nation and the International Institute for Sustainable Development, 2003). The document states that mining, if properly undertaken, offers opportunity for the Tahltan to acquire greater control over their destiny and provides a tool through which, and upon which, a broad range of socio-economic issues could begin to be addressed.

Recognizing the level of economic opportunities currently available in northwestern BC, the absence of the Galore Creek Project may restrains the Tahltan drive towards sustainability.

7.15.4 Socio-Economic Impacts on the Primary Impact Area

7.15.4.1 An Overview

In July 2005 an overview assessment of socio-economic impacts associated with prospective mine developments in northwestern BC was published (G.E. Bridges and Associates, 2005). Serving as a socio-economic baseline, the report concluded that:

- Most of the social concerns related to the new developments in the most effected communities, exist presently and in general, are not specific to mining development. Rather they are characteristic of economic development problems experienced in many communities in the North. Nevertheless, in spite of the uncertainties and limitation noted above, some firm conclusions are evident, and would remain valid over a wide range of alternative project configurations.
- In the absence of new mining development, Highway 37 communities will be severely impacted in terms of lost mining jobs, lost trucking jobs and reduced port-shipping business, leading to population declines (e.g. Stewart). Stewart Bulk Terminals will lose Eskay Creek and Huckleberry's shipping business, presently their main customers – Eskay Creek closing will put about 100 Tahltan people out of work.
- With respect to mine development impacts, communities along the Highway 16 corridor that would likely be affected by the mines, have adequate capacity to address the incremental needs. The region is recovering from the economic downturn of the 1990's and has excess capacity with respect to social service infrastructure. Also, the respective communities are incorporated, providing them a framework and capacity to plan for, finance and deliver services that might be required, and to meet the incremental growth from the new mine development.
- It is reported that the Iskut and Tahltan communities are having difficulty coping with the problems that bear some association with existing mine operations. There is evidence to suggest (e.g. mortality data) that existing education, social and health programs and capacities are not adequate to meet present demands. The closure of Eskay mine, and the opening of one or more of the proposed mines, may increase the stress on the present communities. Either future poses challenges to these vulnerable communities.

- The potential socio-economic impacts of a large, long lived mine, such as Galore Creek (e.g. 2010 to 2030), could provide stable employment, training and apprenticeship openings, and business supplier opportunities that would provide economic stability to a region that is otherwise prone to shorter-term 'boom to bust' cycles.
- The Tahltan and Iskut communities are small and their ability to participate in the mines is limited. Hence, the effect of one mine proceeding may be significant, while the impact of a second or third mine proceeding would be less so. Nevertheless, for the community of Iskut, the Red Chris Mine poses the more significant range of challenges because of its proximity.

Table 7.15-7
Summary of Mining Development Impacts
(derived from G.E. Bridges and Associates, 2005)

New Mine Developments (General)	
Positive Aspects	**Negative Aspects**
Highway 16 Based on the opinions of the interviewees, all would like to see mining projects proceed. Region needs economic development and to retain (and expand) its skilled labour force and population. As a result of declining populations since the late 1990's most communities have excess capacity in schools, hospitals. In some cases, may need some expansion of staff for service delivery (not identified). **Highway 37** Stewart has ample capacity in physical infrastructure, housing stock and developable land (likely truckers hauling from the new mines would live in Stewart). Mining developments may increase population of Dease Lake near previous level in the 1990's and increase general prosperity of the region. Some optimism that more Tahltans may return to their traditional territory. Need training for local population to take full advantage of operating employment opportunities. Opportunity for region and population to participate in real economic development.	**Highway 16** No major issues reported. **Highway 37** With the exception of Stewart, small regional population results in corresponding sized capacity in infrastructure and social service delivery. Small increments to population can lead to noticeable reduction in service, or conversely need to add capacity education, health and housing. Reported that the higher incomes from the mining developments will exacerbate existing drug and alcohol related social and community problems. Camp takes members from community and when they return after 2 weeks they are ready to 'bust out'. For those living in the community it's described as a non-stop party, which is expected to get worse. Reported that Iskut and Tahltan Band health resources are unable to cope with additional population, given resources are at capacity currently. Reported that mines are not contributing to Band programs to ameliorate social problems. While many Tahltan's participate in the modern consumer economy, mining development will contribute to the 'erosion' of Tahltan's traditional way of life and culture. Reported that the fly in/fly out camps facilitate drugs coming from outside communities (view not substantiated, may have been more apparent with Golden Bear, current sources of drugs not identified.

(continued)

Table 7.15-7
Summary of Mining Development Impacts
(derived from G.E. Bridges and Associates, 2005) (completed)

New Mine Developments (General)	
Positive Aspects	**Negative Aspects**
Red Chris	
Highway 37 Although not mentioned in the interviews, the proximity of Red Chris may allow residents to commute to the mine eliminating the 2-week camp rotations for Iskut First Nation members. Similar to Eskay in terms of Tahltan participation, Red Chris would neatly fill employment gap left by the pending closing of Eskay Creek.	**Highway 37** Concern that the mine is too close to Iskut and will overwhelm the community. Examples cited include Cassiar/ Good Hope Lake, Faro/Ross River (note that the mechanism for overwhelming may also be noted so this concern is double counted. Also, there are probably examples where the experience has been positive, but no one cited these examples). Reported concern is the intermingling (e.g. inter-marriage) of Iskut First Nation members with non-Indian status mine workers could lead to loss of Indian Status within a couple of generations. Non-native workers could set up seasonal homes around lakes in areas, as there is private land, and commute to work. Tahltan's could become a minority in their traditional territory. Health issues: dust from Red Chris would affect many Iskut community members who suffer from asthma – noise from mine also mentioned as an issue.

7.15.4.2 Socio-Economic Impacts on Dease Lake

Overall Community Economic Development Impacts

Economic development is generally perceived by many Dease Lake and Dease Lake Reserve 9 residents as one of the primary benefits of construction and operation of the Galore Creek project. Employment and business opportunities are perceived as ways and means of enhancing community sustainability, The 20 year life of the Galore Creek project is also seen as a building block - providing the time required to develop the capacity to take advantage of opportunities and to develop complementary, supportive and alternative sources of employment and livelihood.

Population Growth

BC Stats projections of population growth at Dease Lake and Dease Lake Reserve 9 suggest population growth to 449 persons in 2010 and 550 in 2030. Some in the community believe that the Galore Creek project will encourage some of the 60% of Tahltan people who live outside the area to return.

The Galore Creek Project may discourage out-migration by offering employment to those who otherwise would relocate to communities outside the primary impact area. Development of the Red Chris Mine, if it were to proceed, together with the construction and operation of Galore Creek introduces the likelihood that Dease Lake will experience a labour shortage. Such a shortage further introduces the possibility that non-resident Tahltan will return.

Should it occur, the return of Tahltan to the community is less likely to happen during the construction phase because of the short term nature of construction employment, and is more likely to occur during the operations phase when employment is more secure. As closure approaches, relocation to Dease Lake will become increasingly unattractive if alternative sources of employment are not available.

The probabilities of the return of Tahltan expatriates to Dease Lake are considered to be low. Some who have close family ties and who may live with parents or relatives may return but the shortage of housing and the general lack of community infrastructure and services will serve to discourage large-scale and early return. The experience of Eskay Creek, for example, suggests that Tahltan employees resident in Terrace or Hazelton or Smithers or other communities will commute to the minesite and not relocate back to Dease Lake.

The return of Tahltan to Dease Lake will generate a demand for housing. Approximately 15 housing lots are available for development either within the townsite or within the subdivision. Opportunity for the construction of new houses within the townsite is limited because of the frequency of existing residents to have double lots and because of the location of septic fields. Any significant increase in the Dease Lake population is likely to generate pressure to install piped water service.

Other possibilities for economic growth may arise from opportunities to provide goods and services to NovaGold. Local firms such as the TNDC and Spatsizi Remote Services already provide contract services to Eskay Creek and may build upon that experience to provide services to Galore Creek as well as to Red Chris. Companies such as Spatsizi Remote Services may expand employment and companies such as TNDC may expand the provision of construction services. But the ability of companies to expand into related businesses or to create new services is restrained by capacity, by the lack of available commercial/industrial land, and by the lack of both physical and human resources infrastructure.

Community growth is likely to occur slowly and primarily through internal population growth and restrained out-migration. Some in-migration may occur after operations begin (2010) but in-migration is likely to be minimal.

Community Governance

Dease Lake is an unorganized community governed in accordance with the *Local Services Act*. Dease Lake community as described does not include Dease Lake Reserve 9. Local decision making is very limited. The ability of the Dease Lake community to benefit from residential and business opportunities arising from both the Red Chris and the Galore Creek projects would be substantially improved if Dease Lake had greater local decision making authority. Until Dease Lake is able to respond more speedily with land development, building and construction, and

infrastructure construction and improvements, the community may not be able to fully capitalize on potential economic development opportunities.

Construction and operation of the Galore Creek project will affect overall economic development at Dease Lake through community growth and governance. Impacts on community growth will be positive and, because of the size of the community, are expected to be moderate to high. The impact of closure will be major.

Table 7.15-8
VEC, Overall Economic Development Impacts, Dease Lake

Component	Timing	Duration	Direction	Probability	Magnitude Of Impact
Community Growth					
Return of Tahltan expatriates	Construction	Short Term	Neutral to Positive	Nil to Low	Negligible
	Operation	Medium Term	Neutral to Positive	Low-Moderate	Low-Moderate
	Closure	Long Term	Adverse	High	Negligible
Governance					
Adoption of local governance structure	Construction	Short Term	Neutral to Positive	Low	Negligible
	Operation	Medium Term	Positive	Moderate	Moderate

Addressing the Dease Lake governance issues is likely to speed up with construction, but the time required to implement local governance suggests that it will not occur until the mine is operating. Once a local degree of governance is achieved it will be independent of the mine and will not be affected by eventual mine closure.

Employment Impacts

In 2005, NovaGold employed 15 residents of Dease Lake in various exploration related activities associated with the Galore Creek Project. In addition, NovaGold contractors employed approximately 31 First Nation employees, most of were from Dease Lake. Some of these 46 positions were seasonal but many of the employees have expressed a willingness to continue employment with NovaGold (Munzert, *pers. comm.*, 2006). In addition to employment with NovaGold, another 20 Dease Lake residents are employed at Eskay Creek. In spite of the seasonality of some employment, the absence of provincial income assistance files at Dease Lake suggests that most of the Dease Lake labour force was able to find employment in 2005.

Construction from 2006 through 2007 of the Red Chris Mine may, if development of the mine proceeds, employ many of the 46 Dease Lake residents that have been seasonally employed by NovaGold. With operation of the Red Chris Mine scheduled to begin in 2007, many if not all of the 20 persons currently employed by Eskay Creek may be expected to acquire employment at

Red Chris. Some of the seasonally employed by NovaGold may also acquire more permanent employment at Red Chris.

Assuming that construction of the Red Chris project begins as planned, construction of Galore Creek from 2007 through 2010 may be expected to lead to a competitive market in Dease Lake for mining and mine related employment.

Construction beginning in 2007 of the Galore Creek mine will be primarily undertaken by contractors. Galore Creek construction is expected to occur year-round from 2007 through 2010. Assuming that NovaGold's seasonal employees and contractors from Dease Lake in 2005 continue with employment, approximately 46 Dease Lake residents will be employed during construction of the Galore Creek project. This number may increase somewhat as production declines at Eskay Creek, but the potential construction of the Red Chris Mine during the same period would introduce a competition for labour that will act against much of an increase. It is anticipated that the same circumstances will apply to contractor personnel.

If the Red Chris mine were not to proceed, the Galore Creek mine operation may employ 40 Dease Lake residents. If the Red Chris mine did proceed, an estimated 20 residents of Dease Lake could be employed at Galore Creek during the operation phase. The impact of employment of this number of people in a small community will be major.

NovaGold anticipates employing as many local residents as possible and recognizes that this achievement will address five issues: awareness of employment opportunities; access to employment; skills training; apprenticeships; and, career advancement. These are all components of the Employment and Education VEC (Table 7.15-9).

Overall impact on employment will be positive until mine closure when termination of employment will create an adverse impact on individuals and the community. Employment will have a major impact on individuals and the community.

Income Impacts[2]

Employment, both during construction and operations, offers the prospect of long-term sustainable employment for employees. Incomes to persons will be substantial and in many cases tax free.

As much as these incomes will permit employees to acquire a range of goods and services, some employees will spend their incomes inappropriately. Substance abuse is a broadly-based concern and increased employment generating good and reliable incomes may worsen the problem. Family violence is a related concern. Family stress arises from the amount of money spent on drugs and alcohol at the expense of rent and mortgage payments, utilities, vehicles and other goods and services. There is an often mentioned concern that too many employees will not have the skills to manage their incomes successfully.

[2] All incomes data and projections are based upon current 2006 dollar values, not adjusted for inflation.

Table 7.15-9
VEC, Employment Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Employment					
Jobs	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
	Post Closure	Far Future	Positive	High	Low
Awareness of Opportunity					
Notification; Posting; First Choice	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible
Access to Employment					
Qualifications; Essential Skills Evaluation; Preferential Hiring; Pre-Employment Training	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Skills Training					
On-the-Job Training	Construction	Short Term	Positive	High	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
Apprenticeships					
Apprenticeship Qualification, Training; Papers; Transferability and Mobility	Construction	Short Term	Positive	Low	Negligible
	Operation	Medium Term	Positive	High	Moderate
	Closure	Long Term	Adverse	High	Negligible
Career Advancement					
Skills Training and Enhancement; Career Pathing	Construction	Short, Term	Positive	Low	Negligible
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible

If the Red Chris Mine were not to proceed, a larger number of residents of Dease Lake and Dease Lake Reserve 9 will be available for employment at Galore Creek, The discussion below describes potential Galore Creek employment and income impacts if Galore Creek were the only mine to be developed.

Incomes from Construction

The annual income impact of construction through the year-round employment of 46 Dease Lake residents by contractors from 2007 through 2010 at an assumed 2005 average annual wage of $60,000[3] approximates:

46 persons x $60,000 = $2,760,000

Direct incomes from construction are based on 2005 data and may approximate $2,760,000 for each of the three years. Wages paid for construction labour between 2007 and 2010 will likely increase because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction personnel. Spatzisi Remote Services, for example, may provide camp and catering services. Contractors such as Spatzisi and TNDC, who provide goods and services to Galore Creek, may be expected to earn incomes, measured in 2005 dollars, from $25,000 (Spatsizi Remote Services employees) to $80,000 (equipment operators) or a median of approximately $50,000.

Assuming BC Stats employment multiplier of 1.25, indirect employment may amount to:

(multiplier) 46 x .25 = 11.5 persons

Indirect incomes generated through contractor employment may then approximate:

(multiplier) 11.5 persons x $50,000= $575,000

NovaGold's use of local businesses, such as Spatsizi Remote Services, suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Dease Lake residents could reach 35 persons by Spatsizi Remote Services alone, with the remaining employees coming from Iskut and Telegraph Creek. Added to other indirect employment, it is possible that total indirect employment of Dease Lake residents could reach 45 persons.

Under these circumstances, total indirect construction employment incomes to Dease Lake residents could reach $2,250,000 for each of the three years of construction:

45 persons x $50,000= $2,250,000

*Induced employment impacts***:** While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from construction may not be sufficient to generate further local downstream impacts on employment and incomes.

[3] Lower average incomes account for lower wages paid to employees of service companies such as Spatsizi.

Induced employment at a multiplier of 1.31 may be expected to generate four additional jobs elsewhere in the community with incomes totalling $120,000 from private sector service employers.

Incomes from Operational Employment

The annual direct income impact of operating mine employment through the full time employment of 40 Dease Lake residents by NovaGold from 2010 through 2030 at an assumed average annual wage of $80,000 approximates:

40 persons x $80,000 = $3,200,000

Indirect impacts from this employment income are expected to focus on the provision of goods and services to operations personnel. Assuming 40 direct employees and BC Stats multiplier of 1.25, total indirect employment may amount to:

(multiplier) 40 x .25 = 10 persons

Spatzisi Remote Services, for example, may provide camp and catering services. Contractors may be expected to earn a median of approximately $50,000. Indirect incomes generated through contractor employment may then approximate $500,000 annually:

(multiplier) 10 persons x $50,000 = $500,000

NovaGold's use of local businesses, such as Spatsizi Remote Services, suggests that indirect employment at Galore Creek may be greater than what the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Dease Lake residents could reach 35 persons by Spatsizi Remote Services alone. Added to other indirect employment, it is possible that total indirect employment could reach 45 persons.

Under these circumstances, total indirect employment incomes to Dease Lake residents could reach $2,250,000 annually for each of 20 operating years:

45 persons x $50,000 = $2,250,000

Spatsizi Remote Services experience suggests that approximately 60% of employees will be women.

Incomes are based on 2005 data. Wages paid for contractor employment after 2010 may increase to new base levels because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

*Induced employment impacts***:** Induced employment at a multiplier of 1.31 may generate 2.4 additional jobs elsewhere in the community. In Dease Lake, these positions are likely to be in the private sector in service positions.

40 persons x 1.31 – 1.25[4] = 2 persons

Induced incomes may approximate $70,000.

Incomes upon Closure

Closure of the Galore Creek mine will involve the termination of employment and the cessation of incomes to most of the 85 direct and indirect employees. Cessation of employment will lead to the termination of as much as $5,450,000 of direct and indirect employment income to Dease Lake and Dease Lake Reserve nine employees per annum.

Environmental monitoring of the closed mine will involve the continued seasonal part-time employment of one to five local residents who will be reimbursed at 2030 wage levels. The incomes generated from such employment may range from $50,000 to $100,000 per year if all employees resided in Dease Lake or Dease Lake Reserve 9. Assuming two of these persons lived in the community, annual income may total approximately $50,000.

In the absence of alternative sources of employment, closure of the mine will involve major dislocation of local employees.

Summary of Impacts without Red Chris Mine

Employment and income impacts of the Galore Creek project proceeding without the concurrent development of the Red Chris Mine are presented below in Table 7.15-10.

Table 7.15-10
Dease Lake and Dease Lake Reserve 9, Employment and Income: Galore Creek Proceeding without Red Chris Mine

Construction	Employment	Incomes
Direct	46	$3,680,000
Indirect	45	$2,250,000
Induced	4	$120,000
Operations		
Direct	40	$3,200,000
Indirect	45	$2,250,000
Induced	2	$70,000
Closure	1-5 part-time, seasonal	$50,000 - $100,000

With Red Chris

If the Red Chris Mine proceeds according to plan, two mines in the primary study area will offer employment. Recognizing the sizes of the communities in the primary study area, two mines will introduce labour force competition. Assuming that the Red Chris Mine employs a significant number of Dease Lake and Dease Lake Reserve 9 residents, it is possible that the number of

[4] Induced employment multiplier minus indirect employment multiplier.

residents employed directly at Galore Creek may be less and approximate 20. The discussion below describes potential Galore Creek employment and income impacts if both Red Chris and Galore Creek mines were developed (Table 7.15-11). The number of indirect employees would similarly decrease to approximately 25-30.

The same multipliers apply as if Galore Creek proceeded without Red Chris.

Table 7.15-11
Dease Lake and Dease Lake Reserve 9, Employment and Income: Galore Creek Proceeding with Red Chris Mine

Construction	Employment	Incomes
Direct	20	$1,600,000
Indirect	25-30	$1,250,000 to $1,500,000
Induced	1	$35,000
Operations		
Direct	20	$1,600,000
Indirect	25-30	$1,250,000 to $1,500,000
Induced	1	$35,000
Closure	1-5 Part time, seasonal	$50,000

Table 7.15-12 considers the income impacts for the Dease Lake communities.

Business Development Impacts

While Dease Lake has a small number of commercial enterprises, the construction and operation of the Galore Creek project represents opportunity for Dease Lake businesses to acquire contracts to provide goods and services to NovaGold. Important potential contractors are TNDC, Spatsizi Remote Services, Rescan/RTEC and other local contractors who already provide services to Galore Creek.

Other Dease Lake individuals and businesses may also provide services, particularly construction services, on an ad-hoc basis.

During the operation phase, as much as $8,000,000 annually in contracts may be awarded to local firms. Most of the firms will be located in Dease Lake. Contract opportunities will extend from construction through post closure phases of mine development and will contribute significantly to indirect employment and employment incomes to Dease Lake residents.

NovaGold will establish practices with local contractors relating to the notification of upcoming contracts, access to contracts through bidding assistance, bonding waivers, and other practices.

Table 7.15-12
VEC, Income Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Incomes					
Employment Incomes	Construction	Short Term	Positive	High	Major
	Operation	Medium Term	Positive	High	Major
	Closure	Long Term	Adverse	High	Major
Inappropriate Spending					
Substance Abuse; Money Management	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Family Stress					
Inappropriate Spending of Incomes; Money Management; Substance Abuse; Spousal violence	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Indirect Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	High	Minor
	Operation	Medium Term	Positive	High	Minor
	Closure	Long Term	Adverse	High	Major
Indirect and Induced Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	Low	Minor
	Operation	Medium Term	Positive	High	Minor
	Closure	Long Term	Adverse	High	Major

Due to the small number of commercial enterprises in Dease Lake, the overall magnitude of business development impacts on Dease Lake will be major because of the indirect effect of such contracts on local employment and incomes, enhanced business experience and capacity building, attitudes towards work, and the opportunity for contractors to build, expand and generate community sustainability (Table 7.15-13).

Health Impacts

The physical, mental and social dimensions of health are inter-twined with economic issues of development, employment and income. Healthy individuals are a prerequisite for healthy communities. Whilst the Galore Creek Project contributes to health by offering economic development and associated benefits, there are also concerns regarding the effects of mine activities such as fly-in/fly-out work rotations and high levels of income where money management skills may not be as evident.

Identifiable health issues, most notably substance abuse and related spousal and family violence, existed in Dease Lake before NovaGold arrived. Nevertheless, documentation of health impacts associated with the Galore Creek Project gives recognition to the issues, illustrates the relationship to employment and incomes, and highlights the negative side of employment and

incomes in an environment where incomes confront few alternative employment prospects, few recreational opportunities, peer pressure, and limited faith in the future.

Table 7.15-13
VEC, Business Development Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Awareness of Contracts					
Notification;	Construction	Short Term	Positive	High	Major
Postings;	Operation	Medium Term	Positive	High	Major
First Choice.	Closure	Long Term	Adverse	High	Major
Access to Contracts					
Limited Number of Enterprises;	Construction	Short Term	Positive	High	Major
	Operation	Medium Term	Positive	High	Major
Qualifications;	Closure	Long Term	Adverse	High	Major
Opportunity for First Refusal;					
Contract Administration and Management					
Indirect Employment;	Construction	Short Term	Positive	High	Major
	Operation	Medium Term	Positive	High	Major
Employment Incomes	Closure	Long Term	Adverse	High	Major
	Post Closure	Far Future	Positive	High	Low
Capacity Building					
Education;	Construction	Short Term	Positive	High	Major
Experience;	Operation	Medium Term	Positive	High	Major
Joint Ventures;	Closure	Long Term	Adverse	High	Major
Management Skills					

From the perspective of this socio-economic impact assessment, health issues revolve around the two week in / two week out work rotations and high incomes, and the resulting concerns of:

- Under-developed money management skills by employees, and the propensity of some employees to spend incomes inappropriately,
- Family stress, arising from the absence of a spouse from the household, responsibilities of the spouse to operate the household and raise children, and the expenditure of incomes on items other than family and household maintenance,
- Drug and alcohol abuse, arising in part from the inappropriate expenditure of incomes, and often leading to family stress, violence and suicide,

In addition to these, the safety of employees at the mine site raises issues pertaining to occupational health and safety.

Overall, health may be expected to continue to be a major issue, and exacerbated by the incomes generated from mine employment.

Education Impacts

The Galore Creek Project will have an overall positive impact on the education of Dease Lake employees. This impact arises from the preparation of potential employees for employment, on-the-job training, apprenticeship programs and opportunities for career advancement.

Most education impacts will be experienced through mine operation rather than during the construction phase.

Employment at Galore Creek will not require graduation from secondary school for all positions. Rather, NovaGold will use the TOWES Essential Skills or equivalent program of assessing employee reading, document use and numeracy to determine appropriateness of employment. Continuing on-the-job training and opportunity for apprenticeships leading to trades papers and credentials represent an investment in education. This investment contributes over the long term to capacity building and the opportunity for some individuals and the community to expand the range of goods and services available from Dease Lake.

The educational impacts of the Galore Creek operation will be positive, long-term and of high magnitude (Table 7.15-14). Educational impacts arising from construction will generally be positive but will be available only for three years. The educational impacts of closure will be adverse to the extent that no further educational programming would be available.

Table 7.15-14
VECs, Health Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Occupational Health and Safety					
Workplace Accidents	Construction	Short Term	Adverse	Low	Low
	Operation	Medium Term	Adverse	Low	Low
	Closure	Long Term	Adverse	Low	Low
	Post Closure	Far Future	Adverse	Low	Low
Work Schedules					
Fly-in / Fly-out;	Construction	Short Term	Adverse	Medium to High	Major
Family Separation;	Operation	Medium Term	Adverse	Medium to High	Major
Parent Absenteeism	Closure	Long Term	Positive	Medium to High	Major
Substance Abuse					
Drug and Alcohol Abuse;	Construction	Short Term	Adverse	Medium to High	Moderate
	Operation	Medium Term	Adverse	Medium to High	Moderate
Family Violence; Inappropriate Role Models	Closure	Long Term	Adverse	Medium to High	Moderate
Family Stress					
Inappropriate Spending of Incomes; Money Management;	Construction	Short Term	Adverse	Medium to High	Moderate
	Operation	Medium Term	Adverse	Medium to High	Moderate
Spousal stress	Closure	Long Term	Adverse	Medium to High	Moderate

Table 7.15-15
VEC, Education Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Pre-Employment Training					
Qualification; Skills Evaluation	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Skills Training					
On-the-Job	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Apprenticeships					
Qualifications; Apprenticeships	Construction	Short Term	Neutral	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible
	Post Closure	Far Future	Positive	High	Negligible
Capacity Building					
Skills Training; Continuing Education; Experience	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low

Cultural Impacts

Preservation of the Tahltan culture is a stated priority of the Tahltan Central Council and is interpreted as an essential element in individual and community health of the Tahltan. Like the other Tahltan communities, the numbers of people who know the Tahltan language in Dease Lake is declining. Language is one component and measure of cultural activity. Others include participation in ceremonies such as funerals and celebrations, uses of the land and water resource base for hunting or fishing and the expression of culture in arts and crafts, and the reduction of inter-cultural conflict in the workplace.

The importance of the relationship between culture and individual and community health is recognized in the Tahltan's holistic approach to wellness and articulated in "*Out of Respect*" (Tahltan First Nation and the International Institute for Sustainable Development, 2003). Accordingly, preservation of the Tahltan culture is extremely important in giving the Tahltan pride in their heritage, in providing individuals and the community a sense of who they are, a sense of self-confidence and self-worth, and the optimism that the future may be better than the past or the present. Through these contributions, preservation of the Tahltan culture is believed to be a necessary component in addressing individual and community health issues.

Communications Impact

Dease Lake community and Dease Lake Reserve 9 have highlighted the need to maintain effective communications with the Tahltan Central Council, the Tahltan Band and Iskut First

Nation and the public at large in order to keep residents aware of opportunities and for the community to benefit from those opportunities.

Table 7.15-16
VEC, Cultural Impacts, Dease Lake

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Culture					
Tahltan Language	Construction	Short Term	Adverse	High	Unknown
	Operation	Medium Term	Adverse	High	Unknown
	Closure	Long Term	Adverse	High	Unknown
Ceremonies, Events					
Participation of Employees During Fly-In Work Rotations	Construction	Short Term	Adverse	High	High
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Adverse	High	High
Trapping, Fishing and Hunting					
Access by Non-Residents; Participation by Resident Employees	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Cross-Cultural Sensitivities					
Cross-Cultural Conflict	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate

Developing and maintaining communication channels, the provision of contact names (for example, for complaints), documentation of procedures (for example, for job applications), posting notices and requirements, and notification of employment and contract opportunities comprise part of a communication program which, depending upon implementation, could facilitate the Galore Creek Project or detract from it.

The NovaGold communication program also serves to inform the public about the Galore Creek mine development and the achievements of local residents. Communication channels and media also serve to notify the Tahltan of company responses to Tahltan events such as funerals and ceremonies, time off for hunting and fishing, and participation in community events.

NovaGold communication has been effective to date and bears much of the responsibility for the positive response of the Tahltan to the Galore Creek project.

NovaGold's communication program will continue throughout the construction and operation of the Galore Creek project.

Overall, communication impacts are expected to be positive, long term and of high magnitude (Table 7.15-17).

Table 7.15-17
VEC, Communication Impacts, Dease Lake, Dease Lake Reserve 9

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Communication					
Tahltan Central Council	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	High
Employment Opportunities					
Notification; Postings; First Choice.	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Contract Opportunities					
Notification; Postings; First Choice.	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Public Information					
Newsletter; Meetings.	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High

7.15.4.3 Socio-Economic Impacts on Iskut

If it proceeds, the Red Chris mine, will be operational by 2007 and sited approximately 23 kilometres from Highway 37 south of Iskut, making it within commuting (bus in / bus out) distance of Iskut. Construction of the mine would require a workforce of up to 500 persons; operations would provide direct full-time employment for some 252 persons and another 32 – 50 persons employed full time by contractors (Red Chris Development Co. Ltd., 2004). The effect of the Red Chris construction and development program will, if development occurs, be to offer an alternative source of employment to residents of Dease Lake, Iskut and Telegraph Creek. It is anticipated that because of its proximity to Iskut, the Red Chris mine could become a preferred source of employment to Iskut residents.

It is therefore believed that construction and operation of the Galore Creek mine will not attract a large number of Iskut residents. It is possible, however, that the competition for labour may serve to draw Iskut non-residents back to Iskut.

Employment Impacts

In 2005, NovaGold employed six residents of Iskut in various exploration related activities associated with the Galore Creek Project. In addition, NovaGold contractors employed a small number of Iskut residents. A further 20 to 25 Iskut residents were employed at Eskay Creek in 2005.

Construction beginning in 2007 of the Galore Creek mine will be primarily undertaken by contractors and will compete with full-time employment being offered at the Red Chris mine if that mine proceeds to development. Assuming that NovaGold's Iskut seasonal employees and contractors' employees from 2005 continue with employment, and as many as 20 former Eskay Creek employees become available, then approximately 60 Iskut residents could be employed during construction of the Galore Creek Project.

Operation of the Galore Creek mine in 2010 presents opportunity for year round employment but many potential employees from Iskut will have potentially become employed at Red Chris. Iskut non-residents may be attracted back to Iskut if employees are required to be residents at the point of hire to qualify for employment.

If the Red Chris Mine were not to proceed, approximately 70 Iskut residents could achieve employment at the Galore Creek mine. If Red Chris were to be developed, approximately ten Iskut residents are expected to be employed at the Galore Creek mine during operations.

NovaGold anticipates employing as many local residents as possible and recognizes that this achievement will address four issues: awareness of employment opportunities; access to employment; skills training; apprenticeships; and, career advancement. Table 7.15-18 presents the components of the Employment VEC.

Overall impact on employment will be positive until mine closure when termination of employment will create an adverse impact on individuals and the community. Because of the limited number of employees involved, employment is expected to have a major impact on individuals but a minor impact on the community .

Income Impacts, Iskut[5]

Employment, both during construction and operations, offers the prospect of long-term sustainable employment for employees. Incomes to persons will be substantial and in many cases tax free.

As much as these incomes will permit employees to acquire a range of goods and services, some employees will spend their incomes inappropriately. Substance abuse is a broadly-based concern and increased employment, generating good and reliable incomes may worsen the problem. Family violence is a related concern. Family stress arises from the amount of money spent on drugs and alcohol at the expense of rent and mortgage payments, utilities, vehicles and other goods and services. There is an often mentioned concern that too many employees will not have the skills to manage their incomes successfully.

Without Red Chris

If the Red Chris Mine were not to proceed, a larger number of residents of Iskut will be available for employment at Galore Creek, The discussion below describes potential Galore Creek employment and income impacts if Galore Creek were the only mine to be developed.

[5] All income data and projections are based on constant 2006 dollars. No adjustments are made for inflation.

Table 7.15-18
VEC, Employment Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Employment					
Jobs	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
	Post Closure	Far Future	Positive	High	Low
Awareness of Opportunity					
Notification;	Construction	Short Term	Positive	High	High
Posting;	Operation	Medium Term	Positive	High	High
First Choice	Closure	Long Term	Adverse	High	Negligible
Access to Employment					
Qualifications;	Construction	Short Term	Positive	Moderate	Moderate
Essential Skills Evaluation;	Operation	Medium Term	Positive	High	High
Preferential Hiring;	Closure	Long Term	Adverse	High	High
Pre-Employment Training					
Skills Training					
On-the-Job Training	Construction	Short Term	Positive	High	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
Apprenticeships					
Apprenticeship Qualification, Training;	Construction	Short Term	Positive	Low	Negligible
Papers;	Operation	Medium Term	Positive	High	Moderate
Transferability and Mobility	Closure	Long Term	Adverse	High	Negligible
Career Advancement					
Skills Training and Enhancement;	Construction	Short Term	Positive	Low	Negligible
Career Pathing	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible

Incomes from Construction

The annual income impact of construction through the employment of 60 Iskut residents by contractors from 2007 through 2010 at an assumed 2005 average annual wage of $80,000 approximates:

60 persons x $80,000 = $4,800,000

Direct incomes from construction are based on 2005 data and may approximate $4,800,000 for each of three years. Wages paid for construction labour between 2007 and 2010 will likely increase because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction personnel. Few commercial enterprises at Iskut suggest that few indirect employment and income impacts will be experienced by Iskut businesses. Indirect employment and incomes will likely be generated through companies such as TNDC and Spatsizi Remote Services, based at Dease Lake and employing Iskut residents. Using BC Stats employment multipliers for the Stikine Region, indirect employment from construction may amount to

(multiplier) 60 x .25 = 15 persons

Contractors such as Spatzisi and TNDC who provide goods and services to Galore Creek may be expected to earn incomes, measured in 2005 dollars, from $25,000 (Spatsizi Remote Services) to $80,000 (equipment operators) or a median of approximately $50,000. Indirect local incomes generated by construction of Galore Creek may approximate additional income to Iskut residents of:

(multiplier) 15 persons x $50,000 = $750,000

NovaGold's use of local businesses suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Iskut residents could reach 35 persons by Spatsizi Remote Services alone. Added to other indirect employment, it is possible that total indirect employment could reach 50 persons.

Under these circumstances incomes generated indirectly through contractor employment may then approximate $2,500,000 annually over the construction period:

50 persons x $50,000 = $2,500,000

Spatsizi Remote Services experience suggests that approximately 60% of employees will be women.

*Induced employment impacts***:** While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from construction may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.31 may generate four additional jobs elsewhere in the community. These positions are likely to be in the public service sector where total employment revenues may approximate $200,000.

Incomes from Operational Employment

The annual direct income impact of operating mine employment through the full time employment of 70 Iskut residents by NovaGold from 2010 through 2030 at an assumed average annual wage of $80,000 approximates:

70 persons x $80,000 = $5,600,000

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction personnel. Contractors may be expected to earn incomes, measured in 2005 dollars, averaging $50,000. Assuming a BC Stats employment multiplier of 1.25, indirect employment may amount to:

(multiplier) 70 x .25 = 18 persons

Incomes generated indirectly through contractor employment may then approximate $612,000 annually over the life of the mine:

(multiplier) 18 persons x $50,000 = $900.000

NovaGold's use of local businesses suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Iskut residents could reach 35 persons by Spatsizi Remote Services alone. Added to other indirect employment, it is possible that total indirect employment could reach 53 persons.

Under these circumstances, total indirect employment incomes to Iskut residents during mine operations could reach $2,650,000 annually:

53 persons x $50,000 =$2,650,000 per assum

Incomes are based on 2005 data and wages paid for contractor employment after 2010 may increase to new base levels because of the demand for construction labour.

Induced employment impacts: While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from operations may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.31 may be expected to generate four additional jobs elsewhere in the community. In Iskut, these positions are likely to be in the public service sector.

70 persons x 1.31 – 1.25 = 4 persons

Total induced incomes are expected to approximate $200,000.

Incomes Upon Closure

Closure of the Galore Creek mine will involve the termination of employment and the cessation of incomes to most of the 123 direct and indirect employees. Cessation of employment will lead to the termination of $6,800,000 of direct and indirect employment income to Iskut residents.

Environmental monitoring of the closed mine will involve the continued seasonal part-time employment of one to five local residents who will be reimbursed at 2030 wage levels. The incomes generated from such employment may range from $50,000 to $100,000 per year if all

employees resided in Iskut. Assuming one of these persons lived in Iskut, annual income may approximate $25,000.

In the absence of alternative sources of employment, closure of the mine will involve major dislocation of local employees.

Summary of Impacts without Red Chris Mine

Employment and income impacts of the Galore Creek Project proceeding without the concurrent development of the Red Chris Mine are presented below in Table 7.15-19.

Table 7.15-19
Iskut Employment and Income:
Galore Creek Proceeding without Red Chris Mine

Construction	Employment	Incomes
Direct	60	$4,800,000
Indirect	50	$2,500,000
Induced	4	$200,000
Operations		
Direct	70	$5,600,000
Indirect	53	$2,650,000
Induced	4	$200,000
Closure	1-5 part time, seasonal	$25,000

With Red Chris

If the Red Chris Mine proceeds according to plan, two mines in the primary study area will offer employment introducing labour force competition. Assuming that the Red Chris mine employs a significant number of Iskut residents, it is possible that the number of residents employed directly at Galore Creek may approximate ten. The discussion below describes potential Galore Creek employment and income impacts if both Red Chris and Galore Creek mines were developed (Table 7.15-20). The number of indirect employees may also be expected to decrease to approximately 20 – 25 persons.

Table 7.15-20
Iskut, Employment and Income:
Galore Creek Proceeding with Red Chris Mine

Construction	Employment	Incomes
Direct	10	$800,000
Indirect	20-25	$1,000,000 to $1,250,000
Induced	1	$50,000
Operations		
Direct	10	$800,000
Indirect	20-25	$1,000,000 to $1,250,000
Induced	1	$50,000
Closure	1-5 Part time, seasonal	$25,000

The same multipliers apply as if Galore Creek proceeded without Red Chris.

The Galore Creek project, through employment of local and regional residents, may be expected to have a major impact on Iskut employment incomes (Table 7.15-21).

Table 7.15-21
VEC, Income Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Incomes					
Wages, Salaries	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Inappropriate Spending					
Substance Abuse; Money Management;	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Family Stress					
Inappropriate Spending of Incomes; Money Management; Substance Abuse; Spousal violence;	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Indirect Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	High	Low
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	High
Indirect and Induced Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	Low	Low
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	High

Business Opportunity Impacts

The construction and operation of the Galore Creek Project represents opportunity for Iskut businesses to acquire contracts to provide goods and services to NovaGold. Iskut possesses, however, few commercial and industrial enterprises which could provide goods and services, although one or two businesses could provide contracting services on an ad-hoc basis.

NovaGold has established practices with local contractors relating to the notification of upcoming contracts, access to contracts through bidding assistance, bonding waivers, and other practices.

The overall magnitude of business development impacts on Iskut is therefore expected to be minor because of the lack of commercial and industrial enterprises at Iskut (Table 7.15-22).

Table 7.15-22
VEC, Business Opportunity Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Awareness of Contracts					
Notification; Postings; First Choice.	Construction	Short, Intermediate Term	Positive	High	Minor
	Operation	Long Term	Positive	High	Minor
	Closure	Long Term	Adverse	High	Minor
Access to Contracts					
Limited Number of Enterprises; Qualifications;	Construction	Short, Intermediate Term	Positive	High	Minor
Opportunity for First Refusal	Operation	Long Term	Positive	High	Minor
	Closure	Long Term	Adverse	High	Minor
Capacity Building					
Education; Experience; Joint Ventures; Management Skills	Construction	Short, Intermediate Term	Positive	High	Minor
	Operation	Long Term	Positive	High	Minor
	Closure	Long Term	Adverse	High	Minor

Health Impacts

The physical, mental and social dimensions of health are inter-twined with economic issues of development, employment and incomes. The Galore Creek Project will contribute to the health of individuals and the community by providing economic development. However, development also raises concerns stemming from fly-in/fly-out work schedules and employee money management.

Identifiable health issues existed in Iskut before NovaGold arrived and it is likely that these issues will remain whether Galore Creek proceeds or not. Nevertheless, documentation of health impacts associated with the Galore Creek project gives recognition to the issues, illustrates the relationship to employment, and highlights the negative side of employment in an environment where incomes confront few alternative employment prospects, few recreational opportunities, peer pressure, and limited faith in the future.

Like Dease Lake, health issues in relation to this project revolve around the two week in / two week out work rotations and increased incomes, and the resulting concerns of:

- Under-developed money management by employees, and the propensity of some employees to spend incomes inappropriately,
- Family stress, arising from the absence of a spouse from the household, responsibilities of the other spouse to operate the household and raise children, the expenditure of incomes on items other than family and household maintenance, and the lack of housing

which requires those with housing to accommodate returning family members and adapt to their lifestyles, and

- Drug and alcohol abuse arising in part from the inappropriate expenditure of incomes, and often leading to family stress, violence and suicide.

Overall, health may be expected to continue to be a major issue, and exacerbated by the incomes generated from mine employment.

The extent to which NovaGold exacerbates health issues at Iskut will depend upon the extent to which Red Chris draws employees from here. If the Red Chris mine proceeds, it is anticipated that the Galore Creek Project will not have a major employment impact on Iskut and many of the health issues connected with employment with be reduced in magnitude to minor (Table 7.15-23).

Table 7.15-23
VEC, Health Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Work Schedules					
Fly-in / Fly-out; Family Separation; Spousal stress; Parent Absenteeism	Construction	Short, Intermediate Term	Adverse	Medium to High	Minor
	Operation	Long Term	Adverse	Medium to High	Minor
	Closure	Long Term	Adverse	Medium to High	Minor
Substance Abuse					
Drug and Alcohol Abuse; Family Violence; Inappropriate Role Models	Construction	Short, Intermediate Term	Adverse	Medium to High	Minor
	Operation	Long Term	Adverse	Medium to High	Minor
	Closure	Long Term	Adverse	Medium to High	Minor
Family Stress					
Inappropriate Spending of Incomes; Money Management; Spousal stress	Construction	Short, Intermediate Term	Adverse	Medium to High	Minor
	Operation	Long Term	Adverse	Medium to High	Minor
	Closure	Long Term	Adverse	Medium to High	Minor

Education Impacts

The Galore Creek Project will have an overall positive impact on the education of Iskut employees. This impact arises from the preparation of potential employees for employment, on-the-job training, apprenticeship programs and opportunities for career advancement.

Most education impacts will be experienced through mine operation rather than during the construction phase.

Employment at Galore Creek will not require graduation from secondary school for all positions. Rather, NovaGold will use the TOWES Essential Skills program, or an equivalent program, of

assessing employee reading, document use and numeracy to determine appropriateness of employment. Continuing on-the-job training and opportunity for 30 to 40 apprenticeships leading to trades papers and credentials represent an investment in education. This investment contributes over the long term to capacity building and the opportunity for some individuals and the community to expand the range of goods and services available from Iskut.

Assuming that many Iskut residents successfully seek employment with Red Chris and its contractors, the number of Iskut residents who seek employment with the Galore Creek project may be limited. With this scenario, education will be important to the individuals involved but will have a minor impact on the community.

The educational impacts of the Galore Creek operation on Iskut will be positive and long-term, but of minor magnitude (Table 7.15-24). Educational impacts arising from construction will generally be positive but will be available only for three years. The educational impacts of closure will be adverse to the extent that no further educational component would be available.

Table 7.15-24
VEC, Education Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Pre-Employment Training					
Qualification; Skills Evaluation.	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible
	Post Closure	Far Future	Positive	High	Negligible
Skills Training					
On-the-Job;	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Apprenticeships					
Qualifications; Apprenticeships	Construction	Short Term	Neutral	Moderate	Low
	Operation	Medium Term	Positive	High	Moderate
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Capacity Building					
Skills Training; Continuing Education; Experience.	Construction	Short, Intermediate Term	Positive	High	High
	Operation	Long Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible

Cultural

In 2001, approximately three quarters of Iskut residents spoke English only and only 12.7% speak Tahltan at home. The use of only English at work, through the media, the lack of

recognition of Tahltan names, and work schedules which prevent participation in ceremonies and traditional activities have all contributed to the decline of the Tahltan culture.

The importance of the relationship between culture and individual and community health is recognized in the Tahltan's holistic approach to wellness and articulated in "*Out of Respect*" (Tahltan First Nation and the International Institute for Sustainable Development, 2003). The holistic approach has similarly been adopted by Health Canada. Accordingly, preservation of the Tahltan culture is extremely important in giving the Tahltan pride in their heritage, in providing individuals and the community a sense of who they are, a sense of self-confidence and self-worth. Through these contributions, preservation of the Tahltan culture is believed to be a necessary component in addressing individual and community health issues.

Communications Impacts

The Iskut community has highlighted the need to maintain effective communications with NovaGold in order to keep residents aware of opportunities and for the community to benefit from those opportunities.

Developing and maintaining communication channels, the provision of contact names (for example, for complaints), documentation of procedures (for example, for job applications), posting notices and requirements, and notification of employment and contract opportunities comprise part of a communication program which, depending upon implementation, could facilitate the Galore Creek project or detract from it.

Table 7.15-25
VEC, Cultural Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Culture					
Tahltan Language	Construction	Short Term	Adverse	High	Unknown
	Operation	Medium Term	Adverse	High	Unknown
	Closure	Long Term	Adverse	High	Unknown
Ceremonies, Events					
Participation of Employees During Fly-In Work Rotations	Construction	Short Term	Adverse	High	High
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Adverse	High	High
Trapping, Fishing and Hunting					
Access by Non-Residents; Participation by Resident Employees	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Cross-Cultural Sensitivities					
Cross-Cultural Conflict	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate

The NovaGold communication program also serves to inform the public about the Galore Creek mine development and the achievements of local residents. Communication channels and media also serve to notify the Iskut First Nation of company responses to events such as funerals and ceremonies, time off for hunting and fishing, and participation in community events.

NovaGold communication has been effective to date and bears much of the responsibility for the positive response of the Tahltan to the Galore Creek project.

NovaGold's communication program will continue throughout construction and operation of the Galore Creek project.

Overall, communication impacts are expected to be positive, long term and of high magnitude (Table 7.15-26).

Table 7.15-26
VEC, Communication Impacts, Iskut

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Communication					
Tahltan Central Council	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	High
Employment Opportunities					
Notification; Postings; First Choice	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Contract Opportunities					
Notification; Postings; First Choice	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Public Information					
Newsletter; Meetings	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High

7.15.4.4 Socio-Economic Impacts on Telegraph Creek

Employment Impacts

In 2005, NovaGold employed 14 residents of Telegraph Creek in various exploration related activities associated with the Galore Creek Project. In addition, NovaGold contractors employed a small number of Telegraph Creek residents. In addition to NovaGold employment, another 15 Telegraph Creek residents were employed at Eskay Creek. In spite of the seasonality of some

employment, income assistance rate in January 2006 was considered to be low with 25 files at Telegraph Creek.

Construction beginning in 2007 of the Galore Creek mine will be primarily undertaken by contractors and would compete with full-time employment being offered at the Red Chris mine if the mine were to be developed. Assuming that most Red Chris employment would be drawn from Iskut, and that recent NovaGold and contractor employees will be available for employment during construction of the Galore Creek Project, approximately 50 Telegraph Creek residents may be employed by NovaGold and its contractors during construction of the Galore Creek mine.

Operation of the Galore Creek mine in 2010 presents opportunity for year round employment for the expected 50 Telegraph Creek employed during construction. Non-residents may be attracted back to Telegraph Creek if employees are required to be residents at the point of hire to qualify for employment.

If the Red Chris Mine were not to proceed, approximately 70 Telegraph Creek residents could achieve employment at the Galore Creek mine. If Red Chris were to be developed, and recognizing the appeal of the Red Chris project to Telegraph Creek residents, approximately 35 Telegraph Creek residents would be employed at Galore Creek during operations.

NovaGold anticipates employing as many local residents as possible and, as with the other communities, recognizes that this achievement will help address: awareness of employment opportunities; access to employment; skills training; apprenticeships, and career advancement.

Galore Creek employment of Telegraph Creek residents may be restrained if the Red Chris Mine is developed but overall impact on employment is expected to be positive until mine closure when termination of employment will create an adverse impact on individuals and the community. Due to the number of employees involved, employment will have a major impact on individuals and a major impact on the community.

Employment issues and impacts are described in Table 7.15-27.

Income Impacts, Telegraph Creek[6]

Employment, both during construction and operations, offers the prospect of long-term sustainable employment for employees. Incomes to persons will be substantial and in many cases tax free.

As much as these incomes will permit employees to acquire a range of goods and services, some employees may spend their incomes inappropriately. Substance abuse is a broadly-based concern and increased employment generating high incomes may contribute to the problem. Family stress and violence are related concerns. Family stress may arise as a result of money being spent on drugs and alcohol at the expense of rent and mortgage payments, utilities, vehicles and other

[6] All income data are based on and held constant to 2006 dollars. Projections do not account for inflation.

goods and services. Concern has been expressed that many employees will not have skills to successfully manage their incomes.

Table 7.15-27
VEC, Employment Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Employment					
Jobs	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
	Post Closure	Far Future	Positive	High	Low
Awareness of Opportunity					
Notification;	Construction	Short Term	Positive	High	High
Posting;	Operation	Medium Term	Positive	High	High
First Choice	Closure	Long Term	Adverse	High	Negligible
Access to Employment					
Qualifications;	Construction	Short Term	Positive	Moderate	Moderate
Essential Skills Evaluation;	Operation	Medium Term	Positive	High	High
Preferential Hiring;	Closure	Long Term	Adverse	High	High
Pre-Employment Training					
Skills Training					
On-the-Job Training	Construction	Short Term	Positive	High	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
Apprenticeships					
Apprenticeship Qualification, Training;	Construction	Short Term	Positive	Low	Negligible
	Operation	Medium Term	Positive	High	Moderate
Papers;	Closure	Long Term	Adverse	High	Negligible
Transferability and Mobility					
Career Advancement					
Skills Training and Enhancement;	Construction	Short Term	Positive	Low	Negligible
	Operation	Medium Term	Positive	High	High
Career Pathing	Closure	Long Term	Adverse	High	Negligible

Without Red Chris

If the Red Chris mine were not to proceed, a larger number of residents of Telegraph Creek will be available for employment at Galore Creek, The discussion below describes potential Galore Creek employment and income impacts if Galore Creek were the only mine to be developed.

Incomes from Construction

The annual income impact of construction through the year-round employment of 50 Telegraph Creek residents by contractors from 2007 through 2010 at an assumed 2005 average annual wage of $80,000 approximates:

50 persons x $80,000 = $4,000,000

Direct incomes from construction are based on 2005 data and may approximate $4,000,000 for each of three years. Wages paid for construction labour between 2007 and 2010 will likely increase because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction personnel. Few commercial enterprises at Telegraph Creek suggest that few indirect employment and income impacts will be experienced by Telegraph Creek businesses. Indirect employment and incomes will likely be generated through companies such as TNDC and Spatsizi Remote Services, based at Dease Lake and employing Telegraph Creek residents. Using BC Stats employment multipliers for the Stikine Region, indirect employment from construction may amount to

(Multiplier) 50 x .25 = 13 persons

Contractors such as Spatzisi and TNDC, who provide goods and services to Galore Creek, may be expected to earn incomes, measured in 2005 dollars, from $25,000 (Spatsizi Remote Services employees) to $80,000 (equipment operators) or a median of approximately $50,000. In accordance with BC Stats multipliers, indirect local incomes generated by construction of Galore Creek may approximate additional income to Telegraph Creek residents of:

(Multiplier) 13 persons x $50,000 = $630,000

NovaGold's use of local businesses suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Telegraph Creek residents could reach 35 persons by Spatsizi Remote Services alone with the remaining employees coming from Iskut and Dease Lake. Added to other indirect employment, it is possible that total indirect employment could reach 48 persons.

Under these circumstances, total indirect employment incomes could reach:

48 persons x $50,000 = $2,400,000

Spatsizi Remote Services experience suggests that approximately 60% of employees will be women.

Induced employment impacts: While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from construction may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.31 may be expected to generate four additional jobs elsewhere in the community. In Telegraph Creek, these positions are likely to be in the service sector where total employment revenues may approximate $200,000.

Incomes from Operational Employment

The annual direct income impact of operating mine employment through the full time employment of 70 Telegraph Creek residents by NovaGold from 2010 through 2030 at an assumed average annual wage of $80,000 approximates:

70 persons x $80,000 = $5,600,000

Indirect employment and incomes from contractors who provide goods and services to Galore Creek may be expected to earn incomes which average $50,000. In accordance with BC Stats multipliers, indirect local incomes generated by construction of Galore Creek may approximate additional income to Telegraph Creek residents of:

(Multiplier) 70 x .25 = 18 persons

Incomes generated indirectly through contractor employment may then approximate:

(Multiplier) 18 persons x $50,000 = $900,000

NovaGold's use of local businesses suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. With Spatsizi Remote Services employing 108 persons in 2005, it is possible that indirect employment of Telegraph Creek residents could reach 35 persons by Spatsizi Remote Services alone with the remaining employees coming from Iskut and Dease Lake. Added to other indirect employment, it is possible that total indirect employment of Telegraph Creek residents could reach 53 persons.

Under these circumstances, total indirect employment incomes at Telegraph Creek could reach:

53 persons x $50,000 = $2,650,000

Incomes are based on 2005 data and may increase to new base levels because of the demand for construction labour created by numerous large construction programs in BC.

Induced employment impacts: While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from operations may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.31 may be expected to generate 4.2 additional jobs elsewhere in the community. These positions are likely to be in the service sector where total employment revenues may approximate $200,000.

70 persons x 1.31 – 1.25 = 4 persons

Induced incomes are expected to average $50,000 for a total of $200,000 in annual induced employment income.

Incomes upon Closure

Closure of the Galore Creek mine will involve the termination of employment and the cessation of incomes to most of the 123 direct and indirect employees. Cessation of employment will lead to the termination of $6,800,000 of direct and indirect employment income to Telegraph Creek residents.

Environmental monitoring of the closed mine will involve the continued seasonal part-time employment of one to five local residents who will be reimbursed at 2030 wage levels. The incomes generated from such employment may range from $50,000 to $100,000 per year if all employees resided in Telegraph Creek. Assuming one of these persons lived in Telegraph Creek, annual income may approximate $25,000.

In the absence of alternative sources of employment, closure of the mine will involve major dislocation of local employees.

Summary of Impacts without Red Chris Mine

Employment and income impacts of the Galore Creek project proceeding without the concurrent development of the Red Chris mine are presented below (Table 7.15-27).

With Red Chris

If the Red Chris mine proceeds according to plan, two mines in the primary study area will offer employment. Recognizing the sizes of the communities in the primary study area, two mines will introduce labour force competition such that fewer residents will be available for employment at Galore Creek. Assuming that the Red Chris Mine employs a significant number of Telegraph Creek residents, it is possible that the number of residents employed directly at Galore Creek may approximate 35. The discussion below describes potential Galore Creek employment and income impacts if both the Red Chris and Galore Creek mines were developed (Table 7.15-28).

The same multipliers apply as if Galore Creek proceeded without Red Chris.

Table 7.15-28
Telegraph Creek, Employment and Income:
Galore Creek Proceeding without Red Chris Mine

Construction	Employment	Incomes
Direct	50	$4,000,000
Indirect	48	$2,400,000
Induced	4	$200,000
Operations		
Direct	70	$5,600,000
Indirect	53	$2,650,000
Induced	4	$200,000
Closure	1-5 part time, seasonal	$25,000

Issues in relation to the Income VEC are described in Table 7.15-29.

Table 7.15-29
Telegraph Creek, Employment and Income: Galore Creek Proceeding with Red Chris Mine

Construction	Employment	Incomes
Direct	35	$2,800,000
Indirect	25 - 30	$1,250,000 to $1,500,000
Induced	2	$100,000
Operations		
Direct	35	$2,800,000
Indirect	25 - 30	$1,250,000 to $1,500,000
Induced	2	$100,000
Closure	1-5 Part time, seasonal	$25,000

Business Opportunity Impacts

Telegraph Creek possesses no commercial or industrial enterprises which could provide goods and services to Galore Creek. The overall magnitude of business development impacts on Telegraph Creek will be negligible (Table 7.15-30) because of this lack of appropriate commercial and industrial enterprises at Telegraph Creek.

Table 7.15-30
VEC, Income Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Incomes					
Wages, Salaries	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Inappropriate Spending					
Substance Abuse; Money Management	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Family Stress					
Inappropriate Spending of Incomes; Money Management; Substance Abuse; Spousal violence	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Indirect Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	High	Low
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	High
Indirect and Induced Impact of Employment Incomes					
Basic Commercial Services Only; Small Market Population	Construction	Short Term	Positive	Low	Low
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	High

Health Impacts

The Galore Creek Project will contribute to the health of individuals and the community by providing economic development, employment and incomes. These provide individuals and the community with some of the components of health but also raise concerns stemming from fly-in/fly-out work schedules and employee money management.

Identifiable health issues existed in Telegraph Creek before NovaGold arrived and will continue whether Galore Creek proceeds or not. Nevertheless, documentation of health impacts associated with the Galore Creek project gives recognition to the issues, illustrates the relationship to employment, and highlights the negative side of employment and employment incomes in an environment where incomes confront few alternative employment prospects, few recreational opportunities, peer pressure, and limited faith in the future.

Table 7.15-31
VEC, Business Opportunity Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Awareness of Contracts					
Notification;	Construction	Short Term	Positive	High	Nil
Postings;	Operation	Medium Term	Positive	High	Nil
First Choice	Closure	Long Term	Adverse	High	Nil
Access to Contracts					
Limited Number of Enterprises;	Construction	Short Term	Positive	High	Nil
Qualifications;	Operation	Medium Term	Positive	High	Nil
Opportunity for First Refusal	Closure	Long Term	Adverse	High	Nil
Capacity Building					
Education;	Construction	Short Term	Positive	High	Nil
Experience;	Operation	Medium Term	Positive	High	Nil
Joint Ventures;	Closure	Long Term	Adverse	High	Nil
Management Skills					

From the perspective of this socio-economic impact assessment, health issues revolve around the two week in / two week out work rotations and increased incomes, and the resulting concerns of:

- Under-developed money management by employees, and the propensity of some employees to spend their incomes inappropriately,
- Family stress, arising from the absence of a spouse from the household, responsibilities of the other spouse to operate the household and raise children, the expenditure of incomes on items other than family and household maintenance, and the lack of housing which requires those with housing to accommodate returning family members and adapt to their lifestyles, and
- Drug and alcohol abuse, arising in part from the inappropriate expenditure of incomes, and often leading to family stress, violence and suicide.

In addition to these, the safety of employees at the mine site raises issues pertaining to occupational health and safety.

Overall, health may be expected to continue to be a major issue, and exacerbated by the incomes generated from mine employment (Table 7.15-32).

Table 7.15-32
VEC, Health Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Occupational Health and Safety					
Workplace Accidents	Construction	Short Term	Adverse	Low	Low
	Operation	Medium Term	Adverse	Low	Low
	Closure	Long Term	Adverse	Low	Low
	Post Closure	Far Future	Adverse	Low	Low
Work Schedules					
Fly-in / Fly-out; Family Separation; Spousal stress; Parent Absenteeism	Construction	Short Term	Adverse	High	High
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Adverse	High	High
Substance Abuse					
Drug and Alcohol Abuse; Family Violence; Inappropriate Role Models	Construction	Short Term	Adverse	Moderate	Moderate
	Operation	Medium Term	Adverse	Moderate	Moderate
	Closure	Long Term	Adverse	Moderate	Moderate
Family Stress					
Inappropriate Spending of Incomes; Money Management; Spousal stress	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate

Education Impacts

The Galore Creek Project will have an overall positive impact on the education of Telegraph Creek employees. This impact arises from NovaGold commitments relating to the preparation of potential employees for employment, on-the-job training, apprenticeship programs and opportunities for career advancement.

Most education impacts will be experienced through mine operation rather than during the construction phase.

Employment at Galore Creek will not require graduation from secondary school for all positions. Rather, NovaGold proposes to use the TOWES Essential Skills, or an equivalent program, to assess employee reading, document use and numeracy to determine appropriateness of employment. Continuing on-the-job training and opportunity for apprenticeships leading to trades papers and credentials represent an investment in education. This investment contributes

over the long term to capacity building and the opportunity for some individuals and the community to expand the range of goods and services available from Telegraph Creek.

The educational impacts of the Galore Creek operation on Telegraph Creek will be positive, and long-term but of moderate magnitude (Table 7.15-33). Educational impacts arising from construction will generally be positive but will be available only for three years. The educational impacts of closure will be adverse to the extent that no further educational component would be available.

Table 7.15-33
VEC, Education Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Pre-Employment Training					
Qualification; Skills Evaluation	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Negligible
	Post Closure	Far Future	Positive	High	Negligible
Skills Training					
On-the-Job	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Apprenticeships					
Qualifications; Apprenticeships	Construction	Short Term	Neutral	Moderate	Low
	Operation	Medium Term	Positive	High	Moderate
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible
Capacity Building					
Skills Training; Continuing Education; Experience	Construction	Short, Intermediate Term	Positive	High	High
	Operation	Long Term	Positive	High	High
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Positive	High	Negligible

Cultural

Telegraph Creek is the cultural heart of the Tahltan Nation. In 2001, approximately three quarters of Telegraph Creek residents spoke English only and only 12.7% speak the Tahltan language at home. The use of only English at work, English-language media, lack of recognition of Tahltan names and work schedules which prevent participation in ceremonies and traditional activities have all contributed to the decline of the Tahltan culture.

The importance of the relationship between culture and individual and community health is recognized in the Tahltan's holistic approach to wellness and adopted by Health Canada. Accordingly, preservation of the Tahltan culture is extremely important and a necessary component in addressing individual and community health issues.

In the absence of effort to accommodate cultural considerations, the overall impact of Galore Creek on Tahltan culture is considered to be adverse and of moderate magnitude (Table 7.15-34).

Table 7.15-34
VECs, Cultural Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Culture					
Language	Construction	Short Term	Adverse	High	Unknown
	Operation	Medium Term	Adverse	High	Unknown
	Closure	Long Term	Adverse	High	Unknown
Ceremonies, Events					
Participation of Employees During Fly-In Work Rotations	Construction	Short Term	Adverse	High	High
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Adverse	High	High
Trapping, Fishing and Hunting					
Access by Non-Residents; Participation by Resident Employees	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Cross-Cultural Sensitivities					
Cross-Cultural Conflict	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate

Communications Impacts

The Tahltan community has highlighted the need to maintain effective communications with NovaGold in order to keep residents aware of opportunities and for the community to benefit from those opportunities.

Developing and maintaining communication channels, the provision of contact names (for example, for complaints), documentation of procedures (for example, for job applications), posting notices and requirements, and notification of employment and contract opportunities comprise part of a communication program which, depending upon implementation, could facilitate the Galore Creek project or detract from it.

The NovaGold communication program also serves to inform the public about the Galore Creek mine development and the achievements of local residents. Communication channels and media also serve to notify Telegraph Creek residents of company responses to events such as funerals and ceremonies, time off for hunting and fishing, and participation in community events.

NovaGold communication has been effective to date and bears much of the responsibility for the positive response of the Tahltan to the Galore Creek project.

NovaGold's communication program will continue throughout construction and operation of the Galore Creek project.

Overall, communication impacts are expected to be positive, long term and of high magnitude (Table 7.15-35).

Table 7.15-35
VEC, Communication Impacts, Telegraph Creek

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Tahltan Communication					
Tahltan Central Council	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	High
Employment Opportunities					
Notification; Postings; First Choice	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Contract Opportunities					
Notification; Postings; First Choice	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High
	Post Closure	Far Future	Positive	High	Low
Public Information					
Newsletter; Meetings	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Positive	High	High

7.15.4.5 Socio-Economic Impacts on Stewart

The concerns of the town of Stewart focus pre-eminently on economic and community development. This reflects Stewart's recent history as a much larger community than it is in 2006, and the underutilization of public infrastructure and industrial and port facilities.

Stewart has a history of involvement with the mining industry and port facilities have been developed to accommodate the trucked transport of ore concentrate. Concentrate from the Eskay Creek and Huckleberry mines is currently transported to Stewart, but that transport will terminate with the closure of those mines in 2007. Trucked transport of concentrate would resume with the potential opening of the Red Chris Mine in 2008 and the Galore Creek mine in 2010.

Stewart is also evolving as a summer and winter tourism centre. Tourism promotion focuses on wilderness and adventure experiences.

When Galore Creek begins operating in 2010, as many as 50 trucks in B-train formation could make 180 round trips per day hauling concentrate from the Yukon Zinc, Red Chris and Galore Creek mines. This traffic will follow Highway 37A through downtown Stewart to port facilities. This volume of traffic will impact on hotels, restaurants and other facilities in Stewart, impair the wilderness character of the region, and create traffic hazards within Stewart.

In addition to concerns about traffic in downtown Stewart, concern also exists about the volume of industrial truck traffic along Highway 37A between Stewart and Highway 37 and traffic hazards to tourism traffic along the highway.

Economic Development

From an economic development perspective, Stewart will benefit directly and indirectly from the Galore Creek project through construction, transportation and port service contracts. The effect of these contracts, which have long term implications, will be to create a demand for labour which cannot be satisfied locally.

Any influx of people to Stewart will generate demand for housing and infrastructural services. Municipal, education and health services are all underutilized and an increase in population will facilitate more efficient use of services, and provide Stewart with an enhanced tax revenue.

It is expected that the number of new residents can be accommodated by existing retail and commercial services. The number of new residents is more likely to reduce unemployment than generate new businesses or new employment.

Economic development impacts arising from construction are likely to be limited, while economic development impacts arising from operation are likely to be positive, long term and of high magnitude (Table 7.15-36).

Table 7.15-36
VEC, Economic Development Impacts, Stewart

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Population and Housing					
Population Growth; Housing Demand	Construction	Short Term	Positive	Low	Nil
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	Unknown
Municipal Infrastructure					
Utilities; Education; Health; Recreation	Construction	Short Term	Positive	Low	Nil
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	Unknown
Port Facilities					
Stewart Bulk Terminals	Construction	Short Term	Positive	Low	Minor
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Unknown

Business Opportunity Impacts

The construction and operation of the Galore Creek project represents opportunity for Stewart businesses to acquire contracts to provide goods and services to NovaGold. Stewart possesses transportation, heavy truck repair and construction enterprises.

If truck transport, for example, were to be contracted to the historic joint venture between Arrow Transportation Services Inc. and the TNDC, the total value of truck transport would approximate $10,000,000 per year in 2006 dollars (Rustad, *pers. comm.*, 2006).

All concentrate will be hauled to Stewart Bulk Terminals which will, on the basis of truck traffic, receive in 2010 seven times as much ore concentrate as in 2005-2006.

Construction of Galore Creek may impact Stewart based construction and transportation firms with mine operation impacting on transportation and port facilities. The overall magnitude of business development impacts on Stewart will be high and long term (Table 7.15-37).

Table 7.15-37
VEC, Business Opportunity Impacts, Stewart

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Construction Contracts					
Notification;	Construction	Short Term	Positive	High	Moderate
Posting.	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Operations Contracts					
Notification;	Construction	Short Term	Positive	High	Moderate
Posting;	Operation	Medium Term	Positive	High	High
Joint Ventures.	Closure	Long Term	Adverse	High	High
Port Facilities					
Stewart Bulk Terminals	Construction	Short Term	Positive	Low	Negligible
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High

Employment Impacts

In 2005, NovaGold employed no residents of Stewart at Galore Creek.

During operations, NovaGold expects to employ approximately 30 Stewart residents.

Stewart residents are more likely to be employed by construction, transportation and port service contractors. Construction employment will be subject to award of tenders.

Within the primary impact area, Stewart is the base of the only firms capable of transporting concentrate to port facilities. The potential use of Stewart-based transportation firms may lead to the employment of 50 drivers and approximately 12 maintenance and repair personnel (Mather, *pers. comm.*, 2006).

By 2010, Stewart Bulk Terminals will employ Stewart residents to accommodate the ore storage and ship loading requirements of Yukon Zinc and the Red Chris mines. The additional shipment of Galore Creek concentrate to Stewart will involve the incremental employment of six to seven full time personnel. It is understood these personnel will be drawn from current part-time personnel (Soucie, *pers. comm.*, 2006).

Galore Creek impact on employment at Stewart will be both direct and indirect. Overall impact on employment will be positive until mine closure when termination of employment will create an adverse impact on individuals and the community (Table 7.15-38).

Table 7.15-38
VEC, Employment Impacts, Stewart

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Construction Contracts					
Notification;	Construction	Short Term	Positive	Moderate	Moderate
Posting	Operation	Medium Term	Positive	Moderate	Moderate
	Closure	Long Term	Adverse	High	Low
Operations Contracts					
Notification;	Construction	Short Term	Positive	High	Low
Posting;	Operation	Medium Term	Positive	High	High
Joint Ventures	Closure	Long Term	Adverse	High	High
Port Service Contracts					
Stewart Bulk Terminals	Construction	Short Term	Positive	High	Negligible
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High

Income Impacts, Stewart

Employment, both during construction and operations, offers the prospect of long-term sustainable employment for employees.

Income impacts on Stewart will be assured because of the town's transportation infrastructure and port facilities.

Without Red Chris

If the Red Chris Mine were not to proceed, a larger number of residents of Stewart will be available for employment at Galore Creek. The discussion below describes potential Galore Creek employment and income impacts if Galore Creek were the only mine to be developed.

Incomes from Construction

The annual income impact of construction through the year-round employment of 30 Stewart residents by contractors from 2007 through 2010 at an assumed 2005 average annual wage of $80,000 approximates:

30 persons x $80,000 = $2,400,000

Direct incomes from construction are based on 2005 data and may approximate $2,400,000 for each of three years. Wages paid for construction labour between 2007 and 2010 will likely increase because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction personnel. Commercial enterprises at Stewart suggest that indirect employment and income impacts will be experienced by Stewart businesses. Indirect employment may be expected to be generated through construction and transportation enterprises. Using BC Stats employment multipliers for the Stewart area, indirect employment from construction may amount to

(Multiplier) 30 x .22 = 7 persons

Contractors' employees may be expected to earn incomes, measured in 2005 dollars, of approximately $80,000. Indirect local incomes generated by construction of Galore Creek may approximate additional income to Stewart residents of:

(Multiplier) 7 persons x $80,000 =$560,000

NovaGold's use of local businesses, such as transportation and construction firms, suggests that indirect employment at Galore Creek may be greater than the multiplier suggests. Added to other indirect employment, it is possible that total indirect employment could reach approximately 30 persons.

Under these circumstances, total indirect employment incomes to Stewart residents could reach:

30 persons x $80,000 = $2,400,000

*Induced employment impacts***:** While employment incomes will be more stable than under seasonal employment conditions, employees will be drawn from the existing population, market size will not change, and total local incomes from construction may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.27 may be expected to generate 2 additional jobs elsewhere in the community. These jobs are likely to be centred in the private sector service economy and generating employment incomes of approximately $70,000 annually.

Incomes from Operational Employment

The annual direct income impact of operating mine employment through the full time employment of 30 Stewart residents by NovaGold from 2010 through 2030 at an assumed average annual wage of $80,000 approximates:

30 persons x $80,000 = $2,400,000

Indirect impacts from this employment income are expected to focus on the provision of goods and services to construction, transportation and port personnel. Contractors' employees may be expected to earn incomes, measured in 2006 dollars, of approximately $80,000. Assuming an employment multiplier of 1.22, indirect employment may amount to:

(Multiplier) 30 x .22 = 7 persons

Incomes generated indirectly through contractor employment may then approximate:

(Multiplier) 7 persons x $80,000 = $540,000

Incomes are based on 2005 data and may increase to new base levels because of the demand for construction labour created by numerous large construction programs in BC over the 2006-2010 period.

NovaGold's use of local businesses, such as transportation firms and port facilities, suggests that indirect employment at Galore Creek may be greater than what the multiplier suggests. Added to other indirect employment, it is possible that total indirect employment could exceed 60 persons.

Under these circumstances, total indirect employment incomes to Stewart residents could reach:

60 persons x $80,000 = $4,800,000

*Induced employment impacts***:** Employees will be drawn from the existing population, market size will not change, and total local incomes from operations may not be sufficient to generate further downstream impacts on employment and incomes. Induced employment at a multiplier of 1.27 may be expected to generate 2 additional jobs elsewhere in the community.

30 persons x 1.27 – 1.22 = 2 persons

Induced incomes are expected to approximate a total of $70,000.

Incomes Upon Closure

Closure of the Galore Creek mine will involve the termination of employment and the cessation of incomes to most of the 60 direct and indirect employees. Cessation of employment will lead to the termination of $7,200,000 of direct and indirect employment income to Stewart residents.

In the absence of alternative sources of employment, closure of the mine will involve major dislocation of local employees.

Summary of Impacts Without Red Chris Mine

Employment and income impacts of the Galore Creek project proceeding without the concurrent development of the Red Chris Mine are presented below in Table 7.15-39.

With Red Chris

If the Red Chris mine proceeds according to plan, two mines in the primary study area will offer employment. Two mines will introduce labour force competition such that fewer residents will be available for employment at Galore Creek. Assuming that the Red Chris Mine employs a significant number of Stewart residents, it is possible that the number of residents employed directly at Galore Creek may approximate 15. The discussion below describes potential Galore Creek employment and income impacts if both the Red Chris and Galore Creek mines were developed.

Table 7.15-39
Stewart, Employment and Income:
Galore Creek Proceeding without Red Chris Mine

Construction	Employment	Incomes
Direct	30	$2,400,000
Indirect	30	$2,400,000
Induced	2	$70,000
Operations		
Direct	30	$2,400,000
Indirect	60	$4,800,000
Induced	2	$70,000
Closure	1 part time	$25,000

The same multipliers apply as if Galore Creek proceeded without Red Chris.

Table 7.15-40
Stewart, Employment and Income:
Galore Creek Proceeding with Red Chris Mine

Construction	Employment	Incomes
Direct	15	$1,200,000
Indirect	25-30	$1,500,000 to $1,800,000
Induced	1	$35,000
Operations		
Direct	15	$1,200,000
Indirect	25-30	$1,500,000 to $1,800,000
Induced	1	$35,000
Closure	0	0

While some income impacts on Stewart will arise from direct employment at the Galore Creek mine, many of the income impacts will be indirect and focus of transportation, repair and port services.

The overall magnitude of employment income impacts on Stewart will be high because of the transportation and port infrastructure at Stewart (Table 7.15-41).

Traffic Impacts

When the Galore Creek Project begins operation in 2010, as many as 50 B-train truck units will be making 100 round trips along Highway 37A through Stewart to the port facilities.

The volume of truck traffic will generate traffic impacts on Highway 37A both in urban Stewart and along the highway to Meziadin Junction. The volume of truck traffic will impact on residential and tourism traffic along Highway 37A within Stewart and affect access to accommodation, restaurants and other services. Night-time truck traffic will disturb people's sleep.

Table 7.15-41
VEC, Income Impacts, Stewart

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Incomes					
Wages, Salaries	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Family Stress					
Spousal Absence	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
Indirect Impact of Employment Incomes					
Commercial and Port Facilities; Small Market Population	Construction	Short Term	Positive	High	High
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Indirect and Induced Impact of Employment Incomes					
Commercial and Port Facilities; Small Market Population	Construction	Short Term	Positive	Low	Low
	Operation	Medium Term	Positive	High	Low
	Closure	Long Term	Adverse	High	Low

The volume of traffic may be expected to generate hazards to recreational vehicles and other tourist traffic because of the narrow surface of Highway 37A. The type of traffic, its frequency, volume and noise may detract from the wilderness attributes being promoted by local and regional tourism organizations.

Closure of the mine and the elimination of truck traffic becomes a positive impact from a traffic impact perspective.

The overall impact of truck traffic, at the volumes envisaged, will be adverse and long-term (Table 7.15-42). These impacts will be experienced in both urban and rural sections of Highway 37A, although the range of impacts in urban Stewart will be broader than in rural areas.

7.15.4.6 Land Use Impacts

Traditional Land Use Impacts

From a socio-economic effects assessment perspective, land use impacts of traditional and other resource uses in the primary impact area focus on the provision of road access into areas which are currently inaccessible.

Traditional site-specific fishing sites will not be impacted by the Galore Creek Project because no change in accessibility occurs because of mine development.

Table 7.15-42
VEC, Traffic Impacts, Stewart

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Traffic Volumes, Noise					
Frequency; Interference with Access to Accommodation and Other Services in Downtown Stewart	Construction	Short Term	Adverse	Low	Negligible
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Neutral	Low	Negligible
Truck noise Impairing resident and tourist sleep patterns	Construction	Short Term	Adverse	Low	Negligible
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Neutral	Low	Negligible
Traffic Hazards					
Increased opportunity for traffic accidents	Construction	Short Term	Adverse	Low	Negligible
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Neutral	Low	Negligible
Wilderness					
Threat to Wilderness Perceptions and Marketing	Construction	Short Term	Adverse	Low	Negligible
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Neutral	Low	Negligible

The creation of new road access will, however, facilitate First Nation access into traditional territory not easily or regularly accessed in the past. The construction of the access road to the mine site will increase the ability of Tahltan members to access hunting and trapping areas which were previously inaccessible or accessible only with difficulty.

Road access will also increase the ability of Tahltan members to access sites adjacent to the road to harvest mushrooms, berries, medicinal and other plants (Table 7.15-43).

Commercial Land Use Impacts

The Galore Creek Project will impact on three established guiding and outfitting establishments who cater primarily to out-of-country hunters and fishermen. Access to wilderness landscapes is an important contributor to the experience and appeal of the area.

Construction and operation of the access road may be expected to detract from the wilderness landscape marketed by local and regional guiding and outfitting establishments. One operator indicated that exploration activity itself has discouraged one repeat customer from returning. The two established guiding and outfitting businesses in the impact area are available for sale; as is Telegraph Creek based river touring operation.

While construction will generate activity and noise, which will detract from hunter success in some areas, the greatest impact on land use will be experienced by guiding and outfitters by the construction of the mine access road. The mine access road will facilitate increased access into areas not easily accessed in the past and may generate adverse and long-term impacts to guiding and outfitters. NovaGold will install controlled gates to limit access except to Tahltan members.

Table 7.15-43
VEC, Traditional Land Use Impacts

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Traditional Fishing Sites and Areas					
Increased access to Traditional Fishing Sites, Areas	Construction	Short Term	Neutral	Nil	Negligible
	Operation	Medium Term	Neutral	Nil	Negligible
	Closure	Long Term	Neutral	Nil	Negligible
	Post Closure	Far Future	Neutral	Nil	Negligible
Traditional Hunting Areas					
Increased access by Non-Residents	Construction	Short Term	Adverse	Low	Low
	Operation	Medium Term	Adverse	Low	Low
	Closure	Long Term	Adverse	Low	Low
	Post Closure	Far Future	Adverse	Unknown	Unknown
Traditional Trapping Areas					
Increased Access by Tahltan; Noise	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
	Post Closure	Far Future	Adverse	Unknown	Unknown
Commercial Fishing Sites and Areas					
Increased access to Traditional Fishing Sites, Areas	Construction	Short Term	Neutral	Nil	Negligible
	Operation	Medium Term	Neutral	Nil	Negligible
	Closure	Long Term	Neutral	Nil	Negligible
	Post Closure	Far Future	Neutral	Unknown	Unknown
Botanicals					
Increased Access to Sites	Construction	Short Term	Positive	Moderate	Low
	Operation	Medium Term	Positive	Moderate	Low
	Closure	Long Term	Positive	Moderate	Low
	Pot Closure	Far Future	Positive	Unknown	Unknown

Commercial land uses in Stewart will be affected by the volume and noise of truck traffic operating 24 hours per day. Increased accidents, access to tourism facilities, disturbed sleep patterns and perceptions of the northwest as wilderness will be affected by the volume and frequency of trucks transporting concentrate to Stewart port facilities.

The marketing of wilderness is a feature of Stewart based tourism promotion. This promotion focuses broadly on wilderness, touring, wildlife viewing and winter sports of snowmobiling and heli-skiing. Much of the impact on wilderness and its associated connections appears to focus on truck traffic rather than the mine itself.

7.15.5 Socio-Economic Impacts on the Secondary Impact Areas: Smithers and Terrace

Smithers and Terrace are the two communities likely to acquire the largest array of economic benefits from the development of the Galore Creek mine. Each of these communities has direct air and road connections to Dease Lake.

Table 7.15-44
VEC, Commercial Land Use Impacts

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Guiding and Outfitting					
Increased disturbance to perceptions of wilderness	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Low
	Post Closure	Far Future	Adverse	High	Low
Removal of wildlife resources due to increased hunter access	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Moderate
	Post Closure	Far Future	Adverse	High	Moderate
Commercial Land Uses in Stewart					
Truck traffic impacts on tourism facilities	Construction	Short Term	Adverse	Low	Negligible
	Operation	Medium Term	Adverse	High	High
	Closure	Long Term	Positive	Low	Negligible
	Post Closure	Far Future	Positive	Low	Negligible

Terrace, with a population of 12,565 in 2004, is slightly closer to Dease Lake than is Smithers. Terrace has historically provided a broad range of goods and services to Tahltan communities, and residents of the primary impact area tend to visit Terrace for health (dental, chiropractic, and others), vehicle purchase and repair, shopping, construction services and a multitude of other goods and services.

Smithers, with a population of 5,637 in 2004, has developed as a mine service centre offering a range of diamond drilling, industrial construction, mine supply, fuel, explosives and other goods and services to the mining industry.

Smithers and Terrace each have economic development strategies geared towards community growth and economic diversification. Each community possesses municipal, health, education and government infrastructure which can accommodate an increase in population and larger service roles.

For their similarities, however, there are differences between Smithers and Terrace. Terrace is more resource dependent than Smithers; Smithers is more service oriented. Terrace experienced much greater economic hardship in the late 1990s and early 2000s than did Smithers; Smithers recovery from economic hardship has proceeded much more quickly than has been the case with Terrace. Terrace is much more of an industrial centre than is Smithers. As a generalization, the Smithers population appears to be better educated, less occupationally confined and more mobile than the Terrace population. The population in January, 2006 receiving income assistance was significantly higher in Terrace than Smithers.

Economic Development

From an economic development perspective, Smithers and Terrace will benefit directly from employment and indirectly from the Galore Creek project through construction and operating

contracts. These contracts include the provision of both goods and services and may include, among others, contract drilling, construction services, vehicle maintenance and repair, explosives, fuels, engineering services, employee training services, and wholesale goods ranging from food through office supplies to safety clothing and supplies.

The effect of these contracts, which have long term implications, will be to create a demand for indirect employment.

Any influx of people to Smithers or Terrace will generate demand for housing and infrastructural services. Municipal, education and health infrastructure and services are sized to accommodate any anticipated population growth arising from the Galore Creek Project.

Impacts of economic development on population, housing and municipal infrastructure arising from construction are likely to be limited, while economic development impacts arising from operation are likely to be positive, long term and of low magnitude (Table 7.15-45).

Table 7.15-45
VEC, Economic Development Impacts, Smithers and Terrace

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Population and Housing					
Population Growth;	Construction	Short Term	Neutral	Low	Nil
Business Growth;	Operation	Medium Term	Positive	High	Low
Housing Demand	Closure	Long Term	Adverse	High	Low
Municipal Infrastructure					
Utilities;	Construction	Short Term	Neutral	Low	Nil
Education;	Operation	Medium Term	Positive	High	Low
Health;	Closure	Long Term	Adverse	High	Low
Recreation					

Business Opportunity Impacts

The construction and operation of the Galore Creek Project represents opportunity for Smithers and Terrace businesses to acquire contracts to provide goods and services to NovaGold. These contracts include the provision of both goods and services and may include, among others, contract drilling, construction services, vehicle maintenance and repair, explosives, fuels, engineering services, employee training services, and wholesale goods ranging from food through office supplies to safety clothing and supplies.

Unlike firms in the Primary Impact Area, firms in Smithers and Terrace are knowledgeable of, and experienced in, contractor policies, procedures and qualifications for accessing contracts.

Construction of Galore Creek may impact Smithers and Terrace based construction, service and supply firms. The overall magnitude of business development impacts on Smithers and Terrace will be major and long term. The impacts of closure on Smithers and Terrace businesses in 2030

are expected to be adverse but, because of the communities' greater economic size and diversity, impacts are expected to be of intermediate magnitude (Table 7.15-46).

Table 7.15-46
VEC, Business Opportunity Impacts, Smithers and Terrace

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Construction Contracts					
Notification; Posting	Construction	Short Term	Positive	High	Moderate
Operations Contracts					
Notification; Posting	Construction	Medium Term	Positive	High	Moderate
Closure Contracts					
Notification; Posting	Closure	Long Term	Adverse	High	Moderate

Employment Impacts

Direct employment by NovaGold of residents of Smithers and Terrace will be affected, among other factors, by the demand for labour, familiarity with mining and the proximity of alternative sources of employment.

In 2005, NovaGold employed two First Nations residents of Smithers and nine First Nation residents of Terrace at Galore Creek. Eskay Creek employs approximately 10 residents of Smithers and Terrace of a total employment of approximately 140 persons. Other Smithers residents are employed at the Huckleberry and Kemess mines.

The closure of the Huckleberry and Eskay Creek mines will mean that by 2007, 142 persons currently employed will be available for work, and by 2008, 213 mine employees resident of Highway 16 communities between Houston and Prince Rupert will be available for work. In 2007, the largest pools of available workers will come from Smithers (74 persons) and Terrace (42 persons). In 2008, 99 of these employees will live in Smithers; 72 in Houston, 10 in Terrace and 32 in other Highway 16 communities (G.E. Bridges and Assoc., 2005).

Closure of the Huckleberry and Eskay Creek mines may be compensated by the opening of the Red Chris mine if that mine were to be developed. The direct employment by NovaGold of employees from Smithers may be restrained by potential employment at the nearby Blue Pearl molybdenum site.

Opportunities for employment between 2007 and 2010 in the Terrace/Kitimat/Prince Rupert area suggest that by 2010, there will be a smaller pool of labour in these communities to draw on for employment at Galore Creek. During construction of the Galore Creek project, most employment will be generated from local contractors of goods and services.

During operation of the Galore Creek mine, recognizing alternative employment opportunities, it is reasonable to estimate that as many as 190 of the 213 available employees could be employed

at Galore Creek (Table 7.15-47). Terrace residents employed at Eskay creek are more likely than Smithers residents to dominate hires in 2007. Smithers and Houston residents employed at Huckleberry are more likely than Terrace residents to dominate hires in 2008. Overall, and assuming the current distribution of mining employment, Galore Creek operations may employ 190 residents distributed accordingly.

Table 7.15-47
Galore Creek, Potential Hires, Highway 16 Communities

Community	Potential Hires (Direct)	Indirect Employment	Percentage of Total Hires, Highway 16 Communities
Smithers	93	29	48.7%
Houston	42	13	22.3%
Terrace	28	8	14.7%
Other Highway 16 Community	27	8	14.3%
Total Highway 16 Communities	190	58	100.0%

Direct impacts on Highway 16 communities from NovaGold employment during construction are believed to be limited (Table 7.15-48). Most employment impacts are expected to be generated indirectly from the provision of goods and services by a spectrum of construction, service, supply, and other contractors.

Assuming the application of BC Stats multipliers for indirect employment impacts, indirect employment accruing to Highway 16 communities may approximate 58 persons. Half of all indirect employment is expected to accrue to Smithers, where mine supply and service capabilities in northwestern BC tend to be concentrated.

Assuming induced employment multipliers ranging from 1.48 (Smithers) to 1.41 (Terrace), total induced employment for Highway 16 communities may range from 24 to 28 persons. As in the case of indirect employment, about half of induced employment is expected to accrue to Smithers.

Table 7.15-48
VEC, Employment Impacts, Smithers and Terrace

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Galore Creek Employment (Direct)					
Employment at Mine Site	Construction	Short Term	Positive	Medium	Moderate
	Operation	Medium Term	Positive	Medium	Moderate
	Closure	Long Term	Adverse	Low	Moderate
Contractor Employment (Indirect)					
Employment by Suppliers of Goods and Services	Construction	Short Term	Positive	High	Low
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	Moderate

If the recent history of mine employment holds into the future, Galore Creek will draw direct employees from across British Columbia. While residents in the primary impact communities will have the first opportunity to acquire employment at Galore Creek, a significant percentage of Galore Creek employment will be drawn from Highway 16 communities in order to address potential labour shortages. Overall impact on employment will be positive until mine closure when termination of employment will create an adverse impact on individuals and the community.

Income Impacts, Smithers and Terrace

Incomes from Construction

Incomes from employment accruing to Smithers and Terrace residents will be indirect, from contractors to NovaGold rather than from NovaGold directly.

Incomes from Operations

During operations, the employment of approximately 190 persons with average annual earnings of $80,000 suggests that as much as $15,200,000 will accrue to Highway 16 employees and communities.

Indirect employment of 58 persons earning an average of $60,000 per year will generate $3,480,000 of income.

Induced employment may generate five jobs elsewhere in the community.

It is anticipated that approximately half of incomes will accrue to Smithers residents.

Incomes upon Closure

In the absence of alternatives, closure of the Galore Creek mine will involve the termination of employment and the cessation of incomes to most employees. Closure of the mine will involve major dislocation of local employees.

Health Impacts

While more residents of Terrace, than of Smithers, are likely to be employed at Galore Creek, the number of employees will be small compared to the size of the communities.

BC Stats' Index of Hardship for Smithers suggests less dependency on resources and a population base less characterized by industrial employment than Terrace. Smithers' larger service role has also contributed to a population which is better educated than that of Terrace.

Major construction projects in northwestern BC between 2006 and 2010, and revitalization of forest products establishments at Terrace may be expected to alleviate, over both the short and long term, some of the health and social issues related to unemployment and income assistance at Terrace. The high index of economic hardship for Terrace may be expected to decline.

Due to the size of the communities and the small number of persons who are likely to be employed at Galore Creek, impacts of Galore Creek on community health issues in Smithers and Terrace are expected to be minor (Table 7.15-50).

Table 7.15-49
VEC, Income Impacts, Smithers and Houston

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Incomes					
Wages, Salaries	Construction	Short Term	Positive	High	Moderate
	Operation	Medium Term	Positive	High	High
	Closure	Long Term	Adverse	High	High
Family Stress					
Spousal Absence	Construction	Short Term	Adverse	High	Moderate
	Operation	Medium Term	Adverse	High	Moderate
	Closure	Long Term	Adverse	High	Low
Indirect Impact of Employment Incomes					
Provision of Goods and Services	Construction	Short Term	Positive	Moderate	Moderate
	Operation	Medium Term	Positive	Moderate	Moderate
	Closure	Long Term	Adverse	Moderate	Moderate
Induced Impact of Employment Incomes					
Provision of Goods and Services	Construction	Short Term	Positive	Moderate	Low
	Operation	Medium Term	Positive	Moderate	Low
	Closure	Long Term	Adverse	Moderate	Low

Table 7.15-50
VEC, Health Impacts, Smithers and Terrace

Component	Timing	Duration	Direction	Probability	Magnitude of Impact
Index of Hardship					
Indices of Health Problems, Crime, Economic Hardship, Education Concerns, Children and Youth at Risk	Construction	Short Term	Neutral	Low	Low
	Operations	Medium Term	Positive	Low	Low
	Closure	Long Term	Adverse	Moderate	Moderate

7.15.6 Tertiary Impact Area

British Columbia Input-Output Model

An input-output analysis was undertaken by BC Stats to assess the economic impact of a gold mining operation at Galore Creek.

The 2001 British Columbia Input-Output Model (BCIOM) was used to generate the results.

Table 7.15-51
Galore Creek Mine, Input-Output Modelling

	No Safety Net				Safety Net			
Galore Creek Gold Mine	**Direct**	**Indirect**	**Induced**	**Total**	**Direct**	**Indirect**	**Induced**	**Total**
Output ($M)	226.8	172.7	61.3	460.9	226.8	172.7	29.5	429.1
GDP ($M)	46.3	71.5	33.6	151.4	46.3	71.5	16.2	134.0
Employment (#)	553	1,044	546	2,143	553	1,044	263	1,859
Household Income ($M)	45.8	48.1	21.4	115.3	45.8	48.1	10.3	104.2
Tax Revenue ($M)	26.1	12.3	11.1	49.4	23.5	10.3	5.0	38.9
Federal ($M)	12.5	5.6	4.5	22.6	10.6	4.2	2.0	16.8
Provincial ($M)	12.2	5.7	5.3	23.1	11.4	5.1	2.5	19.0
Municipal ($M)	1.5	1.0	1.2	3.7	1.5	1.0	0.6	3.0

All results are presented in millions of dollars, except for the employment numbers

Estimates generated by the BCIOM

The economic impact of a change in the demand for a commodity or group of commodities is made up of the following three components:

The direct effect, which measures the change in domestic output required to satisfy an initial change in demand. This would include the actual expenditures and the employment directly generated in the scenario.

The indirect effect, which measures the change in domestic output generated by the activity of sectors that supply goods and services used in the direct activities.

The induced effect, which measures the overall impact of more income accruing to the household sector. It is assumed that BC residents spend 80% of their gross earned income on goods and services. The safety net estimates assume that a social safety net is in place, so that workers employed by the project had some income from Employment Insurance (EI) or other safety net programs before they were hired to work on the project. In the no safety net scenario, it is assumed that workers had no source of income prior to their employment. In most cases, the safety net scenario is more realistic than the no safety net scenario.

Economic impacts take a number of forms; specifically:

- Output is the simple sum of all expenditures in the BC economy that result from the project under study. However, this figure to some extent exaggerates the impacts because the purchase of finished products often involves the purchase of components of those products at some earlier stage in the overall production process.
- Labour income is the total amount of income that accrues to households because of employment generated by the activities under study.

- Gross Domestic Product (GDP)[7] is a measure of the value added (the unduplicated total value of goods and services) to the BC economy by current productive activities attributable to the project and taking place within the province.
- Provincial and Federal Revenues are estimates made up of the provincial and federal shares of personal income taxes and commodity taxes (PST and GST), as well as other commodity taxes such as gas taxes or air transportation tax.

Input Information

The data inputs used for this study were provided to BC Stats by Calibre Strategic Services Inc. NovaGold provided the breakdown of costs by commodity, and these were used as direct inputs into the model. The data was used "as is", with the exception of communications expenditures which were allocated to telephone and telecommunications, on-line information services, and postal services. It was assumed that virtually all (90%) of this expenditure item was telephone and telecommunications services, with the remainder split evenly across the other two categories.

The GDP (wages, salaries, benefits and profits) associated with the direct expenditures of the operating mine ($227 million) is just over $46 million (Table 7.15-51), and the mine will employ 553 people. Government revenues from the direct operation of the mine are estimated at $26 million, with both the federal ($13 million) and provincial ($12 million) governments deriving similar revenues from personal and corporate income taxes, plus GST and PST. Property taxes will put $1.5 million into local government coffers.

The PST, GST and property tax data associated with the mine operation was supplied by the client; other tax revenue estimates were generated by the model.

Industries supplying goods and services used in mining operations will produce an additional $173 million in output. Their contribution to GDP is estimated at $72 million and the number of people working in these supplier industries is estimated at 1,044.

Purchases of mining-related services from contractors represent a substantial portion of total mine operating costs. The GDP and employment associated with these contracted services is considered an indirect effect of the mine operation, since the mine has not actually hired the people who are doing the contracted work. This is why the indirect GDP and employment associated with the mine operation are higher than the direct figures. Tax revenues derived from the activities of supplier industries are estimated at about $12 million with the federal and provincial governments each receiving about $6 million. Increased spending by workers is expected to generate an additional $30 million of output (using the safety net scenario), and $16 million in GDP, and provide employment for about 265 people.

[7] It should be noted that direct GDP figures produced by the BCIOM are derived from information provided by clients. These figures are usually project-specific, but they are not always based on complete information. For example, it is often possible to get good data on wages and salaries associated with a project or activity. Labour costs are the biggest component of GDP, but other variables which ought to be included in the estimate (such as investment income, operating surplus, or depreciation) are not always known. When the GDP figures generated by the BCIOM are based on partial information, they may understate the project/activity's direct contribution to GDP.

Assumptions and Caveats

From an Input-Output perspective, commodities made in BC have a much bigger impact than those imported into the province. The analysis presented here is based on using default import ratios for most commodities: *i.e.*, assuming they are purchased locally, but allowing for the fact that they may have been manufactured elsewhere.

All tax data were generated using the model structure, and are based on averages for an industry or commodity.

The precision of the figures in the tables should not be taken as an indication of their accuracy. Economic modelling is an imprecise science and the estimates in this report are probably no better than +/- 10%.

Limitations and caveats associated with input-output analysis

Input-output analysis is based on various assumptions about the economy and the inter-relationships between industries. These assumptions are listed below:

Input-output models are linear. They assume that a given change in the demand for a commodity or for the outputs of a given industry will translate into a proportional change in production.

Input-output models do not take into account the amount of time required for changes to happen. Economic adjustments resulting from a change in demand are assumed to happen immediately.

It is assumed that there are no capacity constraints and that an increase in the demand for labour will result in an increase in employment (rather than simply re-deploying workers).

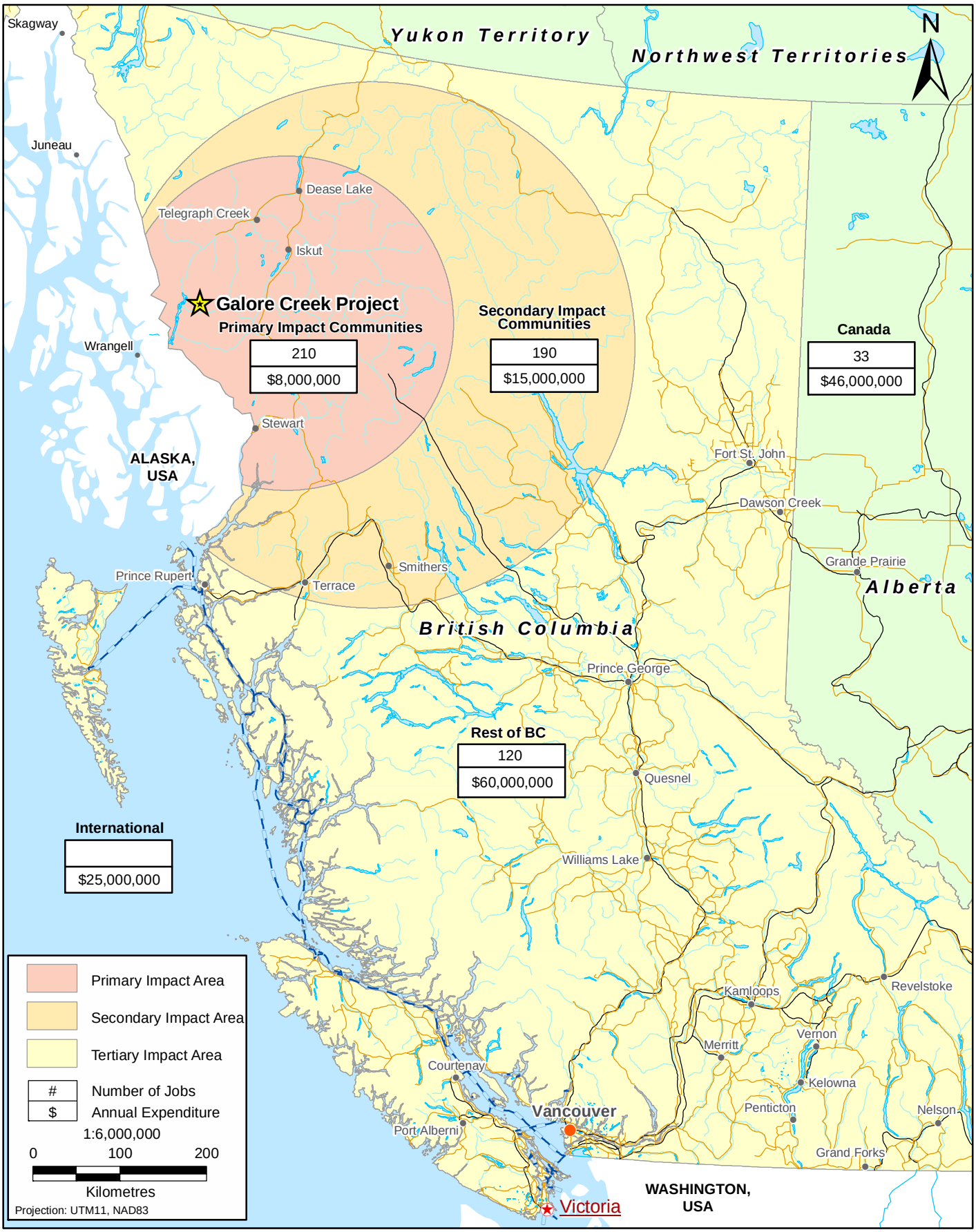
It is assumed that consumers spend an average of 80% of their personal income on goods and services. The remaining 20% of personal income is consumed by taxes, or goes into savings.

The BCIOM is based on a "snapshot" of the BC economy in 2001. It is assumed that relationships between industries are relatively stable over time, so that the 2001 structure of the economy continues to be applicable today. However, it should be noted that employment estimates have been adjusted to reflect wage levels for the year of the expenditures in each case.

The BCIOM does not distinguish between regional effects. It will not, for example, differentiate between the economic impact of a plant located in one region of the province and a similar plant elsewhere in BC.

7.15.7 Impact Mitigation

NovaGold and the Tahltan Central Council have signed a Participation Agreement to minimize potential adverse impacts from the Galore Creek project and to enhance opportunities for the Tahltan. These impact mitigation measures apply to the Tahltan communities of Dease Lake, Iskut and Telegraph Creek.



Distribution of Employment and Expenditures

FIGURE 7.15-1

NovaGold Canada Inc.

Rescan™

Calibre Strategic Services Inc.

From a socio-economic impact perspective, the Participation Agreement addresses the following major issues:

- Employment
- Economic Development and Sustainability
- Workplace Environment
- Business Opportunities
- Culture
- Education
- Communications
- Land Use

These major issues include components or sub-issues. These components, many of which reflect holistic interpretations of health and wellness by both the Tahltan and Canada Health, form the basis of the mitigation program.

7.15.7.1 Enhancement and Mitigation of Socio-Economic Impacts on Tahltan Communities

The NovaGold – Tahltan Nation Participation Agreement for the Galore Creek mine encompasses a range of mitigation measures, described below, which address potential socio-economic impacts on the Tahltan Nation.

Communications

NovaGold will continue a relationship with the Tahltan Central Council of joint co-operation and mutual respect that they have established in respect of the Galore Creek project. This relationship includes the participation and input of the Tahltan Nation through the Tahltan Heritage Resources and Environmental Assessment Team (or "THREAT"). The communications channel will facilitate communication from the Tahltan Nation through THREAT to identify potentially adverse effects and impacts of the project on Tahltan Nation title, rights and interests and determine how to avoid or minimize such impacts and effects.

NovaGold and the Tahltan Nation will maintain effective communications between each other, and will develop plans to ensure that Tahltan Members remain informed about:

- the rules and regulations governing project facilities;
- business opportunities;
- environmental performance by NovaGold;
- timing of project phases;
- use of the access road, and
- other issues of concern to the parties relating to the project.

Land Use

NovaGold will make reasonable efforts to have the Access Road designated by the provincial government as a statutory right-of-way or private road, or to make reasonable efforts to incorporate the joint principles developed in the Road Protocol, as outlined below, into any road permit(s) issued to NovaGold.

NovaGold and the Tahltan Central Council will jointly develop procedures and protocols relating to the use of the Access Road. The Road Protocol will provide for, among other items:

- the establishment of a gate at the entrance to the Access Road, to be operated and monitored by NovaGold personnel, to oversee access;
- guidelines for NovaGold to provide surface access rights to third parties;
- a process for providing access to the Tahltan Nation and Tahltan Members who wish to use the Access Road to access traditional use areas, and for other reasonable purposes agreed to by NovaGold and the Tahltan Nation; and
- a process for advance notice to NovaGold for use of the Access Road by any such third parties.

Use of the Access Road by the Tahltan Nation and Tahltan Members will be at their own risk. NovaGold may implement reasonable safety and operational measures in order to regulate the use of the Access Road by the Tahltan Nation and Tahltan Members.

Traditional Knowledge

After the commencement of construction, NovaGold will fully consider and use Traditional Knowledge made available by the Tahltan Nation in connection with project planning, design and implementation, including any environmental policies, environmental management plans and the Environmental Management System, and in making permit applications.

Human Resources and Employment

NovaGold has, in collaboration with the Tahltan Central Council, agreed to:

- maximize employment, retention and advancement opportunities for Tahltan Members in all categories of employment at the project;
- reduce barriers for employment, retention and advancement of all Tahltan Members in all categories of employment at the project;
- maximize training opportunities for all Tahltan Members during the initial hiring and ongoing hiring phases so that as many willing Tahltan Members seeking employment as are possible are able to qualify for employment positions in all categories of employment at the project; and
- ensure that the above referenced objectives apply fairly and equally to all Tahltan Members.

These objectives will be achieved through:

Human Resources (HR) Inventory

NovaGold will provide funding to the Tahltan Nation for the creation of a Tahltan Nation human resources inventory or database and to hire a Tahltan Employment Coordinator, mutually agreed upon between the Tahltan Nation and NovaGold to:

- outline expected NovaGold jobs, and related qualifications, available at the project and anticipated start dates;
- develop a list of Tahltan Members available to work at the project and the desired area of employment; and
- document results of prior learning assessments to determine appropriate training needs for Tahltan Members to match with NovaGold jobs.

The HR Inventory will be established within 30 days after completion of the feasibility study and will be maintained by the Tahltan Nation. The Tahltan Nation will ensure that the HR Inventory is kept current for the employment and business needs of the project. The HR Inventory will be owned by the Tahltan Nation who has the primary management responsibility to gather, manage and maintain the HR Inventory. The Tahltan Nation will share the HR Inventory, including information in it about potential Tahltan Member candidates with NovaGold for the purposes of meeting the provisions of the agreement related to Tahltan Nation preferential hiring and the anticipated timing for recruiting.

Human Resources (HR) Strategy

NovaGold will prepare an initial Human Resources Strategy for review and discussion with the Tahltan Nation. This HR Strategy will:

- describe the process by which NovaGold will seek to maximize job opportunities for Tahltan Members related to the project;
- discuss the use of prior learning assessments in evaluating Tahltan Members as potential job candidates for NovaGold;
- comment on ideas or strategies for ensuring that employment opportunities connected to the project are maximized for Tahltan Members;
- propose an initial fixed target of employment level for Tahltan Members;
- identify the type of training needs that NovaGold may consider to enable Tahltan Members to qualify as suitable job candidates; and
- outline an initial training program that will be designed on a reasonable and cost effective basis to deliver appropriate training to allow those Tahltan Members who have demonstrated to NovaGold a genuine commitment to securing long-term employment with the project to complete such training in time for the initial hiring process.

Fixed Targets for Employment and Advancement of Tahltan Members

As part of completing the HR Strategy, and thereafter through the establishment of a Human Resources Committee to maximize the proportion of Tahltan Members employed in NovaGold

Jobs, NovaGold and the Tahltan Central Council agree to establish a fixed target for employment and advancement to be met or exceeded by NovaGold.

The fixed target will not act as a quota nor will the achievement of the fixed target be legally enforceable. However, NovaGold will take all reasonable steps, acting in good faith to meet or exceed the fixed target. This obligation to take all such reasonable steps, acting in good faith, is legally enforceable.

Initial Hiring for Project Jobs: Preferential Hiring to Tahltan Members

Prior to pursuing an open competition for, or otherwise filling, any NovaGold Jobs, NovaGold will provide preferential hiring to Tahltan Members for all initial hiring of NovaGold jobs in respect of the project. This preferential hiring will be done through the following job posting system that will provide Tahltan Members with priority consideration for all available jobs except specified management jobs that NovaGold will identify in advance to the Tahltan Nation:

- NovaGold will provide reasonable advance notice to the Tahltan Employment Coordinator of each job posting and the timeframe for filling it;
- the Tahltan Employment Coordinator will use the HR Inventory, prior learning assessments and the HR Strategy, to identify appropriate Tahltan Members who qualify as potential job candidates and fairly evaluate candidates that are significantly qualified but have minor deficiencies that could be appropriately addressed with either short-term pre-employment or on-the-job training;
- NovaGold will review the list of Tahltan Member candidates provided to it and, acting reasonably, offer jobs to such qualified candidates; and
- in circumstances where short-term training has been identified as a need to qualify a candidate, NovaGold will provide this training if it concurs, acting reasonably, with the judgment made by the Tahltan Employment Coordinator that the identified minor deficiency can be addressed with training.

Ongoing Hiring for NovaGold Jobs: Preferential Hiring toTahltan Members

After the completion of Initial Hiring, NovaGold will provide preferential hiring to Tahltan Members of NovaGold jobs:

- NovaGold will use reasonable best efforts to notify, in advance, each of its existing employees that are Tahltan Members of a job vacancy and the timeframe for filling it.
- Concurrent with this notice to its existing employees, NovaGold will also advise the Tahltan Nation of the job vacancy and the timeframe for filling it.
- NovaGold, acting reasonably, will offer the job to the best qualified existing employee that is a Tahltan Member and, in circumstances where training has been identified as a need to qualify the candidate, NovaGold will provide training if it considers that the identified minor deficiency can be addressed with training.
- If the vacancy is not filled by an existing employee who is a Tahltan Member, NovaGold will post the job vacancy to the balance of NovaGold's existing employees.

- If the vacancy is not filled by a non-Tahltan existing employee, NovaGold will consider for employment Tahltan Member candidates, who are not currently employees provided to it by the Tahltan Nation, and provide for the training that may be required.
- If the job continues to remain vacant, NovaGold will be free to advertise the job in the public domain.

The Human Resources Committee

The Human Resources Committee (HRC), comprising representatives from NovaGold and the Tahltan Nation, will have the following mandate and responsibilities:

- to provide a collaborative forum for open and frank dialogue between NovaGold and the Tahltan Nation and to share information about the Tahltan Nation's human resource objectives as they relate to NovaGold Jobs and as provided in the Particpiation Agreement, including employment opportunities, workplace conditions and training needs;
- to review, from time to time as the HRC deems appropriate, the HR Strategy developed by NovaGold for the Initial Hiring of NovaGold Jobs with a view to revising the HR Strategy to continue to maximize the opportunities for NovaGold Jobs for Tahltan Members. This review may also include consideration of the general advancement of Tahltan Members within the workplace as compared to the rest of the employee base and analyze reasons for success or failure;
- to receive progress reports from NovaGold with respect to its obligations and make appropriate recommendations for improving performance;
- to make recommendations to NovaGold on human resources and workplace policies as they relate to the Tahltan Nation's concerns or interests. In particular, as an initial policy task, the HRC will develop the following policies for recommendation to NovaGold:
  - a bereavement policy; and
  - a policy for Tahltan cultural activities;
- balance the interests of NovaGold's Tahltan employees to reasonable amounts of paid and unpaid leave with NovaGold's interest in ensuring the normal day-to-day needs of the project's operations are maintained.

Workplace Commitments

NovaGold will promote a safe and respectful workplace culture for all of its employees and contractors during all project phases. In particular, NovaGold agrees that it will during the Commercial Production Phase:

- provide cross-cultural training related to the Tahltan Nation culture for all employees;
- implement an anti-discrimination policy;
- provide free round-trip transportation to and from the Mine Site for Tahltan Members, on a scheduled basis, to Telegraph Creek, Dease Lake and Iskut and other designations to be determined solely by NovaGold;

- create an Occupational, Health & Safety Committee in accordance with applicable law and ensure that this committee reserves at least 2 positions for interested Tahltan Members who are NovaGold employees;
- provide work-site counseling and an employee assistance program for all employees, which will be designed to include addressing specific Tahltan Nation concerns and coordination of counseling provided off-site by the Tahltan Nation; and
- promote awareness in the workplace of the cultural significance of October 18 to Tahltan Members by holding celebratory events in the workplace as may be recommended by the Human Resources Committee so long as such events do not unreasonably interfere with the project's operational needs.

Workplace Policies Related to Bereavement and Tahltan Cultural Activities

As soon as reasonable after the Commencement of Commercial Production, NovaGold will establish a general bereavement policy, which will entitle all employees, including Tahltan Members, to take paid bereavement leave in accordance with applicable employment legislation. In addition, NovaGold agrees that its employees that are Tahltan Members will be entitled to take unpaid bereavement leave based on a Tahltan Bereavement Policy to be developed by NovaGold with reference to recommendations made by the Human Resources Committee.

As soon as reasonable after the Commencement of Commercial Production, NovaGold will establish a general vacation policy, which will entitle all employees, including Tahltan Members, to paid vacation in accordance with applicable employment legislation. In addition, NovaGold agrees that its employees that are Tahltan Members will be entitled to take unpaid leave to pursue Tahltan cultural activities based on a Tahltan Cultural Activities Policy to be developed by NovaGold with reference to recommendations made by the Human Resources Committee.

Tahltan Business Opportunities

NovaGold and the Tahltan Central Council collaboratively seek to:

- identify business opportunities aimed at developing the delivery of long-term sustainable opportunities and benefits to Tahltan businesses;
- maximize the business opportunities available for Tahltan businesses; and
- set out processes that NovaGold will follow to facilitate the involvement of Tahltan businesses in supplying goods and service to the project.

The Tahltan Nation will establish a registry of the existing Tahltan businesses that may be interested in supplying goods or services to the project. This business registry will be updated, from time to time, by the Tahltan Nation.

Advance Notice of Business Opportunities

Construction

At least 6 months prior to the expected date for the Commencement of Construction, NovaGold will develop and provide a copy to the Tahltan Nation of a list of contracts that it anticipates seeking requests for proposals (RFPs) from interested persons with respect to the Construction

Phase. This list will outline the nature of the work, the term and the estimated dollar value of each RFP based on NovaGold's evaluation of current market conditions.

Operations

After the Commencement of Commercial Production, NovaGold will develop and provide a copy to the Tahltan Nation a list of contracts for which it anticipates seeking RFPs from interested Persons for the upcoming Year. This list will outline the nature of the work, the term and the estimated dollar value of each RFP based on NovaGold's evaluation of current market conditions.

Pre-qualification

Tahltan Businesses that wish to supply goods or services to the project will be encouraged to pre-qualify with NovaGold, through the pre-qualification process established by NovaGold, from time to time with respect to sufficient capacity, human resources and financial viability that is applicable to all potential contractors.

Contract Opportunity Preferences for TNDC Businesses

Subject to meeting the criteria for verification as a Tahltan Business TNDC Businesses will have a preferential right to negotiate with NovaGold for the following types of contracts in advance of any others ("TNDC Preferred Opportunity"):

Construction Phase

- long-term camp catering and camp support (other than short-term contracts where the short-term contractor provides its own catering or support needs as part of its overall service);
- road construction (other than defined exempt contracts);
- road maintenance or snow removal on any completed road(s);
- earthwork in Galore Creek (other than defined exempt contracts);
- environmental monitoring programs; and
- ground (people) transport;

Commercial Production Phase

- camp catering and camp support;
- concentrate haulage;
- road maintenance or snow removal;
- environmental monitoring programs; and
- ground (people) transport.

Contract Opportunity Preferences for Tahltan Businesses

Subject to meeting the criteria for verification as a Tahltan Business, NovaGold and the Tahltan Central Council agree that for any Tahltan Businesses the following types of Commercial

Production Phase contracts will be subject to a preferential right for a Tahltan Business to engage in Open Book Negotiations with NovaGold:

- heavy equipment service;
- avalanche control;
- local food supply;
- contract mining;
- design drafting;
- power line maintenance;
- concentrate pipeline maintenance;
- logging;
- home-based manufacturing (*i.e.* clothing, gloves, etc.); and
- small business opportunities.

Addressing Tahltan Social and Cultural Objectives

NovaGold proposes to provide financial consideration to the Tahltan to address and mitigate the potentially adverse social and cultural impacts that the project may have over time to the Tahltan Nation. NovaGold proposes that a Tahltan Heritage Trust (the Trust) be established for the management and distribution of funds in order to maximize benefits to the Tahltan Nation and Tahltan Members. Through this Trust the Tahltan Nation will establish priorities and maintain decision-making authority over the expenditure of monies.

Proposed responsibilities of the Tahltan Heritage Trust include, among others:

- priority payments from the Trust for costs incurred by the Tahltan Nation in respect of implementing, monitoring and maintaining its obligations and benefits set out in the proposed Participation Agreement, including the maintenance of the Human Resource Inventory, participation on all committees, resolving Disputes, if any, ongoing environmental monitoring and ongoing monitoring of employment, training and business opportunities;
- priority payments in respect of environmental rehabilitation and habitat enhancement;
- fair allocation of payments and benefits to the whole of the Tahltan Nation and for all Tahltan Members, including the communities of Telegraph Creek, Dease Lake and Iskut;
- a fair and clear allocation and distribution procedure for the review and prioritization of the needs of the Tahltan Nation that includes representation in such process from among the communities of Telegraph Creek, Dease Lake, Iskut and from among other Tahltan Members;
- prudent, long term investments made by the Trustee in order to protect the interests of future generations; and

- distributions from the Trust made for Tahltan Nation governance and community development purposes which will include, but not be limited to, education, training, capacity development, housing, health, health education and economic development for all Tahltan Members, residing both on and off reserve lands;

Scholarship Fund

NovaGold will establish and maintain during the term of this Agreement an annual scholarship fund in support of students who are Tahltan Members. This scholarship fund will provide for annual academic awards for both high-school and post-secondary students who are Tahltan Members and are interested in careers in the mining industry or acquiring qualifications related to the project.

7.15.7.2 Enhancement and Mitigation of Socio-Economic Impacts on Stewart

While employment and business impacts of the Galore Creek project are expected to impact positively on Stewart, and while Stewart has the municipal infrastructure in place to accommodate foreseeable economic development impacts, Stewart will be impacted negatively by the volume of truck traffic routed through downtown Stewart en route to Stewart Bulk Terminals. This impact, generated by as many as 50 trucks and 100 round trips per day, may adversely impact businesses on Highway 37A through Stewart, and may adversely impact Stewart's tourism industry.

Direct employment impacts on Stewart are expected to be positive but of moderate magnitude. Employment benefits may be greater during construction and during the initial years of operation as procedures to employ non-resident Tahltan take effect and as Tahltan communities take steps to accommodate returning non-resident Tahltan.

Stewart businesses acquiring contracts to provide goods and services to Galore Creek may lead to increases in employment which will benefit Stewart. Stewart Bulk Terminals will require additional employment. Other contractors are likely to focus on truck transportation and repair and maintenance. The employment impacts on Stewart of trucking contractors may be constrained by the development of joint venture or similar entities with Tahltan transportation firms.

Adverse impacts on Stewart are likely to focus on the volume of truck transport that may be routed along Highway 37A through downtown Stewart. After Galore Creek becomes operational in 2010, the total volume of truck traffic through Stewart will approximate 50 trucks, or 100 round trips, per day. This volume of traffic will generate noise, impact Stewart accommodations and other businesses, increase the incidence of traffic accidents along Highway 37A, and adversely impact on Stewart's tourism industry.

Stewart has recognized the truck traffic issue and has made allowance for a Highway 37A by-pass which would route truck traffic away from downtown Stewart. The location of the by-pass would re-route truck traffic away from downtown Stewart via a new road from the industrial log storage and shipment sites to the port facilities. The location for this new road has been described in the 1978 Stewart Master Plan and comprises part of Stewart's Official Community Plan.

To reduce impacts of traffic noise in Stewart, the use of air brakes will be restricted.

NovaGold will provide support to Stewart in facilitating the development of a by-pass around residential and commercial districts. The location of a by-pass is noted in Stewart's Official Community Plan. NovaGold support will focus on encouraging the BC Ministry of Transportation to develop the by-pass.

7.15.8 Assessment of the Significance of Residual Adverse Effects

Table 7.15-52 provides detailed information on the assessment of each VEC using the descriptor criteria and proposed mitigation measures. This then allows for the identification of any residual effects which remain after mitigation, and the determination of their significance.

The tables show that after enhancement and/or mitigation, most socio-economic impacts are positive. In some instances, however, residual impacts after mitigation are adverse and the potential for them to be significant is considerable.

The significance of these adverse impacts is determined by the magnitude of the impact and the duration of the impact.

Significant residual adverse impacts are associated with the termination of employment upon mine closure, family stresses arising from the fly-in /fly-out work rotations and 24-hour truck traffic in Stewart.

While Dease Lake is more likely to experience development pressures than other Tahltan communities, adverse impacts may also accrue to Iskut should significant numbers of Tahltan return to the community.

Termination of employment, and the associated incomes, will occur when the mine is scheduled for closure in 2030. While mitigation measures will be adopted to minimize the impacts of termination, the success of such efforts will be dependant upon numerous factors including, further economic development in northwestern BC, the success of the Tahltan in generating economically sustainable alternative sources of employment, improved education levels and labour mobility. The significance at mine closure of adverse employment and employment income impacts on individuals, families and communities, is based upon the assumption that northwestern BC will in 2030 be in much the same situation that it is in 2006.

Family stress associated with fly-in/fly-out work schedules may be expected to continue. Through the Participation Agreement, NovaGold will support the Tahltan Central Council in broad ranging initiatives which will address some of the manifestations of stress. These manifestations are as diverse as money management, to substance abuse, to participation in traditional activities and traditional ceremonies and events. Much as efforts may be undertaken to reduce the impacts of fly-in/fly-out work schedules, spousal absences will continue to occur.

Any return of large numbers of expatriate Tahltan to Dease Lake, Iskut or Telegraph Creek will generate housing and infrastructure pressures. The lack of services at Iskut and Telegraph Creek

Table 7.15-52
Socio-Economic Effects Assessment

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Employment Opportunities															
Employment Opportunities	A, B, C and F	50 NovaGold Supervisory/Managerial	Individual	Direct	Construction Phase	Positive	Short Term	Low	Regional	One-time	Low	Enhancement through local and preferential employment	Increased local and regional benefits	Positive	Negligible
	A, B, C and F	553 Jobs, full time; up to 210 local from jobs for Dease Lake, Iskut, Telegraph Creek, Stewart	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary to Regional	Continuous	High	Enhancement through local and preferential employment	Increased local and regional benefits	Positive	Negligible
	A, B, C and F	Termination of employment	Individual	Direct	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary to Regional	One-time	High	Mitigation through employment assistance, counselling	Dependant upon the response of the employee	Positive	Negligible
	A, B, C and F	1-5 part time seasonal positions	Individual	Direct	Post Closure Phase	Positive	Far Future	Negligible	Primary	Continuous	High	Employment of local residents	Minimal due to seasonal and part-time character of the work	Positive	Negligible
	A, B, C and F	3289 jobs with contractors: permanent, part-time, other	Individual	Indirect	Construction Phase	Positive	Short Term	High	Primary to Regional	Periodic to Continuous	High	Enhancement through use of local contractors; transference of construction employment to operations employment	Increased local and regional benefits	Positive	Negligible
	A, B, C and F	1,044 jobs	Individual	Indirect	Operation Phase	Positive	Medium Term	High	Primary to Regional	Periodic to Continuous	High	Enhancement through use of local contractors	Increased local and regional benefits	Positive	Negligible
	A, B, C and F	Termination of employment	Individual	Indirect	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary to Regional	Continuous	High	Mitigation through employment assistance, counselling,	Dependant upon the response of the employee	Positive	Negligible
	A, B, C and F	637 jobs	Individual	Induced	Construction Phase	Positive	Short Term	High	Primary to Regional	Periodic to Continuous	Unknown	None		Neutral	Negligible
	A, B, C and F	284 jobs	Individual	Induced	Operation Phase	Positive	Medium Term	High	Primary to Regional	Periodic to Continuous	Unknown	None		Neutral	Negligible
	A, B, C and F	Termination of employment	Individual	Induced	Decommissioning and Closure Phase	Adverse	Long Term	Moderate	Primary to Regional	Continuous	Unknown	None		Neutral	Negligible
	A, B, C and F	Employment stability over life time of the mine	Families/Households	Direct	Operation Phase	Positive	Medium Term	High	Primary to Regional	Continuous	High	None		Positive	Negligible
	A, B, C and F	Reduced need for out-migration in search of employment	Communities	Direct	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	None		Positive	Negligible
	A, B, C and F	Potential return of expatriate Tahltan for employment	Communities	Indirect	Operation Phase	Positive	Medium Term	Moderate	Primary	Continuous	High	Dependant upon TCC priorities arising from Participation Agreement	Pressure on available housing stock and infrastructure	Positive	Negligible
	A, B, C and F	Potential for 120 jobs in secondary impact area	Regional	Direct	Operation Phase	Positive	Medium Term	Moderate	Primary	Continuous	High		Pressure on available housing stock and infrastructure	Positive	Negligible
	A, B, C and F	190 jobs	Regional	Indirect	Operation Phase	Positive	Medium Term	Moderate	Primary	Continuous	High			Positive	Negligible
Business Opportunities															
Business Opportunities	A, B, C, E and F	Contract Opportunity for Individual Business people	Individual	Direct	Construction Phase	Positive	Short Term	Moderate	Primary to Secondary	Periodic	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Contract Opportunity for Structured Businesses	Individual	Direct	Construction Phase	Positive	Short Term	Moderate	Primary to Regional	Continuous	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Contract Opportunity for Individual Business people	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary to Secondary	Periodic	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Contract Opportunity for Structured Businesses	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary to Regional	Continuous	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Loss of Contract Opportunity	Individual	Direct	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary to Regional	Continuous	High	Market expansion and diminished reliance on single contracts	Dependant upon the response of the contractor	Positive	Negligible
	A, B, C, E and F	Contract opportunity for Environmental Monitoring Services	Individual	Direct	Post Closure Phase	Positive	Far Future	Low	Primary	Periodic	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Sub-Contracts for the provision of goods and services	Individual	Indirect	Construction Phase	Positive	Short Term	High	Primary to Regional	Periodic	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Sub-Contracts for the provision of goods and services	Individual	Indirect	Operation Phase	Positive	Medium Term	High	Primary to Regional	Continuous	High	Enhancement through local and preferential contracting	Increased local and regional benefits	Positive	Negligible
	A, B, C, E and F	Loss of Sub-contract Opportunity	Individual	Indirect	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary to Regional	Continuous	High	Market expansion and diminished reliance on single contracts	Dependant upon the response of the sub-contractor	Positive	Negligible
Employment Incomes															
Employment Incomes	A, B, C, E and F	Incomes from employment	Individual	Direct	Construction Phase	Positive	Short Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Incomes from employment	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Termination of incomes from employment	Individual	Direct	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One Time	High	Advanced notification in accordance with Labour Standards	Alternative employment with NovaGold; job placement strategy; employee assistance		Negligible
	A, B, C, E and F	Incomes from employment with contractors	Individual	Indirect	Construction Phase	Positive	Short Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible

(continued)

Table 7.15-52
Socio-Economic Effects Assessment (continued)

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Employment Incomes	A, B, C, E and F	Incomes from employment with contractors	Individual	Indirect	Operation Phase	Adverse	Medium Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Termination of incomes from employment with contractors	Individual	Indirect	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One-Time	High	Advanced notification in accordance with Labour Standards	Job placement strategy; employee assistance		Negligible
	A, B, C, E and F	Incomes from environmental monitoring	Individual	Indirect	Post Closure Phase	Positive	Far Future	Low	Primary	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Inappropriate spending of pay cheques	Individual	Indirect	Construction Phase through Decommissioning and Closure Phase	Adverse	Short Term through Long Term	Moderate	Primary	Periodic	High	Money management, Dependant upon TCC priorities arising from Participation Agreement	More appropriate spending of pay cheques	Positive	Negligible
	A, B, C, E and F	Incomes derived from employment with contractors	Individual	Induced	Construction Phase	Positive	Short Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Incomes derived from employment with contractors	Individual	Induced	Operation Phase	Adverse	Medium Term	High	Primary through Regional	Continuous	High	Competitive wage and salary rates	None	Neutral	Negligible
	A, B, C, E and F	Termination of incomes derived from employment with contractors	Individual	Induced	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One Time	High	None	Unemployment, or alternative employment	Neutral	Negligible
	A, B, C, E and F	Increased household incomes	Families/Households	Indirect	Construction Phase	Positive	Short Term	High	Primary through Regional	Continuous	High	Eligibility of construction employees for operations employment and acquisition of steady incomes from operations employment	None	Neutral	Negligible
	A, B, C, E and F	Increased, steady household incomes	Families/Households	Indirect	Operation Phase	Positive	Medium Term	High	Primary through Regional	Continuous	High	None	None	Neutral	Negligible
	A, B, C, E and F	Family stress from non-payment on mortgage, rent, utilities, food and other bills arising from employees' inappropriate spending of pay cheques	Families/Households	Indirect	Construction Phase through Decommissioning and Closure Phase	Adverse	Short Term through Long Term	Moderate	Primary	Periodic	High	Money management, Dependant upon TCC priorities arising from Participation Agreement	More appropriate spending of pay cheques	Positive	Negligible
	A, B, C, E and F	Elimination of household incomes	Families/Households	Indirect	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One Time	High	Job placement, counselling	Unemployment, or alternative employment	Neutral	Negligible
	A, B, C, E and F	Reduced family incomes	Families/Households	Indirect	Post-Closure	Adverse	Far Future	High	Primary	Continuous	High	None	None	Neutral	Negligible
	A, B, C, E and F	Enhanced community incomes from increased local expenditures	Communities	Induced	Construction Phase	Positive	Short Term	High	Primary through Regional	Continuous	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
	A, B, C, E and F	Enhanced community incomes from increased direct and indirect expenditures	Communities	Induced	Operation Phase	Positive	Medium Term	High	Primary through Regional	Continuous	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
	A, B, C, E and F	Decreased community incomes from decreased direct and indirect expenditures	Communities	Induced	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One Time	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
	A, B, C, E and F	Enhanced regional incomes from increased regional expenditures	Regional	Induced	Construction Phase	Positive	Short Term	High	Regional	Continuous	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
	A, B, C, E and F	Enhanced regional incomes from increased direct and indirect expenditures	Regional	Induced	Operation Phase	Positive	Medium Term	High	Regional	Continuous	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
	A, B, C, E and F	Decreased regional incomes from decreased direct and indirect expenditures	Regional	Induced	Decommissioning and Closure Phase	Adverse	Long Term	High	Regional	One Time	High	Dependant upon choices made by individuals at the time	Safety net; alternative employment	Neutral	Negligible
Community Growth															
Community Growth	A, C, and F	Relocation of expatriate Tahltan to primary impact communities	Individual	Direct	Operation Phase	Positive	Long Term	Moderate	Primary	Periodic	Moderate	Dependant upon Tahltan priorities in Participation Agreement	Pressure on housing	Adverse	Considerable
	A, C, and F	Relocation of expatriate Tahltan to primary impact communities	Families/Households	Indirect	Operation Phase	Positive	Long Term	High	Primary	Periodic	Moderate	Dependant upon Tahltan priorities in Participation Agreement	Pressure on housing, family support, social support services	Adverse	Considerable
	A, C, and F	Relocation of expatriate Tahltan to primary impact communities	Communities	Indirect	Operation Phase	Positive	Long Term	High	Primary	Periodic	Moderate	Dependant upon Tahltan priorities in Participation Agreement	Pressures on local government services including land development, social support services, recreation, fire protection	Adverse	Considerable
	A, C, and F	Community growth derived from business growth and expansion	Communities	Induced	Operation Phase	Positive	Long Term	High	Primary	Continuous	Unknown	Moral support for Dease Lake local governance	Greater local ability to respond to local priorities	Positive	Negligible

(continued)

Table 7.15-52
Socio-Economic Effects Assessment (continued)

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Education and Training															
Education, Training	A, C,D and F	Local access to employment opportunities	Individual	Direct	Construction Phase	Positive	Short Term	Moderate	Primary	Periodic	High	Skills based qualifications; pre-employment training	Opportunity for employment, opportunity for operations employment	Positive	Negligible
	A, C,D and F	Local access to employment opportunities	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	Skills based qualifications; pre-employment training	Opportunity for continuing employment	Positive	Negligible
	A, C,D and F	On-the-job training, skills development	Individual	Direct	Construction Phase	Positive	Short Term	Moderate	Primary	Periodic	High	Skills-based qualifications	Opportunity for employment, opportunity for operations employment	Positive	Negligible
	A, C,D and F	On-the-job training, skills development	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	Skills-based qualifications	Opportunity for career advancement	Positive	Negligible
	A, C,D and F	Apprenticeship Training	Individual	Direct	Construction Phase	Positive	Short Term	Low	Primary	One-Time	Low	Apprenticeship Training program	Skills development;; opportunity for operations employment; career advancement	Positive	Negligible
	A, C,D and F	Apprenticeship Training	Individual	Direct	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	Apprenticeship Training program	Opportunity for career advancement	Positive	Negligible
	A, C,D and F	Low levels of secondary school matriculation	Communities	Indirect	Construction Phase	Positive	Short Term	High	Primary	Continuous	High	Collaboration with school district, community college, industry and contractors	Improved student education and greater access to employment opportunity	Positive	Negligible
	A, C,D and F	Low levels of secondary school matriculation	Communities	Indirect	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	Collaboration with school district, community college, industry and contractors	Improved student education and greater access to employment opportunity	Positive	Negligible
	A, C,D and F	Limited accessibility to and availability of community college programs, services	Communities	Indirect	Operation Phase	Positive	Medium Term	High	Primary	Continuous	High	Collaboration with school district, community college, industry and contractors	Improved access to employment and improved opportunity for career advancement	Positive	Negligible
	A, C,D and F	General improvement in the regional level of education	Regional	Induced	Operation Phase	Positive	Medium Term	High	Regional	Continuous	High	None	Greater labour mobility and access to employment	Positive	Negligible
Community Infrastructure															
Community Infrastructure	E and F	Increased demand for housing to accommodate Tahltan expatriates; Increased demand for housing at Stewart from small number of new residents	Individual	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic to Continuous	Moderate	Dependant upon priorities of TCC arising from Participation Agreement	Opportunity for new housing stock	Positive	Negligible
	E and F	Increased demand for housing expatriats, reduction of family stresses	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic to Continuous	Moderate	Dependant upon priorities of TCC arising from Participation Agreement	Opportunity for new housing stock	Positive	Negligible
	E and F	Increased demand for housing will increase demand for local social services	Communities	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	Moderate	Dependant upon priorities of TCC arising from Participation Agreement	Opportunity for enhanced community and social support services	Positive	Negligible
	E and F	Increased demand for land and services such as piped water supply to support business investment at Dease Lake	Communities	Indirect	Operation Phase	Adverse	Medium Term to Long Term	High	Primary	Continuous	High	Moral support for Dease Lake local governance	Greater opportunity to respond to local issues and needs	Positive	Negligible
	E and F	Potentially increased demand for and need of wellness centre	Communities	Induced	Operation Phase	Adverse	Medium Term to Long Term	High	Primary	Continuous	Unknown	Dependant upon priorities of TCC arising from Participation Agreement	Abatement of individual and family issues around substance abuse	Positive	Negligible
Occupational Health and Safety															
Occupational Health and Safety	A and D	Concern relating to physical safety of employees	Individual	Indirect	Construction Phase	Adverse	Short Term	Moderate	Primary	Continuous	Moderate	Implementation of Occupational Health and Safety program	Safer physical working environment	Positive	Negligible
	A and D	Substance abuse on the job	Individual	Indirect	Construction Phase	Adverse	Short Term	Moderate	Primary	Periodic	High	Termination of employment	Greater workplace safety	Positive	Negligible
	A and D	Concern relating to physical safety of employees	Individual	Indirect	Operation Phase	Adverse	Medium Term to Long Term	Moderate	Primary	Continuous	Moderate	Implementation of Occupational Health and Safety program	Safer physical working environment	Positive	Negligible
	A and D	Substance abuse on the job	Individual	Indirect	Operation Phase	Adverse	Medium Term to Long Term	Moderate	Primary	Periodic	High	Termination of employment	Greater workplace safety	Positive	Negligible
	A and D	Impact of increased level of sexually transmitted diseases on families	Families/Households	Indirect	Operation Phase	Adverse	Medium Term to Long Term	Moderate	Primary	Periodic	Unknown	Dependant upon implementation of health education program through TCC and Participation Agreement	Reduced incidence of sexually transmitted diseases	Positive	Negligible

(continued)

Table 37.15-52
Socio-Economic Effects Assessment (continued)

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Substance Abuse															
Substance Abuse	E	Substance abuse upon returning from work rotation	Individual	Indirect	Construction Phase	Adverse	Short Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced substance abuse	Positive	Negligible
	E	Substance abuse upon returning from work rotation	Individual	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced substance abuse	Positive	Negligible
	E	Inappropriate spending of pay cheques often related to substance abuse	Individual	Indirect	Construction Phase	Adverse	Short Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	More appropriate money management and reduction of family stress	Positive	Negligible
	E	Inappropriate spending of pay cheques often related to substance abuse	Individual	Indirect	Operation Phase	Adverse	Medium Term to Long Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	More appropriate money management and reduction of family stress	Positive	Negligible
	E	Suicides arising from substance abuse	Individual	Indirect	Construction Phase	Adverse	Short Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced frequency of suicides	Positive	Negligible
	E	Suicides arising from substance abuse	Individual	Indirect	Operation Phase	Adverse	Long Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced frequency of suicides	Positive	Negligible
	E	Family/spousal stresses arising from substance abuse and reflected in money management issues, family violence	Families/Households	Indirect	Construction Phase	Adverse	Short Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced family impact	Positive	Negligible
	E	Family/spousal stresses arising from substance abuse and reflected in money management issues, family violence	Families/Households	Indirect	Operation Phase	Adverse	Long Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced family impact	Positive	Negligible
	E	Family destabilization arising from suicides	Families/Households	Indirect	Construction Phase	Adverse	Short Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced family impact	Positive	Negligible
	E	Family destabilization arising from suicides	Families/Households	Indirect	Operation Phase	Adverse	Long Term	High	Primary	Periodic	High	Dependant upon counselling and related services through TCC and Participation Agreement	Reduced family impact	Positive	Negligible
	E	Support for Wellness Centre, Dease Lake	Communities	Induced	Operation Phase	Neutral	Medium Term to Long Term	High	Primary	Continuous	Unknown	Dependant upon TCC priorities and Participation Agreement	Reduced substance abuse	Positive	Negligible
Family Stress															
Family Stress	F	Return of expatriates who need to live at home	Individual	Direct	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic	High	Dependant upon TCC priorities and the Participation Agreement	Reduced family stress	Positive	Negligible
	F	Termination of employment	Individual	Direct	Construction Phase	Adverse	Short Term	High	Primary through Regional	One time	High	Transference of employment to operation phase; safety net	Reduced family stress	Positive	Negligible
	F	Termination of employment	Individual	Direct	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One time	High	Job placement counselling and placement, Safety net	Alternative employment and/or income	Positive	Negligible
	F	Spousal absence and effect of paternal (usually) absence on other spouse and children	Families/Households	Direct	Construction Phase	Adverse	Short Term	High	Primary through Regional	Continuous	High	None	Family stress issues	Adverse	Considerable
	F	Spousal absence and effect of paternal (usually) absence on other spouse and children	Families/Households	Direct	Operation Phase	Adverse	Medium Term	High	Primary through Regional	Continuous	High	None	Family stress issues	Adverse	Considerable
	F	Inappropriate spending of pay cheques	Families/Households	Indirect	Construction Phase	Adverse	Short Term	Moderate	Primary	Periodic	High	Dependant upon TCC priorities and the Participation Agreement	Reduction of family stress arising from unpaid bills	Positive	Negligible
	F	Inappropriate spending of pay cheques	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic	High	Dependant upon TCC priorities and the Participation Agreement	Reduction of family stress arising from unpaid bills	Positive	Negligible
	F	Increased need for family support notably elder and child care especially if other spouse also works	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	High	Dependant upon TCC priorities and the Participation Agreement	Reduction of family stress due to greater access to child, family support services	Positive	Negligible
	F	Termination of employment	Families/Households	Indirect	Decommissioning and Closure Phase	Adverse	Long Term	High	Primary through Regional	One time	High	Job placement counselling and placement, Safety net	Alternative employment and/or income	Positive	Negligible

(continued)

Table 7.15-52
Socio-Economic Effects Assessment (continued)

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Family Stress	F	Increased need for social support services	Communities	Induced	Operation Phase	Adverse	Medium to Long Term	High	Primary	Continuous	High	Dependant upon TCC priorities and the Participation Agreement	Reduction of family stress due to greater access to child, family support services	Positive	Negligible
Recognition of Tahltan Culture															
Recognition of Tahltan Culture	D	Lack of cultural sensitivity to the Tahltan in the workplace	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Implementation of a cross-cultural sensitivity program in the workplace	Greater awareness of cultural differences and reduced potential for conflict	Positive	Negligible
	D	Lack of opportunity for Tahltan to participate in traditional activities during work rotations	Individual		Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in traditional hunting, fishing and trapping	Greater ability to participate in traditional activities	Positive	Negligible
	D	Lack of opportunity for Tahltan to take part in cultural activities during work rotations	Individual		Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in cultural events, ceremonies, funerals	Greater ability to participate in cultural activities	Positive	Negligible
	D	Lack of opportunity for family participation during work rotations in traditional and cultural activities	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in cultural events, ceremonies, funerals	Family participation possible with spousal ability to take unpaid leave to participate	Positive	Negligible
	D	Concern relating to the gradual loss of the Tahltan language and culture	Communities	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Recognition of Tahltan place names	Recognition of the Tahltan culture	Positive	Negligible
Traditional Activities															
Traditional Activities	B and F	Lack of opportunity for Tahltan to hunt, fish and trap for food	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in traditional hunting, fishing and trapping	Greater ability to provide food for family and friends	Positive	Negligible
	B and F	Lack of opportunity for Tahltan to acquire food for family and friends	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity for employee to take unpaid leave to hunt, fish and trap	Greater supply of country food	Positive	Negligible
Cross-Cultural Sensitivities															
Cross-cultural Sensitivities	D	Lack of cultural sensitivity to the Tahltan in the workplace	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Implementation of a cross-cultural sensitivity program in the workplace	Greater awareness of cultural differences and reduced potential for conflict	Positive	Negligible
	D	Lack of opportunity for Tahltan to participate in traditional activities during work rotations	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in traditional hunting, fishing and trapping	Greater ability to provide food for family and friends	Positive	Negligible
	D	Lack of opportunity for Tahltan to take part in cultural activities during work rotations	Individual	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Periodic	High	Opportunity to take unpaid leave to participate in cultural events, ceremonies, funerals	Greater ability to participate in cultural activities	Positive	Negligible
	D	Concern relating to the gradual loss of the Tahltan language and culture	Communities	Direct	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Recognition of Tahltan place names	Recognition of the Tahltan culture	Positive	Negligible
Wilderness															
Wilderness	B	Noise generated through construction and driving wildlife away has detracted from wilderness marketing to current guiding and outfitting clients	Individual	Indirect	Construction Phase	Adverse	Short Term	Moderate	Primary	Continuous	High	None			
	B	Road access will detract from wilderness atmosphere marketed by guiding and outfitting businesses and impact on business viability	Individual	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	Moderate	Controlled access to road; compensation to affected businesses		Positive	Negligible
	B	Reduction of income to operators of guiding and outfitting establishments	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	High	Compensation to owners of businesses	Transition to adjustment	Positive	Negligible
	B	Potential impacts of mine traffic in Stewart detracting from tourism marketing of Stewart	Communities	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	High	Moral support for road by-pass	Truck traffic impactsd on Stewart's tourism marketing	Adverse	Considerable
	B	Potential impacts on marketing of wilderness to tourists by Northwest Tourism Region	Regional	Induced	Operation Phase	Adverse	Medium Term	Moderate	Regional	Continuous	Moderate	None		Neutral	Negligible

(continued)

Table 7.15-52
Socio-Economic Effects Assessment (completed)

VEC	Component description of mine component	Summary of Effect description of effect	Level of Impact Individual Families/Households Communities Regional	Type of Impact Direct Indirect Induced	Descriptor Criteria for Pre Mitigation Effects Timing (start) Construction Phase Operation Phase Decommissioning and Closure Phase Post Closure Phase	Direction Positive Neutral Adverse	Duration Short Term Medium Term Long Term Far Future	Magnitude Negligible Low Moderate High	Geographic Extent Primary Secondary Regional Transboundary	Frequency One time Periodic Continuous	Probability of Occurrence Nil Low Moderate Unknown High	Proposed Mitigation/Enhancement description of proposed mitigation	Summary of Residual Effects description of residual effects	Potential for Residual Adverse Effect to be Significant Negligible Considerable	Direction of Residual Effect Positive Neutral Adverse
Guiding and Outfitting															
Guiding and Outfitting	B	Noise generated through construction and driving wildlife away has detracted from wilderness marketing to current guiding and outfitting clients	Individual	Indirect	Construction Phase	Adverse	Short Term	Moderate	Primary	Continuous	High	None			
	B	Road access will reduce appeal of the area to current and future guiding and outfitting clients	Individual	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	Moderate	Controlled access to road; compensation to affected businesses	Transition to adjustment	Positive	Negligible
	B	Access to the road by the Tahltan will facilitate increased hunting in areas heretofore lightly hunted	Individual	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	High	Compensation to owners of businesses	Transition to adjustment	Positive	Negligible
	B	Reduced economic viability of guiding and outfitting businesses due to reduced clientele	Individual	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	High	Compensation to owners of businesses	Transition to adjustment	Positive	Negligible
	B	Reduction of income to operators of guiding and outfitting establishments	Families/Households	Indirect	Operation Phase	Adverse	Medium Term	Low	Primary	Continuous	High	Compensation to owners of businesses	Transition to adjustment	Positive	Negligible
Highway 37, 37A Truck Traffic															
Highway 37, 37A Truck Traffic	C	Increased risk of accidents involving trucks due to increased traffic	Individual	Direct	Construction Phase	Adverse	Short Term	Moderate	Primary	Continuous	High	Speed controls; driver safety training	Reduced risk of accidents involving truck traffic	Positive	Negligible
	C	Increased risk of accidents involving trucks due to increased traffic	Individual	Direct	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	High	Speed controls; driver safety training	Reduced risk of accidents involving truck traffic	Positive	Negligible
	C	Increased risk of accidents involving trucks due to increased traffic	Individual	Direct	Decommissioning and Closure Phase	Adverse	Long Term	Moderate	Primary	Continuous	High	Speed controls; driver safety training	Reduced risk of accidents involving truck traffic	Positive	Negligible
	C	Potential increase in need for appropriate medical care	Communities	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic	Unknown	Infrastructure in place; Health District to monitor	Neutral	Negligible	Negligible
	C	Potential for increased policing	Communities	Induced	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	Unknown	Infrastructure in place; RCMP to monitor	Neutral	Negligible	Negligible
	C	Increased volume of truck traffic may require highway design improvements	Regional	Indirect	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic	Unknown	BC Ministry of Transportation to monitor	Neutral	Negligible	Negligible
Truck Traffic and Noise in Stewart															
Highway 37, 37A Truck Traffic	C	Increased risk of accidents involving trucks in Stewart	Individual	Direct	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	Moderate	Speed controls; driver safety training	Reduced risk of vehicle accidents	Positive	Negligible
	C	Increased risk of accidents involving pedestrians	Individual	Direct	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	Moderate	Speed controls; driver safety training	Reduced risk of pedestrian accidents	Positive	Negligible
	C	Impact of truck traffic on tourist use of accommodation and restaurant facilities in Stewart	Individual	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Speed controls; restrictions on the use of air brakes	Reduced noise levels	Positive	Negligible
	C	Impact of night time truck traffic noise on sleep at Stewart accommodation facilities and residences	Individual	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	Speed controls; restrictions on the use of air brakes	Reduced noise levels	Positive	Negligible
	C	Increased industrial traffic along residential and downtown streets	Communities	Indirect	Operation Phase	Adverse	Medium Term	High	Primary	Continuous	High	NovaGold moral support for traffic by-pass	Traffic along residential and downtown streets	Adverse	Considerable
	C	Increased need for traffic policing in Stewart	Communities	Induced	Operation Phase	Adverse	Medium Term	Moderate	Primary	Continuous	Unknown	NovaGold moral support for traffic by-pass	Infrastructure in place; RCMP to monitor	Neutral	Negligible
	C	Potential increase in need for appropriate medical care	Communities	Induced	Operation Phase	Adverse	Medium Term	Moderate	Primary	Periodic	Unknown	NovaGold moral support for traffic by-pass	Infrastructure in place; Health District to monitor	Neutral	Negligible

suggests that development pressures may focus on Dease Lake. These pressures include land availability, services such as piped water and more local governance. Iskut is however closer than Dease Lake to the proposed Galore Creek mine and the provision of free bus services to employees may encourage some Tahltan employees to locate at Iskut. Should this be the case, Iskut will face a variety of issues relating to housing, education, recreation and the provision of some retail/commercial services.

Truck traffic in Stewart will represent a significant adverse impact. Both the volume of traffic and the noise generated by it will affect residents and tourists both at night and during the day. NovaGold will support efforts by Stewart to relocate Highway 37A as a by-pass around the community's residential and commercial districts. Nevertheless, the planning, routing, design, budgeting and construction of a by-pass may be expected to consume a number of years. In the interim, truck traffic impacts on Stewart will be considerable.

Table 7.15-53 provides a summary of residual adverse effects.

Positive residual impacts may be expected to focus on Tahltan economic development including education and training, capacity building and employment and business opportunities, and possibly others including health. Positive residual economic development impacts will arise from NovaGold's collaboration with the Tahltan as expressed in the Participation Agreement and the Tahltan conviction expressed in *Out of Respect* to use the mining industry as a vehicle for the attainment of individual and community capacity building and sustainability and to break away from boom-bust cycles of economic activity. Education and training, capacity building and employment and business opportunities are means to achieve these.

NovaGold financial contributions to the Tahltan Nation will provide Tahltan members with resources to implement Tahltan policies and programs across a spectrum of economic and social issues. The Tahltan will define their priorities and respond accordingly. For example, NovaGold - Tahltan collaboration may lead to the award of business contracts as a stepping stone to building capacity in business management and to the acquisition of future contracts across a more diversified client base.

Another example of a positive residual impact may be on health. The Tahltan recognize substance abuse as a major issue and have proposed the development of a wellness centre to which some funding has already been committed. Should the Tahltan Nation decide to do so, they may determine to use NovaGold financial contributions to help develop that wellness centre and its proposed treatment program for substance abusers.

7.15.9 Socio-Economic Impact Monitoring

Employment Monitoring

Through the Human Resources Committee NovaGold and the Tahltan Central Council will annually review progress towards the fixed target for employment and advancement of Tahltan members. The Tahltan Nation may make recommendations to NovaGold regarding the measures taken to assist in meeting or exceeding the fixed target.

Table 7.15-53
Significance of Residual Adverse Socio-Economic Effects

VEC	Residual Adverse Effect	Descriptor Criteria for Residual Adverse Effects			Significance of Residual Adverse Effect
		Magnitude	Geographic Extent	Duration	
Employment Opportunity	Loss of employment upon mine closure	High	Primary Impact communities	Long Term	Significant
Employment Incomes	Loss of incomes upon mine closure	High	Primary Impact communities	Long Term	Significant
Community Growth	Individual: Return of expatriate Tahltan	Moderate	Primary to Iskut and Tahltan Reserves, to Dease Lake community	Medium Term	Not Significant
	Family: Return of expatriate Tahltan	High	Primary to Iskut and Tahltan Reserves, Dease Lake community	Medium Term	Significant
	Community: Return of expatriate Tahltan	High	Primary to Iskut and Tahltan Reserves, Dease Lake community	Medium Term	Significant
Family Stress	Spousal absence and effect of paternal (usually) absence on other spouse and children	High	Primary through Regional	Medium Term	Significant
Wilderness	Truck traffic impacts on Stewart's tourism marketing	High	Stewart	Medium Term	Significant
Truck Traffic and Noise in Stewart	Traffic along residential and downtown streets	High	Stewart	Medium Term	Significant

The Human Resources Committee will review the HR Strategy developed by NovaGold for the initial hiring of NovaGold jobs with a view to revising the HR Strategy to continue to maximize the opportunities for NovaGold Jobs for Tahltan Members. This review may also include consideration of the general advancement of Tahltan Members within the workplace as compared to the rest of the employee base and analyze reasons for success or failure.

Monitoring Tahltan Business Opportunities

Within 30 days after each twelve month period, after the Commencement of Construction, NovaGold will prepare and deliver to the Tahltan Nation a written report describing the level of Tahltan Business providing goods and services to the project in comparison to all goods and services provided to the project.

NovaGold and the Tahltan Nation will, on an annual basis, meet to discuss and review the Tahltan Business Report and potential opportunities for Tahltan Businesses or Tahltan Members to participate meaningfully in providing goods and services to the project, including the setting of non-binding targets for Tahltan participation in business opportunities for the next Year.

7.16 Visual and Aesthetic Resources Effects Assessment

The management and maintenance of scenic areas and visual quality objectives is an important component of the *Forest and Range Practices Act* and was also an objective of the CIS-LRMP (2000). The valleys of the Iskut and Stikine rivers were identified as potential scenic areas in the CIS-LRMP, with the end goal being to have them officially designated as scenic areas under the Forest Practices Code (Figure 7.16-1). To date, no scenic areas have been formally established in the project area; however, the visual landscape inventory of the larger LRMP area is due to be updated in the near future (MoF, *personal communication*).

7.16.1 Methods

A visibility assessment was conducted using three-dimensional viewshed and line-of-sight modelling. Input data included a digital elevation model (DEM) from the B.C. TRIM program and projected tree height data from provincial forest cover mapping. The DEM provides three-dimensional topographic information, while the tree height data identify areas where viewscapes and lines of sight might be obscured due to tree cover. The model did not take into account tree/vegetation clearing activities that may be required to build the filter plant, access corridor and power transmission line. The visibility of the facilities could therefore be greater than currently projected.

The viewshed analysis identifies areas that can be seen from one or more observation points or lines. For the Galore Creek Project viewshed assessment, visibility was established using observation lines, which included the length of Highway 37 that falls within the project area and the Iskut, Stikine and Porcupine rivers.

The line-of-sight analysis displays the visible and non-visible parts of the landscape that occur in a straight line between selected observer and target locations. Visibility is determined according to where the line of sight falls with respect to topographic features and tree cover. Observer locations were established along Highway 37, at the airstrip at Bob Quinn, from the Iskut River Hot Springs Provincial Park and at points along the Porcupine River, particularly near the confluence of the Porcupine with the Stikine River. Portions of infrastructure that were identified as visible according to the viewshed analysis were used to identify specific observer locations.

The ability to see infrastructure from the Stikine River was also tested. It was found that none of the target features were visible, therefore visibility issues relating to the Stikine River specifically are not discussed further.

7.16.2 Viewshed Analysis

The results of the viewshed analysis are presented in Figure 7.16-2. From Highway 37, the only visible sections of the access corridor are within the first few (7.5) kilometres that run east-west along the existing forest service road. Similarly, sections of the road that run north-south prior to the Iskut River bridge crossing can be seen from the Iskut River.

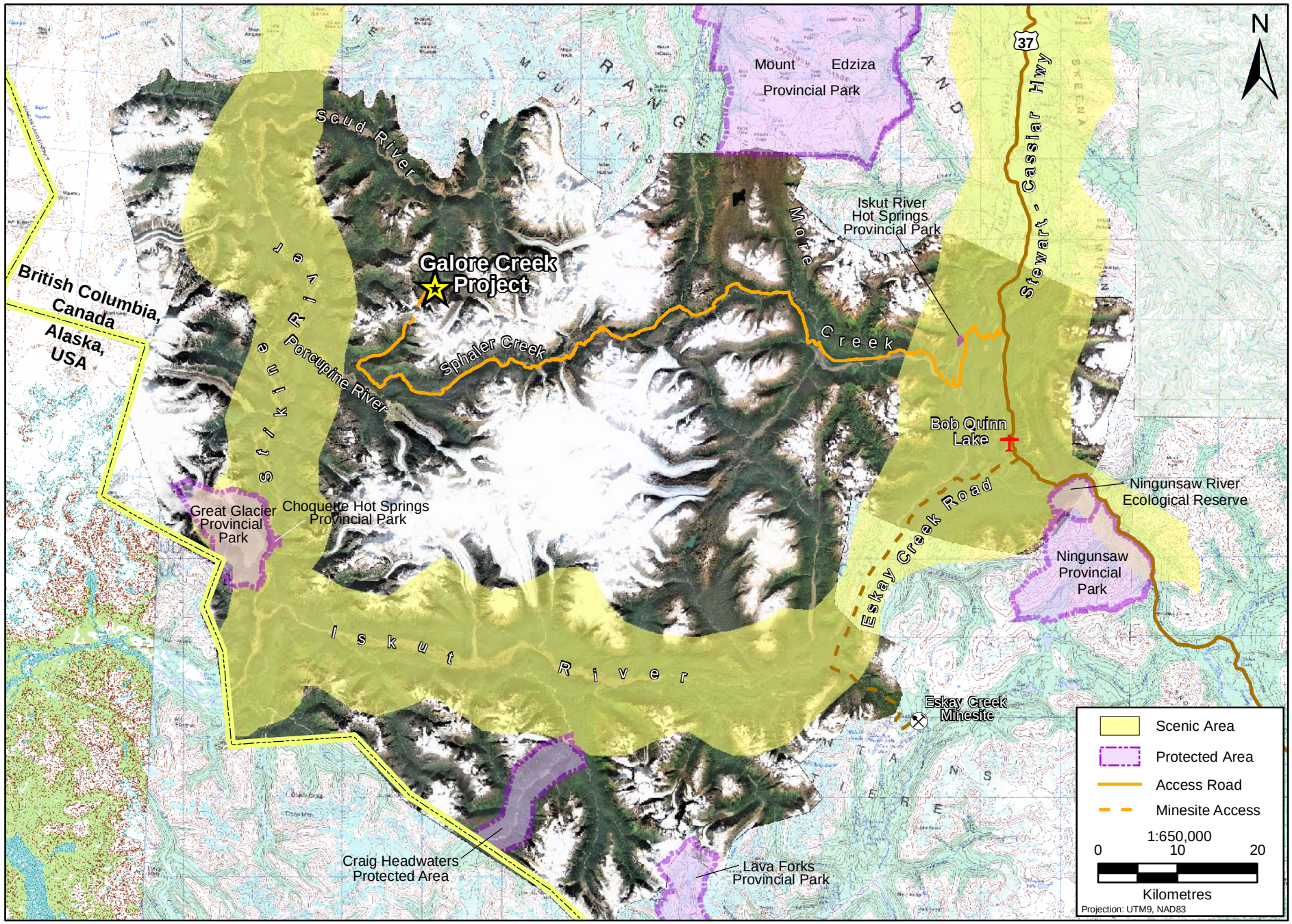


FIGURE 7.16-1

NovaGold Canada Inc.

Cassiar-Iskut-Stikine LRMP- Proposed Scenic Areas

Rescan™

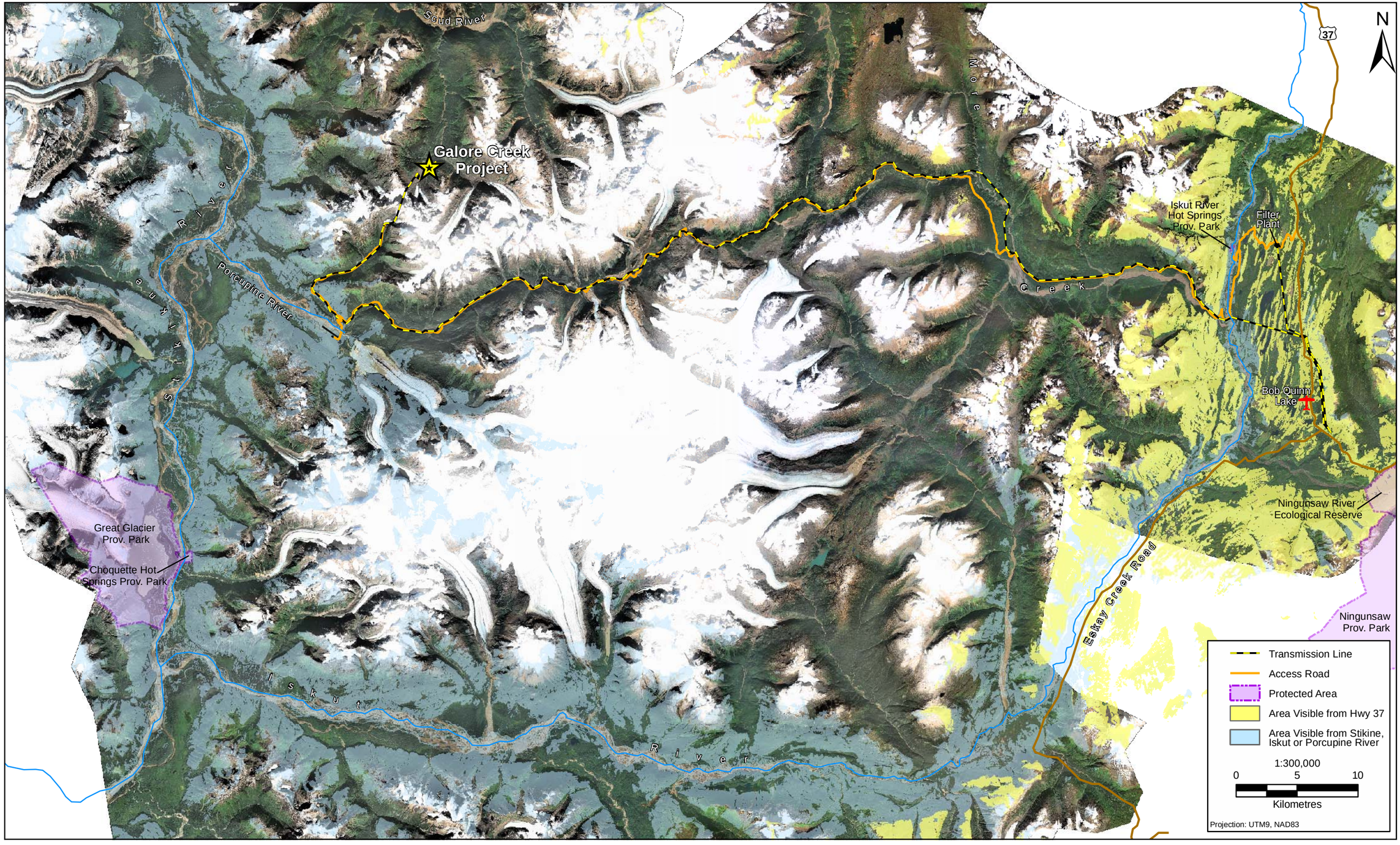


FIGURE 7.16-2

NovaGold Canada Inc.

Viewshed Analysis of the Galore Creek Project Area

Rescan™

The section of the power transmission line that parallels Highway 37 will be visible from the highway. Similarly, sections of the line that travel overland toward More Creek and the filter plant will also be visible. Sections in close proximity to the Iskut River are the only ones that will be visible from the river itself.

At the western edge of the project area, the aerodrome facility and sections of the power transmission line and access corridor that run parallel to the Porcupine River will be visible primarily from the river itself.

7.16.3 Line-of-Sight Analysis

The results of the line-of-sight analysis for the eastern part of the project area are shown in Figure 7.16-3. The lines selected for display indicate that the filter plant and sections of the access road will be visible from various locations along Highway 37, irrespective of topography and tree height. However, the access corridor and diffuser pipeline road will not be visible from the Iskut River Hot Springs Provincial Park. Sections of the power transmission line will be visible from the Bob Quinn airstrip. Visibility of these features may increase depending on the vegetation clearing activities required during construction and maintenance.

The line-of-sight analysis for the western part of the project area is shown in Figure 7.16-4. The aerodrome facility, access corridor, and power transmission line are not visible from the Stikine River. Sections of the access corridor and power transmission line only become visible approximately 5 km up the Porcupine River from the confluence with the Stikine. The aerodrome facility becomes visible further up the Porcupine River as well. Again, these features may become more visible after vegetation clearing during construction and maintenance, but still only from the Porcupine River.

7.17 Traditional Use Effects Assessment

7.17.1 Introduction

7.17.1.1 Effects Assessment Scope

The Galore Creek Project falls within the Traditional Territory of the Tahltan Nation. NovaGold initiated discussions with the Tahltan Nation in November 2004, within two months of signing an agreement to explore Galore Creek. After ongoing meetings and discussions with Tahltan leadership and Tahltan members, a Participation Agreement was ratified by the Tahltan Nation and signed on February 10, 2006. The agreement supports the Tahltan Nation's principles of environmental stewardship, economic sustainability and self-determination. It also commits both parties to working collaboratively throughout the Environmental Assessment review and the permitting process for Galore Creek.

This effects assessment was designed to identify any traditional use resources that may be affected by development of the Galore Creek Project, and if necessary to develop mitigation strategies to avoid or reduce potential effects and to assess the significance of any residual effects.

7.17.1.2 Methods

Individuals and families who are most dependent on local resources for spiritual, cultural and basic needs are often best positioned to not only articulate the importance of certain places and spaces, but also share valuable knowledge that is grounded in learned experience. In this light, NovaGold began working with Tahltan community members and Tahltan Elders as a means of gathering Traditional Knowledge about both the broad Cassiar Iskut-Stikine region and the local project area.

In 2005, NovaGold employed two Tahltan community researchers to undertake desk and field-based research. Additionally, NovaGold funded an archival project so that a Tahltan archivist could work full-time collecting, documenting, and transcribing invaluable Tahltan Traditional Knowledge.

The initial step the researchers took in conducting the Traditional Knowledge study was to gather and review all possible background data including historic accounts, and ethnographic studies. Upon completion of the literature review, the researchers conferred with key Tahltan community leaders to assemble a list of potential Elders who they felt were best suited to participate in and contribute to the study. Recognizing that there are numerous types of knowledge, for example ecological and gender-specific, and striving to complete a holistic study, the researchers sought out Elders who offered different yet complementary information. Tahltan Traditional Knowledge study participants included trapline holders, big game outfitters, hunters, prospectors, matriarchs of high-ranking families and researchers from the Tahltan 1983-1985 Land Use and Occupancy Study. Twenty-two Tahltan Elders were identified as key contributors – eighteen men and four women. Field research was initiated in the summer of 2005.

N

Approximate Extent of 3D View

Direction of 3D View

37

Filter Plant

Bob Quinn Lake

Eskay Creek Road

Iskut River Hot Springs Provincial Park

Mine Site

Mine Creek

Iskut River

3D View Looking Northwest

Access Road
Transmission Line
Observer
Target
Line of Sight
(green = visible, red = not visible)

1:50,000
0 1,000 2,000
Metres

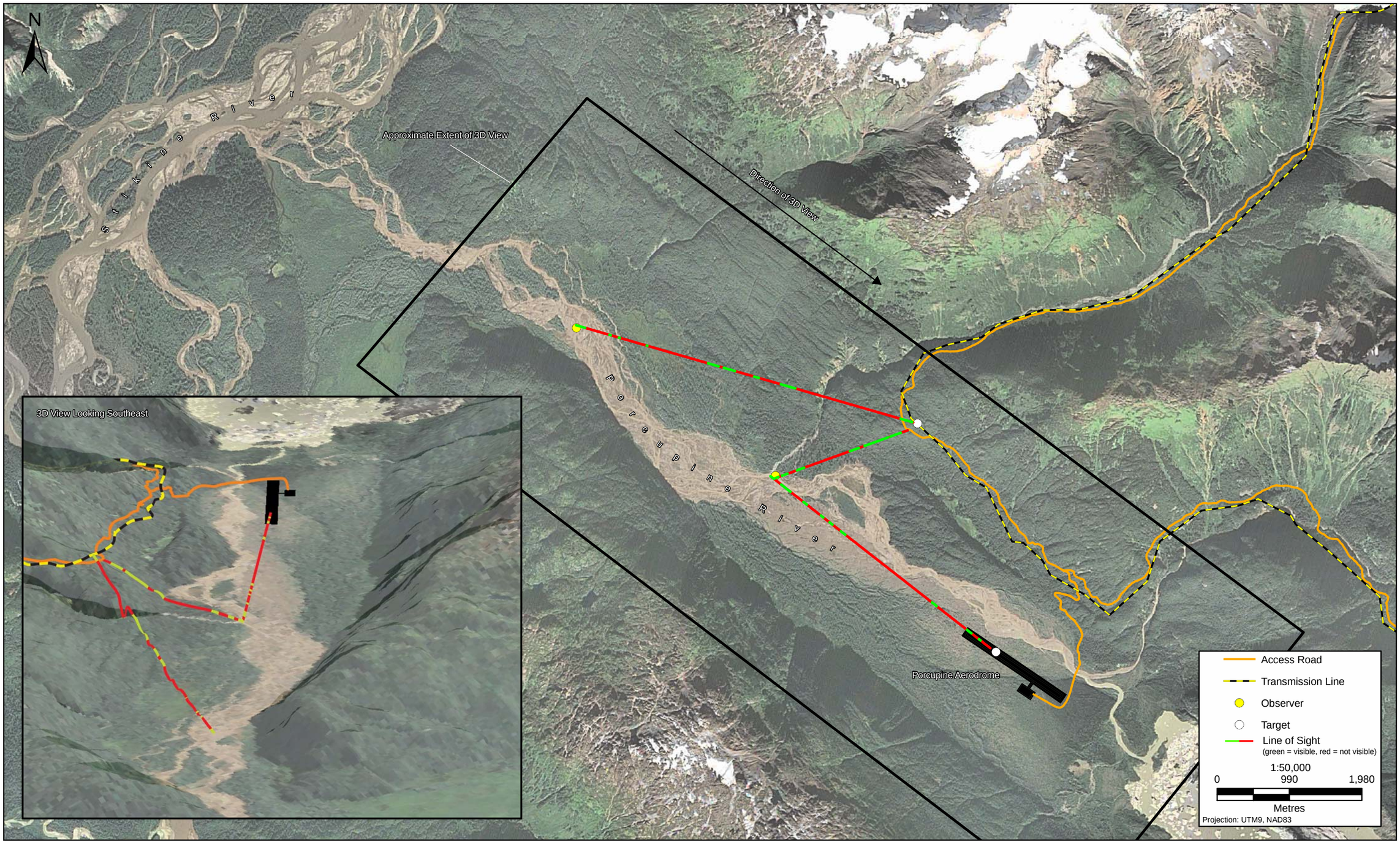
Projection: UTM9, NAD83

FIGURE 7.16-3

NovaGold Canada Inc.

Line of Sight Analysis from Highway 37 and Bob Quinn Lake Airstrip

Rescan™



NovaGold Canada Inc.

Line of Sight Analysis from Porcupine River

FIGURE 7.16-4

Rescan™

The Tahltan Traditional Knowledge research team endeavoured to acquire a broad spectrum of information: land use, travel and transportation routes (aquatic and terrestrial); identity, cultural practices, customs, songs, dances and stories about high-powered animals; location of cultural heritage sites, wildlife trails and fishing spots; weather patterns, including heavy snow and rain fall years; seasonal subsistence rounds and methods for processing foods; and division of labour. Overarching themes and interview questions were developed to help guide the discussions.

7.17.1.3 Spatial Boundaries

Spatial boundaries for this environmental assessment of traditional use resources are two tiered. Because past inhabitants were nomadic and the study area is part of a larger cultural area, a larger region must be considered when interpreting study results and assessing use significance. For the purposes of this study, that regional area is roughly bounded by the Stikine River on the west and north and the Iskut River on the south and east. The project study area is confined to the Porcupine, Sphaler, More and Galore Creek valleys and limited by the Stikine River on the west and the Iskut River on the east (Figure 7.14-1).

7.17.1.4 Assessment Limitations

Traditional Knowledge research often proves to be challenging. The Galore Creek Tahltan Traditional Knowledge studies were no exception. During the summer of 2005, the Nation was confronted by a number of losses – some respected Elders passed away and there were some suicides. Furthermore, there was a climate of internal political conflict; many Tahltan Elders were hesitant to participate in the study, expressing a discomfort with the research. Tahltan Traditional Knowledge researchers developed and utilized a tracking document to record their attempts. Of the 22 identified Elders, 10 interviews were completed.

Another study limitation is gaps in the ethnographic data. Ethnographic studies were not initiated in the region until the early 20th century, by which time a considerable amount of integration had already taken place, and many of the elders with traditional knowledge had succumbed to one of the many epidemics. Furthermore, those studies were relatively brief and were concentrated in the vicinities of the major population centres, well removed from the peripheral use zones such as this study area represents.

7.17.2 Existing Conditions

The Galore Creek Project is situated in the Boundary Range of the Coast Mountains, within the Canadian Cordillera physiographic region (Clague, 1989). Except for the highest peaks of the Coast Mountains, the entire region was covered by a massive ice sheet during the most recent glacial age. The ice sheet is thought to have receded relatively rapidly and to have reached the present limits of glaciation by 9,500 years ago (Ryder and Clague, 1989). This period is therefore the earliest time the area would have been available for human habitation.

The region is characterized by great variations in topography and climate, which govern distribution of crucial plant and animal resources and, consequently, have significant bearing on human use patterns. The study area is typified by glaciers and glacial moraine, alpine vegetation, subalpine parkland ecotone and heavy forests. The study area is within the Stikine volcanic belt

(Clague, 1989), and several volcanoes and numerous cinder cones occur throughout the project area.

The Tahltan people who currently live in the Stikine region are an Athapaskan-speaking Dene group who originated in the interior and moved into the Stikine region about 300 years ago. By all historic and ethnographic accounts, the Tahltan settled in the upper reaches of the Stikine drainage system, primarily between the mouths of the Tuya and Tanzilla rivers and Glenora Creek, but used a considerably larger territory to the northwest, north, east, south and southeast for hunting (Emmons, 1911; Duff, 1969). The Tahltan traditionally claimed the Stikine Valley and tributaries to the mouth of the Iskut River, as well as all of the Iskut drainage system, as their hunting grounds (Dawson, 1889). Emmons (1911) recorded that the lower Stikine (below Glenora) was only occasionally used by the Tahltan, however, and shared with the Tlingit people living on the coast at the mouth of the Stikine. Teit (1906) noted the absence of any permanent settlement between Glenora and the Stikine mouth, likely owing to the generally inhospitable climate, almost impenetrable vegetation and lack of animal resources compared to the Stikine Plateau. He also reported that Tahltan parties on trips to and from the coast occasionally hunted in the country adjoining the Stikine River (Teit, 1906).

Before the fur trade influenced their seasonal activities, the Tahltan generally congregated at fishing sites along the Stikine and major tributaries to catch and dry fish from June until September. They then dispersed into small groups of generally two families (Emmons, 1911) to hunt from October to May (MacLachan, 1981; Albright, 1982), moving camp as frequently as necessary to pursue game resources. The Tahltan were originally big game hunters when they lived in the central interior, exploiting caribou, moose, wood buffalo, black and grizzly bear, bighorn sheep and mountain goat. Caribou were of prime importance and were probably one of the major reasons the Tahltan settled on the Stikine Plateau, where caribou were abundant. However, the people quickly adapted their lifestyle to take advantage of the plentiful salmon resources of the Stikine drainage system. A wide variety of plant materials acquired from the river valleys to the alpine were used for food, medicines and the construction of dwellings and implements (Albright, 1982; Emmons, 1911).

Gold was discovered in the Stikine Valley in 1861, and led to some sporadic prospecting activities in the region. This was followed by a greater influx of people during the Cassiar gold rush in 1874, and again during the Klondike gold rush of 1898.

Given the information gathered on the distribution of available resources, the past uses of the general region and the types and distributions of previously recorded archaeological sites, it has been hypothesized that the degree of use of the immediate study area would have been relatively light and would have represented peripheral presence rather than intensive activity centres. Considering the high levels of snowfall and lack of readily available food, winter use of this area is considered highly unlikely, and use of the area would have likely occurred in the spring, summer or fall.

All the sites recorded during recent archaeological studies in the project area (Section 6.14) were in the uplands within the subalpine zone; no sites were found in the lower valleys (Figure 7.14-2). This distribution confirms a number of aspects of the background information,

particularly that people chose the easier travel routes above the thick vegetation, and probably did not spend much time in the lower valleys because of the comparatively difficult travel conditions.

The location of archaeological site HgTr-1 on the upper side-slope of the More Valley is noteworthy in suggesting that travel routes were chosen primarily on the basis of degree of vegetation cover and that the degree of slope was a secondary factor. The nature of the lithic sites, their content and their proximity indicate a likely association with the Mount Edziza-Spectrum Range obsidian deposits and also suggest a possible route of travel to the south from those areas along the Mess and More/Sphaler valleys. Another noteworthy feature of these sites is their generally sparse nature, suggesting short-term use, probably indicating brief hunting and/or tool repair stops. The fact that there are both lithic sites and Tahltan sites indicates continuity of use of these upper areas, albeit at low frequency. The sites most likely date to early summer or fall, when animals were present, travel was relatively easy and berries were ripe.

In summary, all documentary evidence suggests that this particular area was peripheral to the intensive use areas of Mount Edziza, the upper Stikine drainage system and the Klappan Plateau. Consequently, although it has been shown that there was some traditional use of resources in the study area, the traditional use of the area was not as intense or significant as found in the regions to the north and east.

7.17.3 Likely Future Conditions

The status of the traditional use in the Galore Creek Valley area without the project is unlikely to change. This study area reportedly no longer forms part of intensive traditional subsistence patterns; as is supported by the results of this study.

7.17.4 Environmental Effects Assessment

Ethnographic records have identified that harvesting plants, berries, shoots and tenders for nutritional and medicinal purposes was an important activity pursued by the Tahltan during the summer and early fall. In total, 27 plant species and two species of fungi were identified as country foods harvested and used for medicinal and nutritional purposes by the Tahltan (Table 7.17-1). A complete list of country foods associated with the project area is presented in Galore Country Foods Baseline Assessment, prepared as part of the Galore Creek environmental impact assessment. From this long list, a short list of species was identified as the most frequently consumed country foods or as being of cultural importance to the Tahltan. All species are found within the project area. These are:

- caribou weed,
- blueberry ,
- moose,
- marmot,
- grouse, and
- salmon.

Table 7.17-1
Vegetation Harvested by Tahltans Identified in the Stikine Valley

Local name	Tahltan Name	Purpose
Caribou Weed	*Hodzih lh ānaw*	Medicine/ Nutrition
Jack Pine pitch	*Gāza*	Medicine
Balsam pitch	*Ts'ostsiye*	Medicine
Blueberry	*Echishchō*	Nutrition
Wild Rhubarb	*Ets'ok*	Medicine/ Nutrition
Soapberry	*Ishghohje*	Medicine/ Nutrition
Devil's club	*Khos chō*	Medicine
Spruce pitch	*Ts'ū*	Medicine
Strawberry	*K'indzē'*	Nutrition
Cranberry	*Cgoohgeh'eh*	Nutrition
Lowbush Cranberry		Nutrition
Raspberry	*Dahkāle*	Nutrition
Rosehip	*Khos tsedle*	Nutrition
Moss berry	*Edzinast'ēs*	Nutrition
Hudson's Bay tea	*Hots'edaghodze*	Nutrition
Yarrow	*Dlūne che'*	Medicine
Red alder	*K'is*	Medicine
Mountain ash	*Ts'ulak'iy*	Medicine
Poplar	*Chaba'e*	Medicine
Chokecherry	*Tehkahje jije*	Nutrition
Juniper brush	*Tsesk'iye na'ele*	Medicine
Black currant	*Nihch'ele*	Medicine
Nettle	*T'ūk*	Nutrition
Red currant		Nutrition
Gooseberry		Nutrition
Saskatoon		Nutrition
Puff ball mushroom		Nutrition
Red top mushroom		Nutrition
Unknown plant species	*Tsauth*	Medicine

The country foods study revealed that eleven mammal species and five bird species were identified as consumed by the Tahltan for nutritional purposes (Table 7.17-2). Moose are the most frequently consumed mammal and grouse are the most frequently consumed bird. The picking of pine mushrooms and morels is a growing trend, but no data exists on this nascent industry.

Table 7.17-2
Wildlife Identified in Local Study Area by Tahltan Elders

Species	Tahltan Name	Locations, identified by Elders, where species have been seen:	Used for
Caribou	*Hodzih*	Observed around northern access route	All parts of caribou consumed
Moose	*Keda*	Found in areas around Mess Creek, Anuk River, Porcupine River. Abound in areas where the timber is dense; also around wetlands	Most frequently consumed animal
Goats	*Espaah*	Found in areas around Scud River, Ice Mountain, Good Glacier. Many are seen in the high country	Used for implements, hide.
Bears - Black and Grizzly	*Sus/Gho*	Throughout the LSA map area. Northern access corridor is likely an over-wintering area for grizzly bears . More Creek is prime grizzly denning area. Black bears do not always den up high, some will over-winter at lower elevations, by the rivers	Meat and fat are consumed
Beaver	*Tsah*	Anuk River, Porcupine River	Consumed in spring and fall
Ground hog (Marmot)	*De'diah*	Found in the high country, near Galore Creek valley; also around More Creek and Sphaler Creek	Consumed
Grouse		Seen along Mess Creek	Consumed
Marten		Have been seen around Anuk River, Jack Wilson Creek, Scud River, Sphaler Creek	Consumed

Currently, because of the lack of road access, there is little harvesting of country foods within the project area. It is however anticipated that road access will lead to an increase in the level of harvesting. The primary users of country foods in the project area are the Tahltan.

7.17.5 Potential Effects for Future Traditional Use

The development of the access road offers the potential for enhanced access to the area, however, the road will have strict access control. Access for Tahltan cultural and traditional uses would be subject to an agreement between NovaGold and the Tahltan Central Council. Without details regarding the extent and timing of access and harvest of resources by First Nations, no assessment of potential effects from this factor can be made.

7.17.6 Summary

In summary, all documentary evidence suggests that this particular area was peripheral to the intensive use areas of Mount Edziza, the upper Stikine drainage system and the Klappan Plateau. Consequently, although it has been shown that there was some traditional use of resources in the study area, the traditional use of the area was not as intense or significant as found in the regions to the north and east. This area reportedly no longer forms part of intensive traditional subsistence patterns; this is supported by the results of this study. Therefore, the effects of the mine development on traditional use of the area will be minimal.

7.18 Navigable Water Effects Assessment

In Canada, navigable water includes any body of water capable of being navigated by any type of floating vessel for the purpose of transportation, recreation or commerce. The *Navigable Waters Protection Act* (NWPA) was adopted to protect the public right to navigate. The act ensures that any interference created by the project is acceptable, so that the rights of other waterway users are respected. There are 17 areas of development for the Galore Creek project that may potentially influence the public access to navigable waters (Figure 6.19-1, Table 6.19-1)

Within the study area there is limited human use of surface water as a resource or for navigation. The Scud, Iskut, Porcupine and Stikine rivers are used to varying extents for navigation, but Galore Creek, More Creek and Sphaler Creek are steep-sided mountain streams with limited access for river craft. Furthermore, there are natural barriers to movement on Sphaler Creek, at the mouth of More Creek, and at More Canyon.

All bridge crossings for this project are designed to accommodate current navigation requirements (e.g. Figure 7.18-1). However, further consultation will investigate whether there is any unidentified recreational use of watercourses potentially affected by proposed works placed in or over watercourses. Findings from these consultations will direct appropriate measures to mitigate identified effects.

Given the inaccessibility of most of the region, limited current or historical use of accessible water in the region, and the accommodating design of bridge heights over water, the project is not anticipated to incur adverse effects on navigable water.

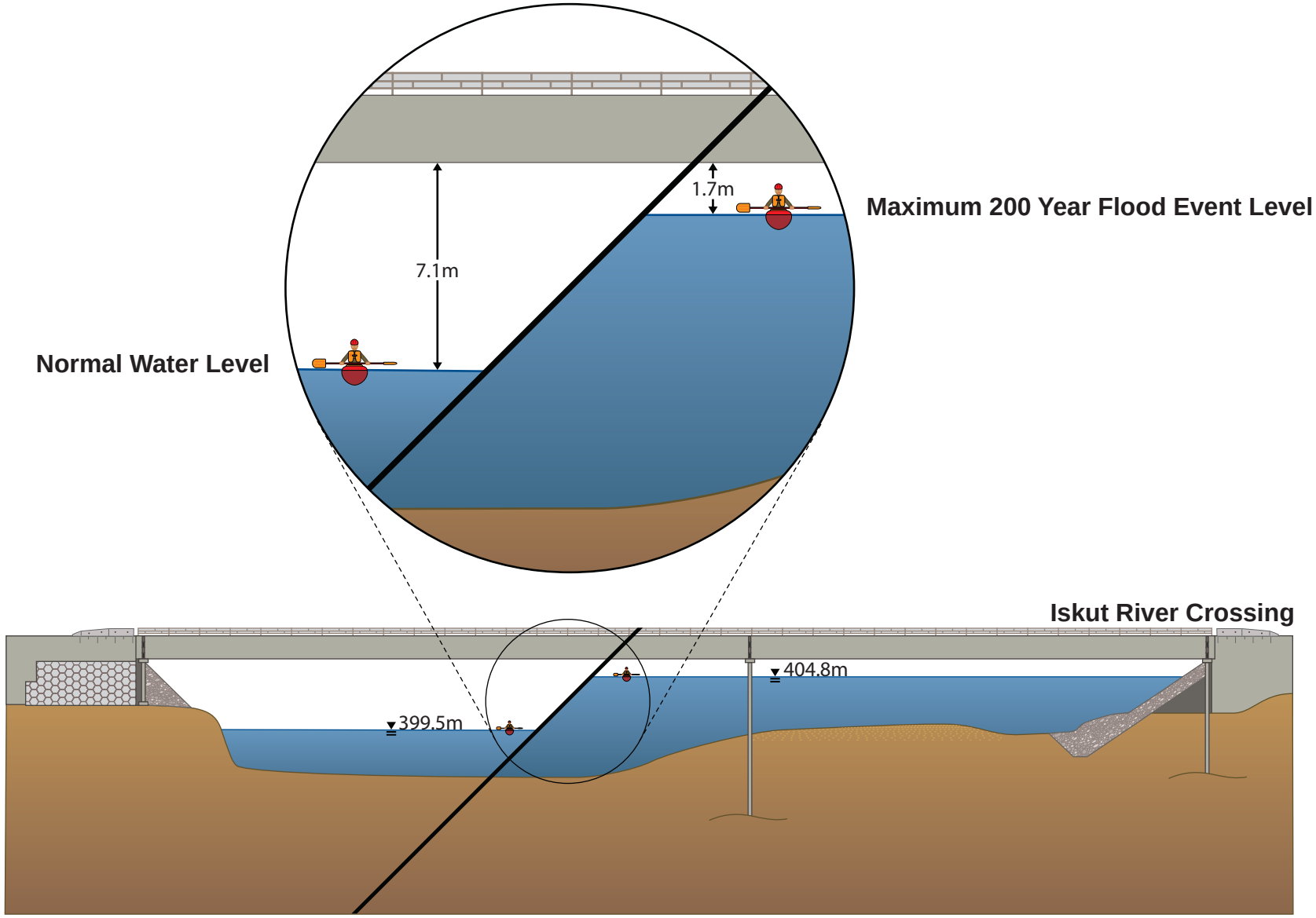


FIGURE 7.18-1

NovaGold Canada Inc.

Typical Clearance Under Major Bridges