GALORE CREEK COPPER-GOLD-SILVER PROJECT

COMPREHENSIVE STUDY REPORT

With Respect to
The Requirements of a Comprehensive Study
Pursuant to the *Canadian Environmental Assessment Act, S.C 1992, c. 37*

Prepared by

Transport Canada
Fisheries and Oceans Canada
Natural Resources Canada
Environment Canada

Environmental Assessment Office

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Purpose of this Report

This Report describes the environmental assessment of the proposed Galore Creek Copper-Gold-Silver Project (Project). The Report briefly describes the Project and consultations with the public, First Nations and Canadian and U.S. federal, British Columbia (B.C.) and Alaska State government agencies during the review process. It summarizes the issues considered during the review of NovaGold Canada Inc.'s application for an environmental assessment (Application) and the measures required to mitigate any adverse effects of the Project, and provides overall conclusions related to the assessment.

The Report constitutes an **Assessment Report** to satisfy the requirements of the British Columbia *Environmental Assessment Act* (BCEAA), and a **Comprehensive Study Report** to satisfy the requirements of the *Canadian Environmental Assessment Act* (CEAA).

This Report has been prepared jointly by the British Columbia Environmental Assessment Office (EAO) and by Natural Resources Canada, Fisheries and Oceans Canada, Transport Canada, and Environment Canada who are the federal responsible authorities (RAs) for this assessment. This Report serves as a summary of federal and provincial environmental assessment decisions on the Project.

Nature of the Project

The Project involves developing an open-pit copper, gold and silver mine located approximately 1,000 kilometres northwest of Vancouver and 150 kilometres northwest of the deepsea port in Stewart.

The Project Proponent

NovaGold Canada Inc. (Proponent) is a wholly owned subsidiary of NovaGold Resources Inc., a publicly traded company based in Vancouver, B.C. The Proponent shares the same management team as NovaGold Resources Inc. In Western Canada, NovaGold Resources Inc. initially pursued exploration and development of the Project through a separately listed subsidiary called SpectrumGold Inc. Following the success of the Galore Creek exploration programs, NovaGold Resources Inc. acquired all outstanding shares in SpectrumGold Inc. in mid-2004 and transferred all project rights to NovaGold Canada Inc.

Project Setting

The Project is located on provincial Crown land and falls within the Cassiar Iskut-Stikine Land and Resource Management Plan, approved by the B.C. government in 2000, and within the area indicated by the Tahltan Nation to be their traditional territory. No other First Nations lay claim to the Project area.

The Galore Creek valley is surrounded on three sides by high, rugged and ice-capped mountains of the Coast Range. Project activities in the Galore Creek valley will take place at elevations between about 500 and 800 metres. Surrounding peaks reach elevations of over 2,000 metres. Most of the area is covered with snow and ice and mature forest. A substantial portion is also largely unvegetated due to the relatively recent retreat of the surrounding glaciers. The remaining landscape consists of herbaceous meadows, shrub complexes, young forest, wetlands and water bodies.

The Project area includes major watersheds of the Stikine and Iskut River drainages. The Stikine drainage system is recognized as a significant wilderness area and has local, regional and global ecological significance. The rivers and their tributaries are important habitat for the five major Pacific salmon species and other local fish species. The area is also one of the more important grizzly bear habitats in B.C. There are resident populations of goats, moose, black bears and other mammals.

Project Description
The Proponent proposes to mine using conventional truck and shovel mining methods and crushing/grinding/flotation processes to extract copper and precious metals to produce a bulk concentrate for shipment to an off-site smelter. A slurry pipeline will transport copper concentrate to a filter plant near Highway 37 where it will be de-watered for transport by truck to Stewart. A small diameter diesel pipeline will transport diesel fuel from the filter plant to the mine site, paralleling the concentrate pipeline. The open pits, processing plant and related support facilities such as shops and employee accommodation will all be located in the Galore Creek valley.

The environmental assessment considers the effects of the Project in all phases, beginning with the construction phase and throughout the operations phase (including any maintenance and/or modifications) and where appropriate, through to the completion of the decommissioning phase, closure and post-closure and includes the following components and activities potentially associated with the Project:

- up to 65,000 tonne per day open pit mine and process plant located in the Galore Creek valley;
- mill tailings and waste rock storage facility(ies) including containment dams;
- site runoff, water diversion and sediment control;
- ore and marginal ore storage;
- borrow pits, and overburden and topsoil storage;
- construction and operations camp, including ancillary facilities such as sewage treatment and incineration;
- explosives manufacturing and storage plant;
- an access road from Highway 37, along More and Sphaler creeks to the Porcupine River, and up to Scotsimpson Creek to a tunnel into the Galore Creek valley;
- a power line from the Bob Quinn Lake area on Highway 37 to More Creek, and predominantly following the access road corridor to the Galore valley;
- an ore concentrate slurry pipeline and diesel pipeline following the access road corridor, from the process plant site in the Galore Valley to the Devil Creek Forest Service Road and terminating at the dewatering facility;
- a filter plant (including dewatering and water treatment facilities), ore concentrate stockpile and truck loadout at the slurry pipeline terminus;
- transportation of mine processing reagents and other hazardous chemicals to the mine site along the access road;
- transportation of concentrate from the filter plant by truck along Highway 37 to the deepsea port at Stewart;
- development of an airstrip along the south side of the Porcupine River into a permanent aerodrome to service the mine during operation;
- construction of a spur road from the airstrip at the Porcupine River connecting to the access road; and,
- a potential construction heavy-lift staging airstrip or heliport in the More Valley near Round Lake.

The lifespan of the Project, including construction, decommissioning and closure is expected to be approximately 25 years. The environmental assessment included a time frame of 1000 years in order to consider post closure long-term water quality predictions.

Provincial and Federal Environmental Assessments
The Project triggers a provincial environmental assessment under BCEAA. EAO determined the Project was reviewable pursuant to the BCEAA *Reviewable Projects Regulation* (BC Reg. 370/02) because it is a new mine facility which, during operations, will have a production capacity of greater than 75,000 tonnes per year of mineral ore.

The Project also triggers a federal environmental assessment under CEAA because Natural Resources Canada, Fisheries and Oceans Canada, Transport Canada and Environment Canada will be required to issue statutory or regulatory approvals for various aspects of the Project. Therefore, these federal departments are RAs for the purposes of the federal environmental assessment. Health Canada, as an expert Federal Authority (FA), provided expert advice to the environmental assessment.

The federal RAs determined that the Project requires a Comprehensive Study review under CEAA because a component of the Project meets the requirements of paragraphs 16 (a,b,c) and 30 (c) of the *Comprehensive Study Regulations,* specifically the proposed construction, decommissioning or abandonment of: a metal mine, other than a gold mine, with an ore production capacity of 3,000 tonnes per day or more; a metal mill with an ore input capacity of 4,000 tonnes per day or more; and, a gold mine, other than a placer mine, with an ore production capacity of 600 tonnes per day or more as well as the proposed construction or decommissioning of an all-season runway with a length of 1500 metres or more. This was confirmed by the federal Minister of Environment after public review of the federal scoping document early in the review process.

The provincial and federal assessment processes have been harmonized in accordance with the Canada/British Columbia Agreement for Environmental Assessment Cooperation (2004).

Scope of the Joint Environmental Assessment

The scope of assessment considered the potential effects of the Project, including environmental, social, economic, health and heritage effects and potential effects on First Nations interests, taking into account practical means of preventing or reducing to an acceptable level any potential adverse effects of the Project.

The scope of assessment under CEAA defines additional factors to be considered. These include: alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means; the effects of the environment on the Project, environmental effects of malfunctions or accidents; potential cumulative environmental effects; measures that would mitigate adverse environmental effects, the significance of the environmental effects; the capacity of renewable resources likely to be affected; and a follow-up program.

The assessment has considered climate, air quality, noise, surface water quantity and quality, groundwater, sediment quality, aquatic resources, fish and fish habitat, wetlands, terrestrial ecosystems, wildlife and wildlife habitat, archaeological and heritage resources, socio-economic, visual and aesthetic resources, and navigable waters.

Public Consultation

Consultation with the public occurred in response to requirements of EAO and federal RAs. The Proponent initiated a public consultation program in February 2004. During the pre-application stage, the Proponent held 16 open houses in the communities of Dease Lake, Telegraph Creek, Iskut, Smithers, Stewart, Terrace and Wrangell (Alaska). The public attending these open houses were largely in support of the Project. During the pre-application stage, a public comment period on the draft Terms of Reference was held by EAO from December 1, 2005 to January 9, 2006.

In the Application review stage, a 60-day public comment period was held by EAO from July 10 to September 8, 2006 to obtain feedback on the Proponent's Application. During this time period, open houses were held in Smithers (July 11, 2006), Terrace (July 12, 2006), Stewart (July 13, 2006), Wrangell (Alaska) and Petersburg (Alaska) (July 13, 2006), Dease Lake (June 28, 2006), Telegraph Creek (June 27, 2006) and Iskut (July 14, 2006). Approximately 140 people attended these open houses. In the formal public comment period for the Application review, thirty-one public comments were received on the Application.

The public participation for the federal environmental assessment process followed the provincial process and included additional participation steps required for a comprehensive study. These included advertising the availability of the Scoping Document for public review (held from December 1, 2005 – January 9, 2006), and the provision of participant funding for participation in the environmental assessment process. Relevant information was also placed on the Canadian Environmental Assessment Registry.

Two submissions were received during the comment period on the Scoping Document. In the Track Report submitted to the federal Minister of the Environment, the RAs, in consultation with the expert Federal Authorities, indicated that a Comprehensive Study could fully address issues related to the Project. The Minister of the Environment issued a decision statement on June 29, 2006, that the environmental assessment under CEAA would continue as a Comprehensive Study.

All issues raised by the public during the review of the Project have been considered in the Application review process and the documents generated as part of the review. **Appendix C** summarizes the comments submitted by the public and the Proponent's response to the comments.

There will also be a formal public review opportunity for this Report under CEAA. All comments submitted will be provided to the RAs and will become part of the public registry for the Project. The RAs will indicate to the Agency whether or not their conclusions have been altered as a result of the public comments received.

Government Consultation and Issues

Proponent consultation on the Project with federal, provincial and local government agencies occurred primarily through a Technical Working Group, comprised of representatives of Canadian and U.S. federal agencies, B.C. and Alaska state government agencies, Tahltan Nation and local governments. Smaller working groups were also established to focus on specific issues identified during the review. Early in the process, EAO recognized that U.S. federal and Alaska State agencies should be invited to participate in the review because of potential transboundary effects.

The Technical Working Group and sub-groups were used to identify, document and resolve project-related issues. All technical issues raised by federal, provincial and local government agencies during the review of the Project have been considered in the Application review process and the documents generated as part of the review. **Appendix D** summarizes the comments submitted by government agencies and the Proponent's response to the comments.

First Nations Consultation

The Tahltan Central Council, Iskut First Nation and Tahltan Band Council were first notified about the Project by EAO in February, 2004 and were invited to participate on the Technical Working Group that was being established to participate in the review of the Project.

EAO provided funding to the Tahltan Central Council to help cover the Tahltan's participation costs in the pre-application and Application review stages. The CEA Agency provided funding to the Iskut First Nation pursuant to the federal Participant Funding Program. The Proponent also provided funding to the Tahltan Central Council to help them participate in the review.

The Tahltan Central Council established the Tahltan Heritage Resource and Environmental Assessment Team to participate in the Technical Working Group meetings. EAO and the CEA Agency held open houses during the Application review stage in Telegraph Creek (June 27, 2006), Dease Lake (June 28, 2006) and Iskut (July 14, 2006). The Proponent participated in the open houses to provide information on the environmental assessment of the Project.

The Proponent initially met with Tahltan elected officials in the fall of 2003 to introduce their company and the Project to the Tahltan. In early meetings with the Tahltan, the Proponent agreed to support the formation of several joint ventures, one of which was the May 2004 formation of Rescan Tahltan Environmental Consultants (RTEC), a 50/50 joint venture between RTEC and the Tahltan Nation Development Corporation.

Several open houses were held by the Proponent in the predominately Tahltan communities of Dease Lake, Iskut and Telegraph Creek in June 2004, October 2004, May/June 2005 and October 2005. The Proponent also funded local researchers to conduct projects that incorporated and documented Traditional Knowledge about the region. A Special Assembly on the Project was held in Dease Lake in January 2005. The Proponent also participated in the Tahltan Resource Development Forum held in Telegraph Creek, Dease Lake and Iskut on June 13 -15, 2006.

Appendix E includes a table identifying comments provided by the Tahltan Heritage Resource and Environmental Assessment Team on the Application and the Proponent's response to the comments.

On February 10, 2006, the Tahltan Nation and NovaGold announced that they had entered into a comprehensive agreement.

Key Environmental Effects Raised During the Assessment

Climate

- Increase in greenhouse gas emissions from the combustion of diesel fuel.
- Reduction in carbon sinks (vegetated areas) which counteracts greenhouse gas.
- Climatic change implications of ice dam recurrence in Porcupine Lake.
- Need for a glacier monitoring program to determine if the glacier mass balance in the region is changing and if so, whether this change is resulting in a change in discharge in affected watersheds.

Air Quality

- Air quality effects on human health, vegetation, fish and wildlife.
- Air emissions from open burning during land clearing and waste incinerator.
- Need for an appropriate long-term air quality monitoring program.

Noise

- Noise levels effects from mining operations and aircraft on employee health and safety and wildlife.
- Indoor noise in workers' living quarters.

Surface Water Quantity

- Surface water flow impacts in a number of watersheds and major river systems downstream.
- Likelihood of there being water of sufficient quality in storage facilities during low flow conditions.
- Increased flow effects on erosion and downstream morphology.
- International transboundary implications.

Surface Water Quality

- Water quality effects in streams and rivers as well as downstream wetlands and small lakes.
- Effects of drainage from the Scotsimpson tunnel on pit water drainage chemistry predictions.
- Need for further details related to the installation, maintenance and operation of the filter plant.
- Modeling of predicted metal concentrations in sediment and water and predictions downstream of the Scud River.
- Need to meet total suspended solid levels identified in the federal *Metal Mining Effluent Regulations* in the tailings impoundment discharge.

- Implications on dam height of using an acid rock neutralization potential ratio of 1.3 versus 2.
- Post-closure long-term pit lake water quality.

Groundwater

- Seepage estimates for the main tailings dam.
- Post closure groundwater regime and hydraulic conductivity values.
- Need for additional modeling to estimate seepage flows to and from the tailings impoundment and to characterize residual project effects on the groundwater flow regime and the hydrology of the Galore Creek watershed in the post-closure period.
- Effects of nitrogen and phosphorus nutrient loading on surface or groundwater.

Sediment Quality

- Siltation effects and physical and chemical changes to sediment quality as it relates to water quality and its importance to periphyton, macrophytes, benthic invertebrates and fish.
- Effects of increased flow on changes in erosion and channel morphology downstream of the main dam.

Aquatic Resources

- Habitat loss and mortality within Galore Creek and habitat loss due to diversion of tributaries in upper Galore Creek.
- Effluent discharge effects on biota in lower Galore Creek.
- Effects of slope failures along the access road.
- Effects of filter plant effluent discharge on biota in localized area downstream of diffuser in Iskut River.

Fish and Fish Habitat

- Effects on fish and fish habitats, including changes to productive capacity of aquatic systems, aquatic organisms and habitat, changes in water chemistry (suspended solids, nutrients, major ions, metals), and physical and chemical changes to sediment quality.
- Habitat loss or alteration, including aquatic vegetation and spawning areas.
- Effects on rare and/or sensitive species (including fish and amphibians) and habitat and Committee on Status of Endangered Species/*Species at Risk Act*-listed species.
- Effects on species of cultural, spiritual, or traditional use importance to First Nations (e.g., salmon).
- Changes to the thermal regime of the aquatic environment.
- Direct and indirect mortality (includes fishing).
- Acoustic effects from blasting on fish and fish habitat in local aquatic systems along the access corridor.
- Mitigation and/or compensation requirements (based on Fisheries and Oceans Canada's Policy for the Management of Fish Habitat and the related principle of no net loss of the productive capacity of fish habitat).
- Potential sediment effects resulting from channel re-alignment in the Porcupine River after major floods.
- Potential for the Porcupine aerodrome site to become fish habitat.
- Effects of reduced flows in lower Galore Creek.
- Effects from the diffuser with additional information required on design and fish populations.
- Need for contingency plans for restoration, particularly of environmental effects, in event of catastrophic breaching of the dam.

Wetlands

- Effects on wetland functions.
- Effects of the access road and Porcupine airstrip on wetlands.

Terrestrial Ecosystems, Vegetation and Soils

- Loss and alteration of ecosystems.
- Indirect impacts such as dust, microclimate changes (e.g. alteration of moisture regime, increased sunlight to previously shaded environments), and a decrease in ecological integrity.
- Potential contaminants to country foods together with a possible increase in use of the area by the Tahltan.
- Effects on rare ecosystems.
- Need to salvage soils and subsoils for reclamation.

Wildlife and Wildlife Habitat

- Effects on wildlife and wildlife habitat (e.g. habitat alteration, disruption, blockage, and impediment to wildlife movements, noise disturbance, disturbance of feeding, breeding and denning habitats or behaviour, features acting as an attractant; chemical hazards, reduction in wildlife productivity and wildlife mortality).
- Effects on mountain goats and grizzly bear.
- Effects of ore concentrate spills.
- Possible underestimation of wildlife effects for mountain goats and grizzly bear.
- Possible overestimation of suitable high value goat habitat.
- Too much reliance on using the regional context to assess potential adverse effects.
- Proposed Wildlife Mitigation and Monitoring Plan must provide sufficient information on the types of mitigation measures but further discussion required to better define how and where mitigation measures should be applied and linking these measures to the monitoring plan.
- Proximity of borrow and gravel pits to high value habitats.

Navigable Waters

- Design road and bridge crossings to meet federal navigation requirements and take into account flood events and water conveyance.
- Location and design of the filter plant diffuser.

Key Socio-Economic/Socio-Cultural Effects Raised During the Assessment related to BCEAA

Socioeconomic

- Economic, employment and business opportunities.
- Handling of landfill waste.

Visual and Aesthetic Resources

- Maintaining scenic areas and visual quality objectives.
- Effects on Iskut River Hot Springs Provincial Park.

Key Issues Raised Related to CEAA-Specific Requirements During the Assessment

Effects of the Environment on the Project

- Effects of extreme weather events, floods, forest fires, climate change, volcanic activity and geohazards and resulting environmental effects.
- Effects of catastrophic events such as an earthquake on the tailings impoundment dam and potential socio-economic, financial and environmental losses.
- Unknown risk that climate change poses to the Project, including the potential effects of climatic warming on the overall risk of geohazards to the Project.

- Potential for the tailings dam and impoundment to be affected by snow avalanches and other debris/rockfall hazards or by a surge wave in the tailings impoundment.

Environmental Effects of Accidents and Malfunctions

- Risk of potential accidents and malfunctions to affect the environment.
- Ensuring the tailings dam integrity over the long-term and the potential downstream effects of a catastrophic dam failure.
- Potential for spills and managing the risk of potential spills of hazardous substances into the environment.
- Tunnel safety.
- Geological conditions of the tailings dam foundations.
- Long-term (i.e. post-closure) maintenance and monitoring of the tailings dam and spillway.

Cumulative Environmental Effects Assessment

- Cumulative effects of numerous mine proposals and mineral exploration projects in the Stikine River watershed.
- Methods used to establish and utilize spatial and temporal bounds, especially in relation to water quality and fish/fish-habitat.
- Selection of other projects/developments used in the cumulative effects analysis.
- Extent of spatial boundary and length of temporal boundary.
- Interpretation of cumulative effects on surface water quantity and quality, terrestrial ecosystems, grizzlies and mountain goats.

Capacity of Renewable Resources

- Consideration of the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.

Key First Nations Interests Raised During the Assessment

The Tahltan Heritage Resource and Environmental Assessment Team raised similar issues to government agencies during the review of the Application. In addition to the issues identified above, the Tahltan provided comments on potential archaeological resources and socio-cultural effects and cumulative effects as follows:

Archaeological and Heritage Resources

- Analyze obsidian finds to confirm the source(s).
- Research prospective obsidian routes back to Raspberry Pass (Mount Edziza) to allow a more thorough analysis of potential archaeology sites along that route.
- Consider archaeological features such as rock piles or cairns, rock cliff or cave shelters in future archaeological work as they have high Tahltan ethnographic significance.
- Attempt to document the four tephra (or volcanic ash layers) markers in future excavations.
- Consider potential for ice patch archaeology in future archaeology work.

Socio-cultural/socio-economic

- Increase in domestic and community violence, gambling, substance abuse, suicides and accidents.
- Loss of family support structures and increased family stress due to the two week work rotation.
- Influx of non-aboriginal workers, which will contribute to loss of language and culture.
- Loss of pristine traditional land.
- Increase in stress and stress-related illnesses, sexually-transmitted diseases and pregnancies.
- Potential contamination of Tahltan water sources, foods and medicines.

- Availability of short term, high paying jobs will discourage students from completing high school and/or continuing post-secondary education.
- Increased pressure on health and social services and related infrastructure.

Cumulative Effects

- Socio-cultural effects due to the high level of resource activities in the Tahltan traditional territory and the lack of the cumulative effects assessment to address these effects.

Monitoring and Follow up

The scale and long life cycle of the Project call for the establishment of a comprehensive monitoring and Follow-up program. The Proponent proposed an environmental monitoring program, which would collect data and compile information to detect potential project impacts measured against an established baseline. The Proponent also committed to undertake a follow-up program to verify the accuracy of the predicted environmental effects of the Project and the effectiveness of the proposed mitigation.

In the Application, the Proponent outlined an overarching environmental management system, which would form the basis for a more detailed management system to be developed during project permitting. The Proponent committed to the implementation of an environmental management system that is based on ISO 14000, which provides a framework for the development of both the management system and supporting audit program, including the requirement for continual improvement.

The Proponent committed to providing an annual monitoring summary report outlining how mitigation measures have been implemented and commenting on the effectiveness of these measures in reducing adverse environmental effects. In addition, every three years, the Proponent committed to prepare a more detailed report outlining trends observed in the monitoring programs. Those three-year reports will assess trends in the predicted effects of the Project, as outlined in the environmental assessment, and determine the success of mitigation measures or alternate measures to reduce the effects on the environment.

Commitments Made by the Proponent for Mitigation of Potential Effects

The Proponent has proposed to mitigate potential effects through commitments made in the Application, as well as modified commitments and new commitments to address issues raised during the environmental assessment review. Key commitments include:

- building long-term relationships with the Tahltan Nation and local communities;
- developing a site-wide air monitoring program to assess effectiveness of mitigation measures;
- developing a dust deposition program to measure dust/chemical deposition from mining activities;
- using pipelines for moving concentrate and diesel fuel to reduce the number of haul truck trips and consequent amount of diesel emissions and fugitive dust;
- assessing acid rock drainage potential of excavated faces during access road and diversion channel construction, using an on-site laboratory, and develop appropriate mitigation, including mitigation for closure, for any acid rock drainage encountered;
- stockpiling excavated rock from tunnel construction and characterize excavated rock for metal leaching/acid rock drainage potential during construction. If the rock is potentially acid generating, it will be transported to the Galore Creek valley for proper disposal after tunnel construction is finished;
- eventually submerging all potentially acid generating rock as an acid generation control measure;
- installing groundwater wells downstream of the main dam to intercept any seepage exceeding effluent permit limits;
- monitoring groundwater levels and quality outside of the Galore Creek valley of wells at the Porcupine aerodrome camp site, Round Lake heliport camp site and the filter plant site;

- during operations and after closure, monitoring and managing drainage from the tunnel, not-potentially acid generating dumps, ore and marginal ore storage stockpiles, pits, seeps and other mine areas, including the impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the *Environmental Management Act* effluent discharge permit limits and federal *Metal Mining Effluent Regulations* discharge criteria that are applicable at the time;
- plugging wells and drains at mine closure;
- monitoring water quality after closure until regulatory agencies determine that conditions are stable and predictable;
- maintaining intensive receiving environment, aquatic, fisheries and wildlife monitoring programs, throughout the life of the mine and developed in cooperation with university researchers, Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council, to ensure water quality, aquatic, fisheries and wildlife resources are not impacted by the Project and are protected for future generations;
- continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of appropriate organisms in the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project;
- adding an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during the permitting stage;
- establishing criteria, in conjunction with appropriate Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council, for assessing potential significant biological effects to the receiving environment identified by the monitoring programs;
- working with Fisheries and Oceans Canada, Transport Canada and Tahltan Central Council, to ensure the design of the diffuser minimizes potential impacts on fisheries resources and waterborne traffic; incorporating information derived from monitoring in an ongoing process of adaptive management;
- investigating low flow conditions in the lower reaches of Galore Creek in 2007- 2008 to establish mean flows and will supplement baseline flows in Galore Creek to maintain critical water levels for fish in extreme low flow periods;
- further investigating the cumulative effects of the additive aspects of mixtures of metals and their effect on aquatic life, including testing of actual tailings effluent during the first year of operations prior to discharge to Galore Creek;
- developing comprehensive fish and fish habitat compensation plans in cooperation with the Ministry of Environment, Fisheries and Oceans Canada and the Tahltan Central Council;
- developing and implementing a Wildlife Mitigation and Monitoring Plan;
- providing shutdown procedures, shutoff valves, a spill response plan and an emergency drainage sump at the low point of the slurry pipeline alignment to minimize the extent and consequence of any spillage from the pipeline following a breach to the line;
- constructing the tailings dam in accordance with the Canadian Dam Association, Dam Safety Guidelines (1999) to withstand a 1 in 10,000 year earthquake and the design will consider the effects of an avalanche-induced wave and the ability for the spillway to pass a Probable Maximum Flood;
- establishing an ongoing initiative with the Tahltan Central Council and relevant Canadian and U.S. federal and B.C. and Alaska state government agencies to assess, at a conceptual level, the potential effects of a catastrophic dam failure and develop a program for remediation of those effects;

- based on environmental monitoring, should a specific country food appear vulnerable, monitoring of contaminant levels in the tissues consumed, if feasible, will be undertaken and appropriate mitigation implemented; and,
- developing and implementing a follow-up program and enter into an agreement with the federal government to implement the program.

Conclusions of the Assessment

This Report and its conclusions are based on: the Application and supplementary information provided during the Application review stage; the potential effects of the Project identified by the Proponent; potential effects and issues raised by the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team; and the additional mitigation measures and commitments made by the Proponent to mitigate potential effects identified.

Pursuant to the requirements of the BCEAA, EAO is satisfied that:

- the Application, together with additional clarifications and information provided during the review, adequately identified and assessed the potential significant adverse environmental, economic, social, heritage and health effects of the Project and potential effects on First Nations interests;
- public and First Nations consultation, and the distribution of information about the Project, have been adequately carried out by the Proponent;
- issues identified by the public, First Nations, Canadian and U.S. federal, B.C. and Alaska state, and local government agencies, that are within the scope of the environmental assessment, were adequately addressed by the Proponent during the review of the Application and subsequent material submitted by the Proponent; and,
- practical means have been identified to prevent or reduce to an acceptable level potentially significant adverse effects of the Project.

Pursuant to the requirements of the CEAA, the Rresponsible Authoritites have determined that, on the basis of the Comprehensive Study, taking into account the implementation of the proposed mitigation and commitments, the Project is not likely to cause significant adverse environmental effects.

LIST OF ACRONYMS AND DEFINITIONS

Application	Application for an Environmental Assessment Certificate (dated June 23, 2006, and accepted by EAO on June 26, 2006)
BCEAA	British Columbia *Environmental Assessment Act* (S.B.C. 2002, c. 43)
CEAA	*Canadian Environmental Assessment Act* (S.C. 1992, c. 37)
CEA Agency	Canadian Environmental Assessment Agency
Certificate	Environmental Assessment Certificate issued pursuant to BCEAA
EAO	B.C. Environmental Assessment Office
FA	Federal Authority under CEAA
NovaGold Canada Inc.	Proponent
Project	the Galore Creek Copper-Gold-Silver Project
Proponent	NovaGold Canada Inc.
RA(s)	Responsible Authority (ies)under CEAA
Report	Joint provincial Assessment Report/federal Comprehensive Study Report
RTEC	Rescan Tahltan Environmental Consultants
Tahltan Nation	Tahltan Central Council, Tahltan Band Council and Iskut First Nation

PART A - GENERAL REVIEW BACKGROUND

1. INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This Report has been prepared to meet the requirements of a provincial Assessment Report and a federal Comprehensive Study Report for a proposal by NovaGold Canada Inc. (Proponent) to develop an open-pit copper, gold and silver mine located approximately 1,000 kilometres northwest of Vancouver and 150 kilometres northwest of the deepsea port in Stewart (**see Figure 1**). Components of the Galore Creek Copper-Gold-Silver Project (Project) include open pits, processing plant, access road, concentrate and diesel pipelines, tailings and waste storage facility, accommodation facility, filter plant and diffuser system, aerodrome and power transmission system.

On June 23, 2006, the Proponent submitted an application for an environmental assessment certificate (Application) to the Environmental Assessment Office (EAO) pursuant to the British Columbia *Environmental Assessment Act* (BCEAA), for the Project. The Application also provided information required for an environmental assessment to be carried out under the *Canadian Environmental Assessment Act* (CEAA).

The purpose of a provincial Assessment Report is to provide ministers with:

- a brief description of the Project;
- a description of consultations with First Nations, government agencies and the public;
- a summary of the issues considered during the review of the Application;
- a report on whether the Application has considered and adequately addressed the Project's identified potential environmental, health, heritage, social and economic effects;
- the measures required to prevent or reduce to an acceptable level any adverse effects of the Project,
- conclusions with respect to whether the Project is likely to result in significant adverse effects.

The purpose of a federal Comprehensive Study is to:

- identify the potential environmental effects, as defined in the CEAA, of the Project, including the environmental effects of any accidents or malfunctions that may occur in connection with the Project and any cumulative effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
- describe measures that are technically and economically feasible to mitigate any adverse environmental effects of the Project;
- report on all public concerns raised in relation to the Project and how they have been addressed,
- based on the Comprehensive Study Report and public comments, provide conclusions with respect to whether the Project is likely to result in significant adverse environmental effects.

The provincial and federal scope of assessment and factors considered in a Comprehensive Study are identified in Section 2.6 of this Report.

1.2 PROVINCIAL AND FEDERAL ENVIRONMENTAL ASSESSMENT PROCESSES

1.2.1 Provincial Process and BCEAA Requirements

A preliminary Project description of the Project was submitted to EAO in February 2004. On the basis of this information, EAO determined the Project was reviewable pursuant to the BCEAA *Reviewable Projects Regulation* (B.C. Reg. 370/02) because it is a new mine facility which, during operations, will have a production capacity of greater than 75,000 tonnes per year of mineral ore. EAO issued an order under section 10(1)(c) of BCEAA, which indicated an environmental assessment certificate (Certificate) is required before the Project could proceed. This order was issued on February 25, 2004.

A Technical Working Group comprised of representatives of Canadian and United States (U.S.) federal, British Columbia (B.C.) and Alaska State, Tahltan Nation and local governments was established in March 2004. An initial Technical Working Group meeting was held on April 5/6, 2004. Information on the Technical Working Group is provided in section 4.1.

On November 30, 2005, EAO issued an order under section 11 of BCEAA outlining the scope of the Project, scope of the assessment, and the procedures and methods to be undertaken during the pre-application and Application review stages.

On March 7, 2006, EAO issued an order under section 13 of BCEAA amending the scope of the Project as described in the section 11 Order. The Order also changed the timeline for the Proponent to submit a request for concurrent review of provincial permits.

Draft Terms of Reference for the Application were developed by the Proponent with input from EAO, Canadian and U.S. federal, B.C. and Alaska State agencies, local government and the Tahltan Nation. A public comment period was held on the draft Terms of Reference from December 1, 2005 to January 9, 2006. EAO considered the comments submitted by the public and approved the Terms of Reference on March 10, 2006 as fulfilling the information requirements pursuant to section 16(2) of BCEAA. Federal agencies provided conditional support at that time, pending the outcome of a public review of the proposed scope of the review as required under CEAA and final confirmation by the federal Minister of Environment on whether to continue by way of a Comprehensive Study or to refer the Project to a review panel.

On May 15, 2006, the Proponent submitted its Application to EAO for screening against the Approved Terms of Reference. The Canadian Environmental Assessment Agency (CEA Agency), Ministry of Environment, Natural Resources Canada, Tahltan Heritage Resource and Environmental Assessment Team, Transport Canada, Ministry of Forests and Range, Ministry of Energy, Mines and Petroleum Resources, Health Canada, Environment Canada, Fisheries and Oceans Canada, the Ministry of Community Services and U.S. federal and Alaska state agencies participated in the screening of the Application against the Approved Terms of Reference for the Application.

On June 13, 2006, EAO issued an order under section 13 of BCEAA to make a further change to the timeline for the Proponent to submit a request for concurrent review of provincial permits.

The Application was accepted for review on June 26, 2006, subject to a number of clarifications and editorial changes.

Figure 1. Location of Galore Creek Copper-Gold-Silver Project

On December 22, 2006, at the request of the Proponent, EAO suspended the completion of the review to December 29, 2006, to provide the Tahltan Central Council with additional time to review this Report.

1.2.2 Federal Process and CEAA Requirements

A preliminary description of the Project was reviewed by the CEA Agency and interested federal departments in December 2004. An updated description of the Project was submitted in June 2005 to provide additional information to federal departments. Subsequently, Natural Resources Canada, Transport Canada, Fisheries and Oceans Canada, and Environment Canada confirmed that the Project would likely require specific regulatory authorizations or approvals from each department, which would trigger the need for an environmental assessment under CEAA. The specific powers, duties or functions of the Responsible Authorities with respect to the Project are outlined in detail in section 3.1.

Transport Canada, Natural Resources Canada, Fisheries and Oceans Canada and Environment Canada determined that the scope of Project meets the following provisions of the Comprehensive Study List Regulations of CEAA:

16. The proposed construction, decommissioning or abandonment of:
- *(a) a metal mine, other than a gold mine, with an ore production capacity of 3,000 tonnes per day or more;*
- *(b) a metal mill with an ore input capacity of 4,000 tonnes per day or more;*
- *(c) a gold mine, other than a placer mine, with an ore production capacity of 600 tonnes per day or more.*

30. The proposed construction or decommissioning of:
- *(c) an all-season runway with a length of 1500 metres or more.*

Accordingly, a comprehensive study process was initiated.

For the purposes of this Comprehensive Study, there are four Responsible Authorities: Transport Canada, Natural Resources Canada,Fisheries and Oceans Canada, and Environment Canada. The conclusions of those four Responsible Authorities are outlined in this Report. In reaching those conclusions, the Responsible Authorities received specialist advice from Health Canada

For the Project, the Responsible Authorities and expert Federal Authorities, , in conjunction with the CEA Agency, prepared the Scoping Document for the Project and advertised its availability for public review. The 30-day public review period ended on January 9, 2006. The ensuing report to the Minister of Environment led to confirmation, on June 29, 2006, that the environmental assessment under CEAA would continue as a Comprehensive Study.

1.2.3 Harmonized Review

The Canada-British Columbia Agreement for Environmental Assessment Cooperation (2004) provides for coordinated environmental assessment processes to avoid uncertainty and duplication between the provincial and federal environmental assessment processes and to facilitate a one-window approach when both processes are triggered.

The harmonized assessment of the Project was conducted in accordance with this agreement and an agreement between the CEA Agency and EAO. EAO's role is to neutrally administer and manage environmental assessments. The CEA Agency, as the Federal Environmental

Assessment Coordinator, is the principal point of contact for federal departments during the assessment process, consolidating information requirements for the assessment as well as coordinating the actions of federal authorities with those of EAO.

This Report is a collaborative effort intended to provide a common basis for an Assessment Report under BCEAA and a Comprehensive Study Report under CEAA. It captures the process followed, issues raised, potential effects and the Proponent's proposed mitigation measures for the purposes of both federal and provincial review, and will be the common basis for federal and provincial environmental assessment decisions. The provincial Ministers of Environment and Energy, Mines and Petroleum Resources will use this Report and other accompanying materials as the basis for a decision under section 17 of BCEAA.

The federal Responsible Authorities and expert Federal Authorities have participated in the development of this Report and support its conclusions. However, a final federal determination and conclusion of whether the Project is likely to cause significant adverse environmental effects will be made by the federal Minister of the Environment in an environmental assessment decision statement.

2. PROJECT DESCRIPTION AND SCOPE OF REVIEW

2.1 PROPONENT INFORMATION

The Proponent, NovaGold Canada Inc. (NovaGold) is a wholly owned subsidiary of NovaGold Resources Inc., a publicly traded company based in Vancouver, B.C. The Proponent shares the same management team as NovaGold Resources Inc.

In Western Canada, NovaGold Resources Inc. initially pursued exploration and development of the Project through a separately listed subsidiary called SpectrumGold Inc. Following the success of the Galore Creek exploration programs, NovaGold Resources Inc. acquired all outstanding shares in SpectrumGold Inc. in mid-2004 and transferred all Project rights to NovaGold Canada Inc.

2.2 PROJECT SETTING

The Project is located between the Stikine and Iskut rivers and Highway 37 in northwestern B.C., approximately 1,000 kilometres northwest of Vancouver and 150 kilometres northwest of the deepsea port in Stewart **(Figure 1)**. The Project is on provincial Crown land and falls within the Cassiar Iskut-Stikine Land and Resource Management Plan, approved by the B.C. government in 2000.

The Project is situated within the area indicated by the Tahltan Nation to be their traditional territory. The Tahltan traditional territory is 93,600 square kilometres, which includes an area stretching from the drainage basin of the Stikine River and its tributaries to Dease Lake, the Iskut, Cottonwood and upper Rancheria rivers and the northern sources of the Nass and Skeena rivers.[1] No other First Nations lay claim to the Project area.

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[1] Emmons, G.T. 1911. The Tahltan Indians. In: *University of Pennsylvania The Museum of Anthropological Publications* Vol. IV, No. 1; Teit, James. Tahltan Tales. In: Albright, Sylvia. 1984. *Tahltan Ethnoarchaeology*. Department of Archaeology, Simon Fraser University, Burnaby, B.C. Publication Number 15.

The Tahltan Nation includes the Tahltan Central Council, Iskut First Nation and the Tahltan Band Council. The Iskut First Nation's main settlement is situated at Iskut Indian Reserve #6 at the north end of Kluachon Lake. Iskut is approximately 200 kilometres from the Project site by existing and proposed roads. The Tahltan Band's main settlement is situated at Telegraph Creek Indian Reserve #6. Telegraph Creek is approximately 380 kilometres from the Project site by existing and proposed roads. There is also a Tahltan reserve in Dease Lake (Dease Lake #9), approximately 280 kilometres from the Project site by existing and proposed roads.

The mine extraction, mineral processing, waste rock and tailings disposal sites and permanent camp facilities will be located in the Galore Creek valley (Latitude 57º 07′, Longitude 131º 27′). This glacially scoured U-shaped valley flows northwards to the Scud River, which in turn flows westward into the Stikine River. The Galore Creek valley is surrounded on three sides by high, rugged and ice-capped mountains of the Coast Range. Project activities in the Galore Creek valley will take place at elevations between about 500 metres and 800 metres. Surrounding peaks reach elevations of over 2,000 metres.

The Project area includes major watersheds of the Stikine and Iskut river drainages. The Stikine drainage system is recognized as a significant wilderness area and has local, regional and global ecological significance. The rivers and their tributaries are important habitat for the five major Pacific salmon species and other local fish species. The area is also one of the more important grizzly bear habitats in British Columbia. There are resident populations of goats, moose, black bears and other mammals.

The climate of the Stikine-Iskut basin is affected by the Pacific Ocean to the west and continental Arctic regions to the northeast. Lower elevations of the Project area typically exhibit mild, damp coastal conditions, while higher elevation areas have climate characteristics more typical of the interior of the province. For example, annual precipitation averages 1,726 millimetres near the Iskut/Stikine rivers confluence, 309 millimetres at Mount Klappan to the east of the Project area and 2,200 millimetres in the upper Galore Creek valley.

The Project area is transitional between coastal and interior influences, represented by the Sub-Boreal Interior, Coast and Mountain and Northern Boreal Mountains ecoprovinces. Most of the area is covered with snow and ice and mature forest. A substantial portion is also largely unvegetated due to the relatively recent retreat of the surrounding glaciers. The remaining landscape consists of herbaceous meadows, shrub complexes, young forest, wetlands and waterbodies.

2.3 PROJECT DESCRIPTION

The Proponent proposes to mine using conventional truck and shovel mining methods and crushing/grinding/flotation processes to extract copper and precious metals to produce a bulk concentrate for shipment to an off-site smelter. A slurry pipeline will transport copper concentrate to a filter plant near Highway 37 where it will be de-watered for transport by truck to Stewart. A small diameter diesel pipeline will transport diesel fuel from the filter plant to the mine site, paralleling the concentrate pipeline.

The open pits, processing plant and related support facilities such as shops and employee accommodation will all be located in the Galore Creek valley.

The location of the Project is shown in **Figure 1** and the location of key components is shown in **Figure 2**.

The major components of the Project are:

- **Open Pits** with a combined resource of 494 million tonnes based on a cutoff of U.S. $3.26 per tonne Net Smelter Return;
- a **Plant Site** for processing mined ore at a nominal milling rate of 65,000 tonnes per day producing a combined copper-gold-silver concentrate;
- a **Tailings and Waste Rock Storage Facility** in which tailings and potentially reactive waste rock will be submerged. A permanent dam will be constructed at the downstream end of the facility;
- an **Accommodation Facility** with a capacity to house up to about 440 people, including all direct and contract employees during operation of the mine;
- a 140 kilometre single lane **Access Road** with a finished width of five to six metres and capable of carrying the legal load limit for trucks on B.C. highways. The average design speed is 40 kilometres per hour with maximum grades of 15% to allow vehicle traffic year-round. The final section of the road leading into the Galore Creek valley will include a 3.8 kilometre tunnel sized to accommodate both construction and operations phase truck traffic. Subsequent to submitting the Application, the Proponent decided a glacier crossing route during construction was not required;
- a buried **Concentrate Pipeline** for delivering concentrate slurry from the process plant to a filtration and truck-loading facility near Highway 37;
- a **Filter Plant** for dewatering concentrate slurry**,** with the filter cake to be loaded into haul trucks with gross vehicle weights up to 63,500 kilograms. The dewatered concentrate will then be transported via Highways 37 and 37A to the Port of Stewart bulk-loading facility at the head of the Portland Canal;
- a pipeline and **Diffuser System** via which treated filtrate from the slurry concentrate dewatering process will be discharged into the Iskut River;
- a **Diesel Pipeline** will be installed alongside the **Concentrate Pipeline**. Diesel fuel will be delivered to the Filter Plant site by super B train tanker truck-and-trailer combinations, and subsequently be pumped into the pipeline leading to storage tanks at the mine plant site within the Galore Creek valley;
- an **aerodrome** with a 1,500 to 1,800 metre by 50 metre wide gravel-surfaced airstrip designed to accommodate aircraft as part of mine operations. All mine staff will be flown into and out of the mine site via the aerodrome on a two-week rotation,

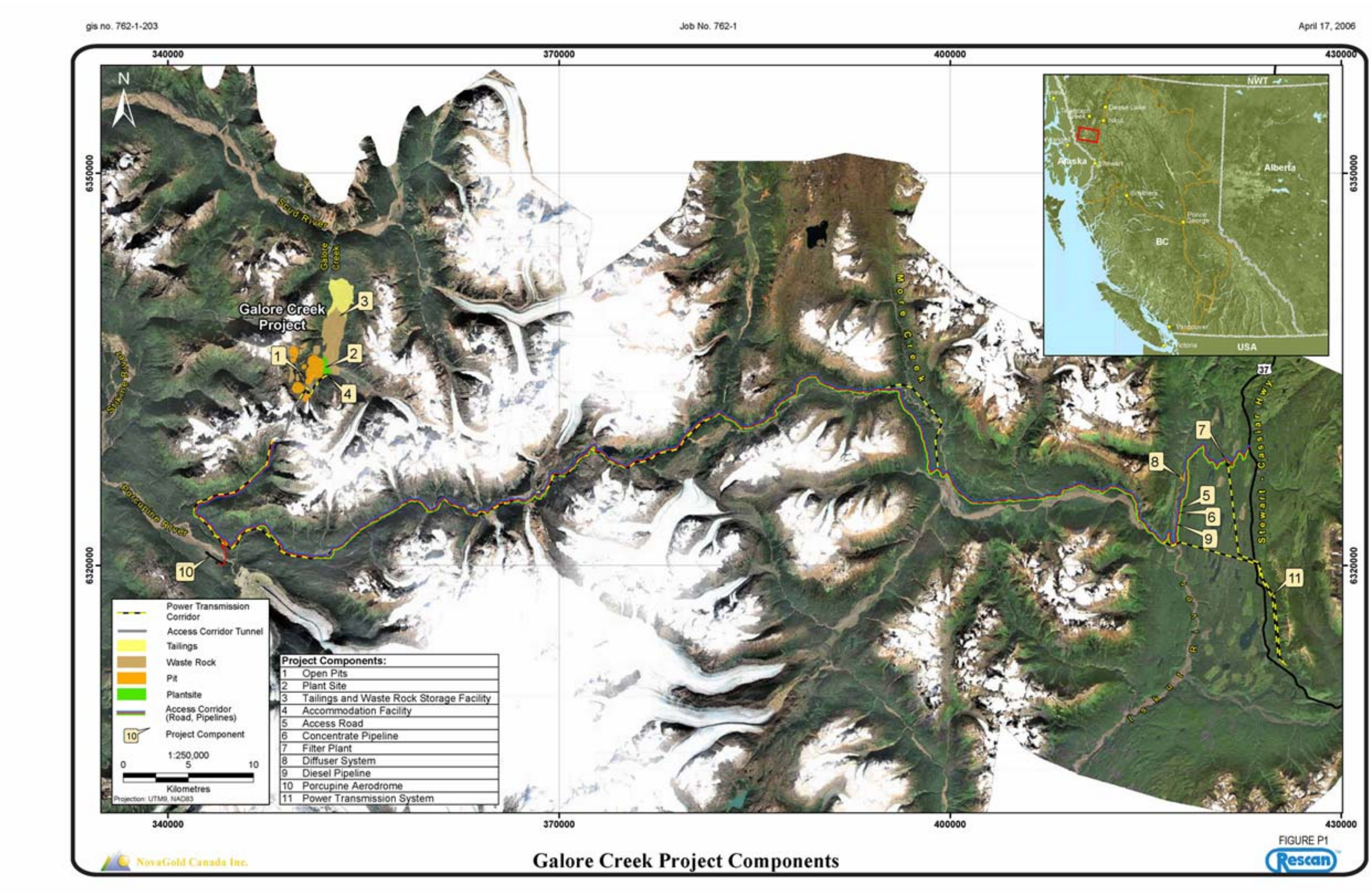

Figure 2. Location of Key Project Components

- a **Power Transmission System** to provide electrical power from a substation at Bob Quinn Lake to both the Filter Plant and the Galore Creek mine site. The Bob Quinn substation will be able to isolate power from either the B.C. Hydro grid or the Forrest Kerr generating facility, and will step down the voltage for the transmission line leading to the filter plant.

2.3.1 Open Pits

Mining at Galore Creek will be by conventional truck and shovel operation with one main pit (Central) and several satellite pits (Southwest, Junction, Middle and West Fork pits) as shown on **Figure 3**. Approximately 80% of the ore will be from the Central pit. The Southwest, Junction, Middle and West Fork pits will be excavated to approximately 300 m, 315 m, 107 m and 128 m respectively. The Central pit, being the largest of the pits will be excavated to a final depth of approximately 482 m in the more northerly bottom and 419 m in the more southerly bottom. Ore extraction will be allocated between the pits as necessary to maintain an appropriate volume and grade of ore flow to the mill. Mining will be performed top down by benches within multiple pits at the same time. The Central Zone deposit is 1,700 metres long, 200 to 500 metres wide and has been traced to a depth of 450 metres. The Southwest Zone is up to 400 metres long and may be as wide as 140 metres. The Junction deposits lie about two kilometres northwest of the Central Zone and about 460 metres higher in elevation. The West Fork deposit is located less than one kilometre south of the Central Zone.

2.3.2 Plant Site

Galore Creek ore will be processed on site to produce a copper-gold-silver concentrate for shipment to an off-site smelter. The nominal milling rate will be 65,000 tonnes per day. The Galore Creek mill will process a blend of open pit ore from the Central, Southwest, Junction, and West Fork pits. The same flowsheet will be used for all ore types.

The mill will consist of the following unit operations: ore storage; primary crushing; two-stage grinding; copper flotation; rougher concentrate regrinding; concentrate thickening and pumping; tailings thickening and pumping; and water reclaim. The mill will operate 24 hours per day, 365 days per year with scheduled downtime for equipment maintenance.

2.3.3 Tailings and Waste Rock Storage Facility

Over the twenty-year life of the Project, an estimated 475 million tonnes (351.9 million metres cubed) of tailings will be produced. At the end of the mine life, the tailings impoundment will be approximately 2.6 kilometres long, 1.5 kilometres wide and 200 metres above the existing valley bottom.

An initial starter dam will be constructed and will be sized to accommodate two years of tailings. Lifts will be added to the starter dam incrementally until the approximate height of 275 metres is achieved. To facilitate construction of the tailings starter dam in dry conditions, water will be ponded behind a 71 metre high coffer dam, 3.5 kilometres upstream of the main tailings dam.

During operations, tailings will be piped from the plant site - approximately 5.6 kilometres - to the designated tailings impoundment area. The tailings pipeline(s) will be placed on a berm built immediately down slope of the access/maintenance road constructed in the eastern slopes above the waste impoundment. Tailings will be primarily spigotted from the north end of the impoundment area, off of the main dam crest. Tailings slurry will also be spigotted off the eastern slopes to optimize filling of the basin.

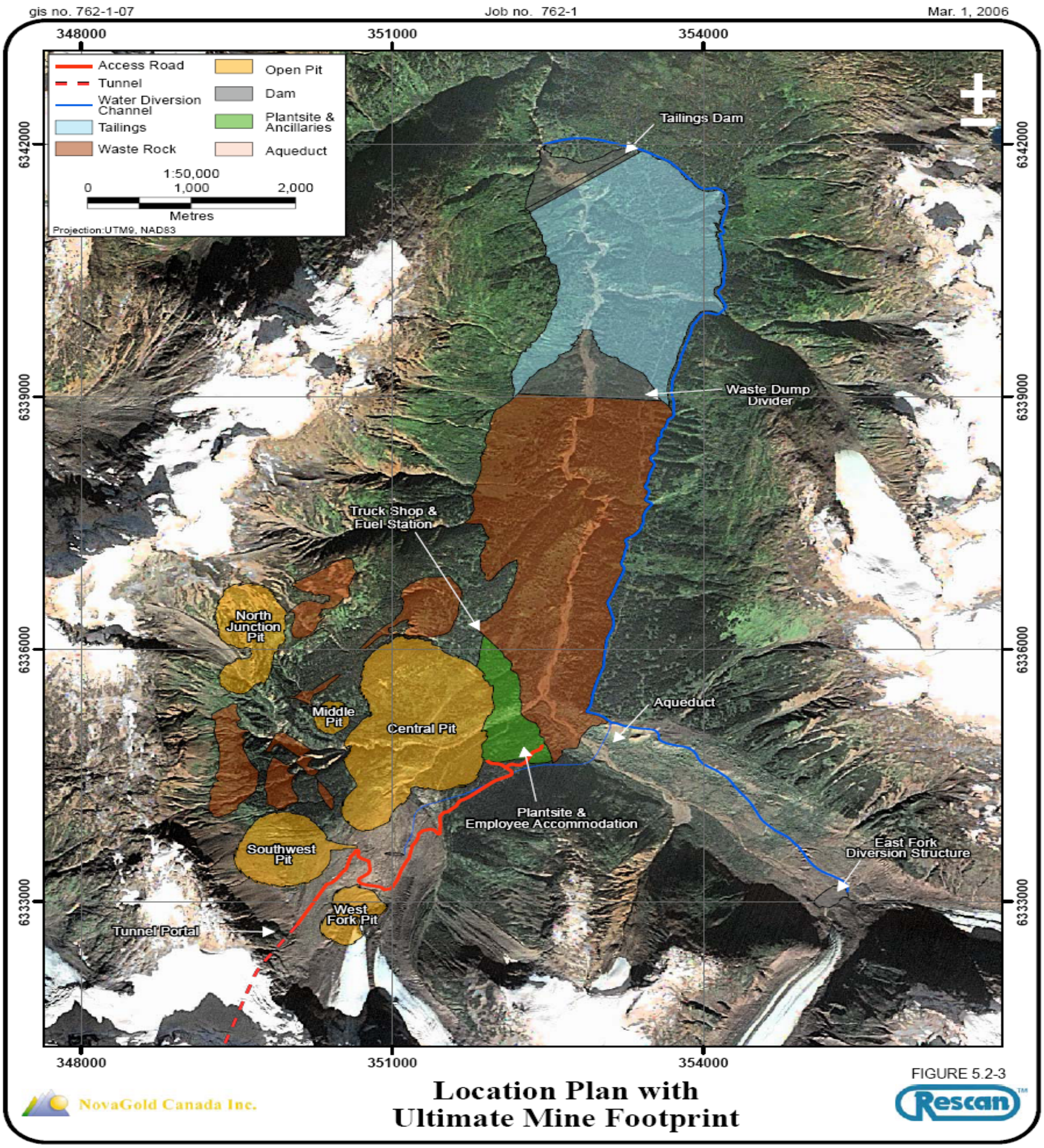

Figure 3. Location of Open Pits

With deposition off the main dam, water will be forced south against the waste dump, creating a beach on the upstream slope of the main dam. However, it is recognized that there will likely be water against the main dam, most of the time. Any beaches that do form will slope to the south at an inclination of less than 1%, depending upon the pond water level and final tailings grain size. Tailings exposed in temporary beaches will remain water saturated.

Up to 85% of the tailings supernatant will be reclaimed either from the tailings thickener or from the pond and pumped back to the mill for use as process water. The two 762 millimetre diameter reclaim pipelines will be buried under the diversion channel maintenance road. In order to maintain water balance in the tailings impoundment, excess water must be released from the pond every year. Following solids settling and consolidation, surplus pond water, comprising a combination of site drainage and tailings water, will be released between mid-May and mid-October. Releases will be controlled by pumping from the pond and release rates will be paced to mimic as much as possible the natural receiving water hydrograph.

Preliminary acid base accounting testing of tailings provided different results between the Phase 1 and 2 testwork. Phase 1 indicated potentially acid generating for the whole tailings, whereas Phase 2 suggests that the whole tailings representing the first five years of tailings production are not-potentially acid producing. The tailings are considered potentially acid producing overall and therefore the Proponent proposes to use a conservative approach by storing all tailings under a water cover in perpetuity to restrict oxidation and the potential onset of metal leaching and acid rock drainage. On closure the tailings will have a minimum water cover depth of 16 metres.

2.3.4 Construction Camps and Accommodation Facilities

The Proponent proposes to construct and operate the Project using camp type accommodation for all employees. Workers will be accommodated on site for a period of several weeks, depending on their specific job rotation schedule, and will commute to their homes in other communities for their scheduled time off. The Proponent will not construct a traditional community to house workers near the Project.

Several construction camps will be required to meet reasonable project timelines. Initial work on the northern portal of the Scotsimpson tunnel will be based from the existing exploration camp in the Galore Creek valley. It is anticipated that by May 2008 the primary camp will be established in the vicinity of the plant site in the Galore Creek valley with a capacity of about 450 people to support initial civil construction. This camp will be expanded by August 2009 to an 850 person capacity to support the major construction efforts prior to commissioning. The expansion will include accommodation units transferred from the Porcupine and West More sites once they are no longer required. The Galore camp will be supported solely by helicopter pending completion of the tunnel and access roads.

In November 2006, during the review of the Application, the Proponent advised that the following changes to the location of the construction camps proposed in the Application were required:

Filter Plant – Temporary construction camp to be expanded to house up to 200 people. Small 35-person operations camp to be constructed at the new filter plant location at kilometre 8.7.

West More – Temporary camp proposed for kilometre 73.2 to be moved to kilometre 74.5 to avoid potential effects on a recently discovered archaeological site. There will be up to 120 people in this camp. The new site has been assessed for archaeological resource potentialPorcupine River – Temporary camp relocated to the north side of the river to permit construction of camp prior to erecting the bridge over the Porcupine River to the aerodrome. This camp will house up to 70 people.

Other – New camps are also required at: kilometre 36.5 on the south side of the access road (100 people); kilometre 91 on the north side of the access road (130 people), kilometre 125.3 on the south side of the access road for work on the south tunnel portal (50 people).

On completion of construction, the Galore Creek valley camp will be downsized to house about 280 people for mine operations. Temporary camps will be decommissioned once access road construction has been completed.

The changes to the location of the construction camps did not change the effects assessment reported in the Application.

The Project will require two permanent camp facilities; one at the mine site adjacent to the plant in an area with low snow avalanche and geotechnical hazard risk and a second camp at the filter plant. The permanent camp facility for the mine operation will consist of a pre-fabricated, modular structure with about 230 double occupancy rooms; kitchen and dining facilities, lounge and fitness rooms. The structure will be designed with peaked roofs to handle the high snow loads in this location.

The mine will not accommodate casual visitors. The combination of 12 hour shifts, limited road access outside the immediate mine area, normal mining operation hazards, rugged surrounding terrain, cold and wet climate and fish and wildlife protection objectives will discourage employees from exploring areas adjacent to the mine during their time off. A wide variety of foods will be available to mine workers in a cafeteria style dining area. Menus will attempt to address the cultural diversity of the workforce.

The filter plant camp will accommodate employees required to operate the filter plant, water treatment facility, road security gate, and truck load out on a 24 hour per day basis. It will consist of several attached prefabricated buildings containing 30 single occupancy rooms, washing, laundry, kitchen and dining facilities, a lounge and a fitness room. It will be located immediately adjacent to the filter plant complex.

The domestic waste disposal system for the Project will consist of a waste transfer area, landfill, land farm, incinerator, and sewage effluent/sludge disposal processes.

2.3.5 Access Road

An access road to the mine site is required in order to develop the Project. Several access alternatives were investigated and are discussed in section 5 of this Report. The Proponent's preferred alternative is an all weather road from the Devil Creek Forest Service Road which connects with Highway 37 north of Bob Quinn Lake, following More Creek to the headwaters of West More Creek, down the Sphaler Creek drainage to the Porcupine River and up the Scotsimpson Creek drainage to a tunnel at the head of Scotsimpson Creek which will provide access to the Galore Creek valley.

The access road is classified as a resource development road with a finished road width of five to six metres and a design speed of 30 to 60 kilometres per hour capable of carrying the legal load limit for trucks on B.C. highways on a year round basis. The average design speed is 40 kilometres per hour. Allowance for a minimum standard in control sections such as Sphaler Canyon is made for a five to six metre road width with turnouts and a reduced travel speed of 30 kilometres per hour. Grades in this short section may reach 14 to 15% on short pitches.

The use of a slurry pipeline, rather than trucks, to transport concentrate allows steeper grades exiting the mine. With no concentrate transportation on the road, the traffic during the production phase will be mostly trucks hauling non-diesel fuels, grinding media, reagents and supplies to the mine, and leaving the mine empty. Passenger buses will be used to transport workers from the mine to the Porcupine aerodrome, or to the airstrip at Bob Quinn Lake when the aerodrome is not available due to inclement weather. A traffic study suggests that maximum supply traffic on the road will be about 19 vehicles each way per day once the mine is in operation. There will be additional traffic for maintenance and monitoring.

2.3.6 Concentrate Pipeline

The Proponent investigated several options for transporting concentrate, including trucking of dewatered concentrate directly from the mine to the port of Stewart, transporting the concentrate in slurry form by pipeline from the mine to the port, and several combinations of pipeline and trucking. The Proponent has chosen to construct a concentrate slurry pipeline from the mine to a filter (or de-watering) plant near the junction of the mine access road and Highway 37 and to haul dewatered concentrate by truck from that point to Stewart.

A second pipeline, to transport diesel fuel to the mine site from Highway 37, will be constructed parallel to the concentrate pipeline to further reduce the mine's dependence on daily road access. This pipeline will eliminate the requirement for diesel tanker truck traffic on the access road, reduce the weekday traffic volume on the road by a further 10%, reduce the potential for diesel spills due to accidents and improve project safety.

On September 26, 2006, during the review of the Application, the Proponent submitted a detailed feasibility study on the ore concentrate pipeline to provide further information on the pipeline.

2.3.7 Filter Plant

The filter plant will be located at the terminus of the concentrate slurry pipeline. Subsequent to submission of the Application, the Proponent re-located the filter plant because the original area was too small and had ravines on both sides. The plant is now located at kilometre 8.7 on the Devil Creek Forest Service Road. The change to the filter plant location did not result in any change to the location of the diffuser.

The filter plant will be equipped to de-water the concentrate and treat all water received at the plant through the slurry pipeline prior to discharge. Consequently, the filter plant will include water treatment facilities to ensure that the discharge water is clean and readily meets discharge criteria. The plant will consist of: concentrate stock tank, two pressure filters, filtrate thickener, reactor clarifier, sand, cartridge and carbon filters, and flocculant and sulphuric acid systems. The filter plant will also house the equipment for the necessary utilities such as power, compressed air, fire water and heating and will have an adjacent accommodation complex for about 30 plant workers, a covered concentrate storage area and truck loading and weighing facilities.

Concentrate slurry will be received in an 8 metre diameter by 8 metre high agitated stock tank at about 56% solids by weight, then filtered through the two 108 m^2 pressure filters to achieve 8% to 10% moisture. The filter cake will be conveyed to a 580 tonne loadout bin or a large concentrate storage shed until collected for transportation by truck to the tidewater port of Stewart, B.C. The filtrate treatment solids (sludge) will be blended into the concentrate prior to shipment. The peak design throughput will be about 2,000 tonnes per day with normal operations being about 25,000 tonnes per month.

2.3.8 Diffuser System

After treatment, the clean water will be pumped through a 15 centimetre diameter high-density polyethylene pipeline, buried for much of its length alongside the concentrate pipeline, to the Iskut River where it will be discharged through a pipeline and diffuser system.

A site for the diffuser has been identified at a relatively straight and narrow reach of the river approximately five kilometres upstream of the confluence of the Iskut River and More Creek and two kilometres downstream of the Iskut River hot springs.

Diffuser design was undertaken with the U.S Environmental Protection Agency's "PLUMES" suite of models to assess combinations of port size, port spacing and vertical angle. A maximum diffuser length of 24 metres, one half the low-flow river width, is allowable.

During the Application review, the Proponent provided additional information on the design of the diffuser.

2.3.9 Diesel Pipeline

The diesel pipeline will be 8.89 centimetres (3.5 inches) in diameter with a design throughput of 46,000 cubic metres per year. Capacity control shutdowns will occur as a normal operating practice.

The pipeline will be laid in the same trench as the concentrate slurry pipeline and will be equipped with leak detection systems similar to the slurry pipeline and remotely operated with automatic shut off safety valves. The leak detection system should detect a diesel leak within 2 to 10 minutes of occurrence. The two pipelines will share a state of the art cathodic protection system. Safety provisions will be consistent with regulations governing petroleum products pipelines, which use conventional and proven technologies. Control and monitoring of the pipeline will be from the filter plant central control room.

Diesel will be delivered to the filter plant via about 500 super B train tanker truck and trailer combinations per year. A single 38 m^3 (10,000 US gal) storage tank, located in a lined containment area sized to 110% of the capacity of the storage tank, will be constructed at the filter plant to feed the pipeline. The fuel transfer station for incoming diesel supply trucks will use conventional safety and spill prevention systems. It will have a concrete pad and sumps to collect spills and will be equipped with appropriate spill kits.

2.3.10 Aerodrome and Heliport

The Proponent proposes to construct a permanent aerodrome in the Porcupine River watershed to support road and tunnel construction and to provide ongoing air support during operation of the mine. A heavy lift heliport will be constructed near the West More camp in the headwaters of West More Creek to support a road construction camp. Initial development of both sites will require use of heavy-lift helicopters.

The Porcupine aerodrome will be a 1,500 to 1,800 metre long by 50 metre wide gravel-surfaced airstrip designed to accommodate a Hercules L-100 aircraft. In order to accommodate the weight of a Hercules on an all-season basis the airstrip will require a 600 millimetres sub-base of gravel or stone, a 230 millimetres base of crushed stone or crushed gravel and a 135 millimetres surface of crushed stone or crushed gravel. The crushed material is necessary to provide long-term stability.

2.3.11 Power Transmission System

The Proponent anticipates the Project will have an average electrical load of 80 megawatts and a maximum load of about 90 megawatts. It is expected that power will be available from the provincial power grid in the vicinity of Bob Quinn Lake. The provincial electric power grid currently extends to Meziadin Junction.

Subsequent to submitting the Application, the Proponent acquired Coast Mountain Hydro Corporation, which is constructing a 100 megawatt run-of-river hydroelectric project on the Iskut River near the confluence with Forrest Kerr Creek, with a proposed commissioning date in 2008. Coast Mountain Hydro Corporation has contracted to deliver power to B.C. Hydro and proposes to construct a 138 kilovolt transmission line from the power plant to the provincial electricity grid at Meziadin.

2.4 CAPITAL COSTS AND EMPLOYMENT

The Proponent estimates the capital cost of the Project will be approximately US$1.4 billion, assuming access to the provincial electric power grid at Bob Quinn Lake. The Project will create approximately 900 to 1,000 jobs during the construction phase and require approximately 500 direct employees during the operations phase. Additional contract employees will be required for many ongoing and intermittent tasks, including camp operation, concentrate hauling, tailings dam expansion and mill relining. Construction is expected to take more than three years and, once in production, the mine is expected to operate for over 20 years.

2.5 PROJECT SCOPE

The scope of the Project for this Report includes the construction, operation, and decommissioning (including closure and reclamation) of the following components and activities potentially associated with the Project:

- up to 65,000 tonnes per day open pit mine and process plant located in the Galore Creek valley;
- mill tailings and waste rock storage facility(ies) including containment dams;
- site runoff, water diversion and sediment control;
- ore and marginal ore storage;
- borrow pits, and overburden and topsoil storage;
- construction and operations camp, including ancillary facilities such as sewage treatment and incineration;
- explosives manufacturing and storage plant;
- an access road from Highway 37, along More and Sphaler Creeks to the Porcupine River, and up to Scott Simpson Creek to a tunnel into the Galore Creek valley;
- a power line from the Bob Quinn Lake area on Highway 37 to More Creek, and predominantly following the access road corridor to the Galore Creek valley;
- an ore concentrate slurry pipeline and diesel pipeline following the access road corridor, from the process plant site in the Galore Creek valley to the Devil Creek Forest Service Road and terminating at the dewatering facility;
- a filter plant (including dewatering and water treatment facilities), ore concentrate stockpile and truck loadout at the slurry pipeline terminus;
- transportation of mine processing reagents and other hazardous chemicals to the mine site along the access road;
- transportation of concentrate from the filter plant by truck along Highway 37 to the deepsea port at Stewart;
- development of an airstrip along the south side of the Porcupine River into a permanent aerodrome to service the mine during operation;
- construction of a spur road from the airstrip at the Porcupine River connecting to the access road,

- a potential construction heavy-lift staging airstrip or heliport in the More valley near Round Lake.

The scope of the Project under CEAA differs slightly from that under BCEAA in that the transport of ore concentrate from the filter plant to the port was not included as part of the federal environmental assessment since this activity does not require any federal permits, licences or authorizations and therefore no “trigger” under CEAA.

The environmental assessment considers the effects of the Project in all phases, beginning with the construction phase and throughout the operations phase (including any maintenance and/or modifications) and where appropriate, through to the completion of the decommissioning phase, closure and post-closure.

2.6 SCOPE OF ASSESSMENT

For the purposes of BCEAA, the scope of the assessment includes consideration of potential effects of the Project, including environmental, social, economic, health and heritage effects and potential effects on aboriginal interests, taking into account practical means of preventing or reducing to an acceptable level any potential adverse effects of the Project.

For the purposes of CEAA, the Responsible Authorities are required to consider the factors specified in section 16 of the CEAA, taking into consideration the definitions of the environment, environmental effect of the Project, prior to making a decision regarding whether to take action (e.g., grant funding, dispose of land, or issue a permit or authorization) that would permit the Project to proceed.

Factors considered in the environmental assessment, pursuant to section 16 of the CEAA, include the following:

- the environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
- the significance of the environmental effects referred to above;
- comments from the public that are received in accordance with the Act and the regulations,
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project.

Additional factors to be considered as part of the Comprehensive Study include:

- the purpose of the Project;
- alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the Project,
- the capacity of renewable resources that is likely to be significantly affected by the Project to meet the needs of the present and those of the future.

As defined under CEAA, “environmental effect” means, in respect to a project:

a) any change that the Project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*;
b) any effect of any change referred to in paragraph (a) on

i. health and socio-economic conditions;
ii. physical and cultural heritage;
iii. the current use of lands and resources for traditional purposes by aboriginal persons; or
iv. any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance; or

c) any change to the Project that may be caused by the environment

whether any such change or effect occurs within or outside Canada.

The scope of the assessment under CEAA differs slightly from that under BCEAA, given the definition of environmental effects noted above. Similarly, there are specific CEAA requirements that are not required to be addressed under BCEAA. These differences are noted in Part B of the Report.

2.6.1 Valued Ecosystem Components

An environmental effects assessment is a process designed to predict the environmental effects of proposed developments before they are carried out. The purpose of an assessment is to minimize or avoid adverse environmental effects before they occur and to incorporate environmental factors into decision-making. A key aspect of undertaking an environmental assessment is to identify environmental components that could be affected by, or have an influence on, the proposed development. While all components of the environment are important, it is not practicable to assess every potential effect on every component. Consequently, the analysis must focus on the components that have the greatest relevance in terms of value and sensitivity to the particular circumstances of the development under review, and that have a meaningful potential to be affected by the development.

Following a widely recognized approach, the Proponent identified components of the environment that were valued for traditional or contemporary use, economic reasons, and/or cultural/social reasons. These valued ecosystem components were selected based on consultations with First Nations, resource users, local communities, and government agencies (federal and provincial). The valued ecosystem components evaluated for the Project are discussed in detail in Part B of this Report.

In order to effectively assess the potential environmental effects of the Project, the spatial boundaries for valued ecosystem components varied based on the spatial characteristics of the Project and various valued ecosystem components. These boundaries extended beyond physical project limits, and even beyond the limits of potential direct interactions between the Project and the valued ecosystem components, particularly in the case of migratory species, or regional or national socio-cultural and economic systems.

3. REQUIRED STATUTORY APPROVALS

3.1 FEDERAL APPROVALS

At the conclusion of the environmental assessment the federal Minister of the Environment will issue an environmental assessment decision statement. The federal departments will be able to proceed to their regulatory decisions if the Minister's environmental assessment decision statement indicates that, in the opinion of the Minister, the Project is not likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures.

Section 5(1) of the CEAA states that an environmental assessment of a project is required before a federal authority exercises a power, duty or function in respect of a project, in this case issue any required approvals, authorizations, permits and licences:

- a permit or license for an explosives factory and magazine under paragraph 7(1)(a) of the *Explosives Act;*
- approval(s) pursuant to subsection 5(1) of the *Navigable Waters Protection Act* for the construction of bridges or other structures over navigable waterway(s) associated with: the access road from Highway 37 into the Galore Creek valley, the construction of a bridge across the Porcupine River, containment dams required for the construction of the Tailings Impoundment Area, and some of the pipeline crossings,
- authorizations pursuant to subsection 35(2) of the *Fisheries Act* for the harmful alteration, disruption or destruction of fish habitat resulting from stream crossings and the infilling of waterbodies associated with: the access road from Highway 37 into the Galore Creek valley; the ore concentrate pipeline and the diesel fuel pipeline following the road corridor from the plant site in the Galore Creek valley to Highway 37; the 1525-metre airstrip along the south side of the Porcupine River, the construction of a bridge across the Porcupine River; and
- a licence under subsection 10(1) of the *International River Improvements Regulations* for a river improvement (dam and related works) that will alter the natural flow of an international river.

The completion of the environmental assessment does not guarantee that the necessary permits, approvals and authorizations will be granted, as the Project must comply with the requirements of the appropriate federal regulatory agencies.

The above list relates to those federal statutory and regulatory approvals in the *Law List Regulations* under CEAA that require environmental assessments under CEAA if they enable a project to be carried out. There may be additional federal permit or regulatory requirements for the Project that are not listed above.

3.2 PROVINCIAL APPROVALS AND CONCURRENT REVIEW OF PERMITS

No provincial authorizations, permits, tenures or licenses may be issued under any provincial statutes until the Project has received an environmental assessment certificate from provincial ministers. In addition, the issuance of a certificate does not guarantee that the necessary permits and authorizations will be granted, as the Project must comply with the requirements of the appropriate provincial regulatory agencies.

The “permitting stage” refers to the stage following an environmental assessment certificate decision in which approvals may be issued by regulatory agencies. Provincial regulatory agency approvals required by the Project in the permitting stage are shown in **Appendix G**.

Under section 23 of BCEAA and B.C. Regulation 371/2002, a Proponent may apply to EAO for concurrent review of applications submitted to provincial regulatory agencies, at the same time their environmental assessment application is being reviewed.

On June 23, 2006, the Proponent submitted an application to EAO for the concurrent review of ten applications, shown in **Appendix H**. EAO accepted the applications for concurrent review in a letter of formal acceptance dated July 6, 2006.

4. INFORMATION DISTRIBUTION AND CONSULTATION

4.1 MEASURES UNDERTAKEN WITH GOVERNMENT AGENCIES

4.1.1 Technical Working Group

In March 2004, a main Technical Working Group was established by EAO to participate in the environmental assessment. The Technical Working Group was comprised of Canadian and U.S. federal agencies, B.C. and Alaska state agencies, Tahltan Nation and local governments.

The working group participated in the review by:

- reviewing and commenting on proposed baseline study programs prepared by the Proponent;
- reviewing and commenting on drafts of the Application Terms of Reference and the Application;
- providing advice on issues raised during the course of the assessment of the Project; and
- commenting on the assessment findings to be reported to provincial ministers and the federal Minister of Environment at the conclusion of the environmental assessment.

During the pre-application stage, smaller working groups were also established to focus on specific issues such as metal leaching and acid rock drainage, water quality and quantity, fisheries and navigable waters, wildlife, access, socio-cultural, and mine planning, reclamation and closure.

The initial Technical Working Group meeting was held in April 2004 in Smithers. During the pre-application stage, there were approximately 44 meetings and teleconferences involving the working group.

Early in the environmental assessment review, EAO recognized that U.S. federal and Alaska State agencies should be invited to participate in the review because of potential transboundary effects (Boundary Waters Treaty, Pacific Salmon Treaty and *International River Improvements Act)*. The Proponent, Tahltan Nation, EAO and CEA Agency representatives travelled to Juneau in May 2004 to discuss the Project with U.S. federal, Alaska State agency and local government representatives. Participants in this meeting included representatives from the: Alaska Departments of Natural Resources, Environmental Conservation, and Transportation and Public Facilities; U.S. Department of the Interior (including the Fish and Wildlife Service and the Bureau of Indian Affairs); U.S. Department of Agriculture – Forest Service; U.S. Department of Commerce – National Marine Fisheries Service; and the U.S. Environmental Protection Agency, City of Wrangell. The meeting ended confirming participation in the Project review by the: Alaska Departments of Natural Resources, Environmental Conservation, and Fish and Game; U.S. Department of Interior; U.S. Department of Agriculture – Forest Service; and U.S. Department of Commerce – National Marine Fisheries Service, U.S. Environmental Protection Agency.

EAO organized a meeting with representatives of the Tahltan Nation, Canadian and U.S. federal, B.C. and Alaska State agencies in June 2004 in Vancouver to provide information on federal and provincial regulatory requirements as they relate to mine projects.

During the Application review stage, there were about twelve meetings and teleconferences involving the Technical Working Group.

Proponent-led Consultations
The Proponent initiated meetings with government regulators shortly after the Project officially entered the pre-application stage of the process in February 2004. The Proponent organized several site visits for members of the working group.

Throughout the review, the Proponent attended working group meetings to provide information on the Project, review proposed baseline studies and respond to questions from the working group. The Proponent also met independently with provincial and federal agencies to resolve issues identified throughout the environmental assessment.

4.2 MEASURES UNDERTAKEN WITH THE PUBLIC

EAO, the CEA Agency and federal Responsible Authorities are responsible for ensuring project information is adequately distributed and that the public is consulted at key stages of a project environmental assessment. The section 11 and section 13 Orders issued to the Proponent by EAO identified public consultation measures for the pre-application and Application review stages. The public participation for the federal environmental assessment process followed the provincial process while including additional participation steps required for a Comprehensive Study. The additional steps under CEAA are outlined in Section 4.3.

The Proponent initiated its consultation program in February 2004. During the pre-application stage, 16 open houses were held in the communities of Dease Lake, Telegraph Creek, Iskut, Smithers, Stewart, Terrace and Wrangell, Alaska. The dates of the open houses were advertised in local newspapers and met the seven days notice requirement under BCEAA. The public attending the open houses were largely in support of the Project.

During the pre-application stage, EAO held a public comment period on the draft Terms of Reference from December 1, 2005 to January 9, 2006. The Proponent advertised the availability of the Terms of Reference in local newspapers. Copies of the draft Terms of Reference were placed in public libraries in Smithers and Stewart, the Iskut First Nation and Tahltan Band Offices, and the Northern Lights College in Dease Lake. Following the close of the comment period, the draft Terms of Reference were revised to incorporate comments from the public and the additional comments submitted by members of the Technical Working Group. The Approved Terms of Reference were issued by EAO on May 10, 2006.

In accordance with sections 13.2 and 14.2 of the section 11 Order, during the screening of the Application, EAO reviewed the adequacy of public and First Nation consultation activities undertaken during the pre-application stage and proposed public and First Nation consultation measures proposed during the Application review stage. On June 14, 2006, EAO wrote to the Proponent indicating the public notice provided by the Proponent for the open houses held during the pre-application stage was adequate. The Proponent also advised that consultation measures undertaken during the pre-application review stage and proposed for the application stage were adequate. In addition to the public consultation proposed during the review of the Application EAO requested the Proponent:

- contact key stakeholders, including licensed guide outfitters and registered trapline holders identified in the Application to determine any potential effects and measures to mitigate identified effects;
- investigate whether there is any recreational use (e.g. whitewater kayakers, canoeists, fishers or other users in boats) of watercourses potentially affected by works placed in or over watercourses, and attempt to contact users to identify any potential effects and measures to mitigate identified effects; and,
- by October 16, 2006, provide a written report to EAO, which summarizes the results of consultations with the stakeholders referred to above, including any identified effects and measures to mitigate these effects.

During the Application review, EAO and CEA Agency held open houses in Telegraph Creek (June 27, 2006), Dease Lake (June 28, 2006), Smithers (July 11, 2006), Terrace (July 12, 2006), Stewart (July 13, 2006), Wrangell and Petersburg, Alaska (July 13, 2006),and Iskut (July 14, 2006). A minimum of seven days prior to the open houses, ads were placed in local newspapers (The Northern Connector, Terrace Standard, Interior News, the Prince Rupert Daily News, Wrangell Sentinel and Petersburg Pilot) to advertise open house dates and the public comment period on the Application.

Approximately 140 people attended these open houses. Questions asked at the open houses in Smithers, Terrace and Stewart focused on employment, business opportunities and training. Questions were also asked about the Project's power requirements, mine plan and development schedule, filter plant operation and discharge and public use of the access road and road decommissioning requirements. At open houses held in Petersburg (Alaska) and Wrangell (Alaska), the public raised concerns about potential downstream effects on Stikine River sport, commercial and subsistence fisheries and aquatic resources and water quality. Questions were asked about possible metal contamination, tailings dam integrity and potential failure, pipeline ruptures and hydrocarbon spills, and provincial bonding requirements for the mine.

EAO held a public comment period on the Application from July 10 to September 8, 2006. Copies of the Application were placed in: public libraries in Smithers, Stewart, Terrace, Vancouver, Wrangell (Alaska) and Petersburg (Alaska) and the Dease Lake Learning Centre.

Thirty-one public comments were received on the Application. Some comments from the public indicated support for the Project. Members of the public commented on the potential effects of the Project on Stikine River fisheries and aquatic resources, air and water quality, and Iskut River Hot Springs Provincial Park. The public also commented on the potential effects of increased truck traffic along Highway 37 and through the Town of Stewart, the potential for catastrophic failure of the tailings dam, the scope of the cumulative effects assessment and requirements for bonding, monitoring during operations and post-closure and reclamation, and emergency and spill response planning. Some members of the public noted their support for the Proponent's decision to pursue access along a modified northern route. **Appendix C** summarizes the comments submitted by the public and the Proponent's response to the comments.

Throughout the review, EAO used the electronic Project Information Centre to post the Application, supplementary information, meeting records and correspondence related to the Project.

4.3 PUBLIC PARTICIPATION UNDER CEAA

4.3.1 CEAA Section 21 – Proposed Scope of Project

Under subsection 21(1) of the CEAA, for a Comprehensive Study, Responsible Authorities must ensure public consultation with respect to the proposed scope of the Project, the proposed factors to be considered in the environmental assessment, the proposed scope of those factors, and the ability of a Comprehensive Study to address issues relating to the Project. A public consultation period was held from December 1, 2005 to January 9, 2006.

The public were invited to review and comment on the scoping document by placing ads in the following newspapers: Vancouver Sun, The Province, Wrangell Sentinel, Smithers-Interior News, Petersburg Pilot, Terrace Standard, L'Express du Pacifique and on local radio – CJFW (Terrace) and CBC in late November/early December, 2005. The availability of participant funding was included in the ads and the scoping document was posted on the Canadian Environmental Assessment Registry.

Two comments were submitted, one from a member of the public and another from the Tahltan Central Council. Neither comment raised concerns to suggest that a Comprehensive Study would be insufficient to address project-related issues. The comments were either addressed in the final federal scope or were evaluated as part of the cooperative Canada-BC environmental assessment.

In the Track Report submitted to the Minister of the Environment, the Responsible Authorities, in consultation with the expert Federal Authorities, indicated that the Comprehensive Study could fully address issues related to the Project. The Minister of the Environment issued a decision statement on June 29, 2006, that the environmental assessment under CEAA would continue as a Comprehensive Study.

The Participant Funding Program recipient was confirmed on July 5, 2006. The Iskut Band Council received $30,000 to support its participation in the environmental assessment of the Project.

4.3.2 CEAA Section 21.2 - Comprehensive Study

As a part of the cooperative provincial/federal review of the Project, the Responsible Authorities shared the formal comment period on the Application as prescribed in the BCEAA (from July 10 to September 8, 2006). This process is further discussed in Section 4.2 of this Report.

4.3.3 CEAA Section 22 - Comprehensive Study Report

A third opportunity for public input on the Project and the associated environmental assessment is held during the federal public comment period on this Report. Pursuant to section 22(1) of the CEAA. The CEA Agency will facilitate public access to the Comprehensive Study Report, including administering a formal public comment period. All comments submitted will be provided to the Responsible Authorities and will become part of the public registry for the Project. The Responsible Authorities will be asked by the CEA Agency to respond to the comments and advise the Agency whether their conclusions have been altered as a result of the public comments received.

4.4 MEASURES UNDERTAKEN WITH FIRST NATIONS

4.4.1 Government-Led Consultations

The Tahltan Central Council, Iskut First Nation and Tahltan Band Council were first notified about the Project by EAO in February, 2004 and were invited to participate on the Technical Working Group that was being established for the review of the Project.

EAO provided funding to the Tahltan Central Council to help cover the Tahltan's participation costs in the pre-application and Application review stages. The CEA Agency provided funding to the Iskut First Nation pursuant to the federal Participant Funding Program.

The Tahltan Central Council established the Tahltan Heritage Resource and Environmental Assessment Team (THREAT) to participate in Technical Working Group meetings. THREAT members included representatives of the three Tahltan communities. THREAT members were provided with opportunities to review and comment on the draft Terms of Reference for the EA Application and the draft section 11 Order, and to screen the Application against the Approved Terms of Reference to determine whether the Application could be accepted for formal review. THREAT members also reviewed and submitted comments on the Application.

EAO and the CEA Agency held open houses during the Application review stage in Telegraph Creek (June 27, 2006), Dease Lake (June 28, 2006) and Iskut (July 14, 2006). At the open houses, the Proponent provided an overview of the Project as described in the Application. Representatives from EAO and CEA Agency provided an overview of the environmental assessment process.

During the Application screening, EAO reviewed past and proposed First Nation consultation measures. EAO determined the consultation measures were adequate and acknowledged the efforts undertaken by the Proponent and the Tahltan Nation to conclude the Participation Agreement.

The initial meeting to review government agency and public comments on the Application was held in Dease Lake to enable more THREAT representatives to participate in the meeting. Additional open houses took place in July 2006 in the communities of Iskut, Dease Lake and Telegraph Creek.

Appendix E includes a table identifying Tahltan Nation comments on the Application and the Proponent's response to the comments.

4.4.2 Proponent-Led First Nation Consultations

The Proponent initially met with Tahltan elected officials in the fall of 2003 to introduce their company and the Project to the Tahltan. In early meetings with the Tahltan, the Proponent agreed to support the formation of several joint ventures, one of which was the May 2004 formation of Rescan Tahltan Environmental Consultants (RTEC), a 50/50 joint venture between RTEC and the Tahltan Nation Development Corporation. During the 2004 and 2005 field seasons, RTEC took the lead in collecting and assembling all baseline data and information on environmental components such as climate, water quality, fish and wildlife for the environmental assessment. The Proponent also collaborated with RTEC and Kwantlen University College to develop a training program geared toward the Tahltan community.

The Proponent hired a Tahltan Senior Project Coordinator based in Dease Lake to provide logistical support and help coordinate the hiring of Tahltan members at the Project's exploration camp.

The Proponent provided funding to the Tahltan Central Council to help them participate in the pre-application and Application review stages. The funding enabled Tahltan representatives to travel to Technical Working Group meetings and to hire independent technical experts to review and comment on proposed baseline study programs in 2004/05 and 2005/06, and the Application.

Several open houses were held in the predominately Tahltan communities of Dease Lake, Iskut and Telegraph Creek in June 2004, October 2004, May/June 2005 and October 2005. EAO participated in these open houses. The Proponent prepared and distributed a newsletter to these communities providing details and updates about the Project, and a Tahltan Elder and members of THREAT participated in a series of site visits.

The Proponent also funded local researchers to conduct projects that incorporated and documented Traditional Knowledge about the region. A Special Assembly on the Project was held in Dease Lake in January 2005. The Proponent also participated in the Tahltan Resource Development Forum held in Telegraph Creek, Dease Lake and Iskut on June 13 -15, 2006.

The Proponent met with the Tahltan leadership to discuss the overall approach to a participation agreement, which include the principles to guide an agreement and items to be included in an agreement. The Tahltan Central Council Board of Directors and representatives of the Tahltan Nation in Dease Lake signed a draft Agreement in principle in October 2005.

On February 10, 2006, the Tahltan Nation and NovaGold announced that they had entered into a comprehensive agreement. Highlights of the Participation Agreement include:

- establishing measures and procedures to fully engage the Tahltan in all aspects of environmental protection;
- maximizing training and employment of Tahltan members throughout the mine life and to create processes for ongoing dialogue about advancement;
- ensuring access for Tahltan businesses to maximize business opportunities for supplying goods and services throughout the mine life and during mine closure; and,
- making financial contributions to the Tahltan Heritage Trust Fund, which will be used to mitigate any adverse social and cultural effects of the mine during mine operations.

Prior to the Tahltan submitting written comments on the Application, the Proponent met with several members of THREAT to discuss their comments on the Application. This meeting provided an opportunity to clarify and resolve any misunderstandings before the Tahltan submitted their comments on the Application.

4.4.3 Tahltan Comments on First Nation Consultation

During the review of the Application, the Tahltan Central Council noted consultations with the Crown were not up to standard because the environmental assessment process did not adequately address Tahltan concerns related to the assessment of social and cultural impacts.

To respond to the Tahltan's concerns about socio/cultural effects assessment, EAO is participating on a Socio/Cultural Working Group established as part of the Tahltan-B.C. reconciliation table to: discuss existing processes for addressing potential socio-cultural effects of proposed resource developments within the Tahltan traditional territory, and identify the Tahltan's interests in socio-cultural effects assessment in environmental assessment reviews. EAO anticipates these discussions will lead to improvements in social cultural effects assessments for reviews of other proposed projects in the Tahltan traditional territory.

Further, the Tahltan Central Council will be consulted by provincial and federal government agencies during the permitting stage. For example, the Tahltan Central Council is a member of the Northwest Mine Development Review Committee based in Smithers and chaired by the Ministry of Energy, Mines and Petroleum Resources. As a member of this committee, the Tahltan will have an opportunity to review and comment on *Mines Act* permit applications. The federal government will also be continuing consultation during the permitting stage and will be seeking input from the Tahltan Central Council as part of the review process for the federal permits licences approvals and authorizations required for the Project. As part of the Participation Agreement, the Tahltan Central

Council will be provided with copies of all draft permit applications by the Proponent before they are submitted to government agencies for review and decision.

4.5 CONSULTATION SUMMARY

As noted, **Appendices C, D and E** of the Report contain tables identifying written comments submitted by the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team during the review of the Application, and the Proponent's response to the comments. The Tahltan Heritage Resource and Environmental Assessment Team submitted detailed comments on the Application. These comments are identified under each valued ecosystem component in Part B of this Report.

On September 29, 2006, pursuant to the BCEAA section 11 Order, the Proponent submitted a written report on the results of its public consultation activities during the Application review. The report summarized comments submitted by the public on the Application and consultations undertaken with licensed guide outfitters, registered trapline holders and recreational users during the review of the Application.

There are two licensed guide outfitters and six registered trapline holders within the vicinity of the Project. The Proponent met with fifteen individuals representing five of the trapline holders and both of the guide outfitters. Based on the comments made by individuals during these meetings, the Proponent does not perceive there to be any objections to the mine. However, there were mixed views about the selection of the modified northern access route. Concerns were expressed about increased activity and traffic along the access route and valley, and associated noise, and potential effects on wildlife movements and increased mortality. The Proponent has committed to organize further discussions and/or meetings with potentially affected guide outfitters and trapline holders to discuss potential effects of the Project, mitigate measures and compensation.

As requested by EAO, the Proponent investigated whether there are any recreational use of watercourses by contacting individuals representing the Recreational Canoeing Association of B.C. and the Whitewater Kayaking Association of B.C., an avid kayaker living in Smithers and three businesses thought to operate in the area (The Hike, Bike and Paddle Tour Company, Canyon Sport and Rowing Tours, and Eckard's Fish Guiding). These contacts confirmed that the portion of the Iskut River between the bridge over Burrage Creek and the mouth of the Ningunsain River, which will pass over the diffuser site and under the proposed dual span bridge across the Iskut River, has been paddled by experienced kayakers. The Recreational Canoeing Association of B.C., commented on safety issues with respect to instream construction. Pursuant to the *Navigable Water Protection Act*, the Proponent will be required to ensure unimpeded and safe navigation of navigable waters over which bridge structures are proposed.

On November 27, 2006, pursuant to 16.5 of the section 11 Order, the Proponent submitted a report summarizing consultation efforts and comments provided by First Nations during the Application review. The report also documented measures undertaken by the Proponent to implement the Participation Agreement.

All issues raised by the public, Tahltan Heritage Resource and Environmental Assessment Team and government agencies during the review of the Project that are deemed to be within the scope of the environmental assessment have been considered. The Proponent has met the consultation requirements outlined in the section 11 Order.

As required under CEAA, this Report considered comments from the public. In addition, public comments received on the conclusions and recommendations and any other aspect of this Report and responded to by Responsible Authorities will be taken into consideration by the federal Minister of the Environment in the environmental assessment decision statement.

5. ASSESSMENT OF ALTERNATIVES

As outlined in the Terms of Reference and specifically as required under CEAA, the Joint Report is to examine the purpose of the Project, the alternatives to the Project; the technically and economically feasible alternate means of carrying out the Project and the environmental effects of any such alternatives. The "purpose of" the Project is established from the perspective of the Project Proponent and provide the context in which any alternatives were considered. A clear statement of the purpose of the Project is used to establish the scope of the alternatives to be considered (i.e. those within the control or interest of the Proponent). "Alternative means" of carrying out the Project are defined as the various technically and economically feasible ways that the Project can be implemented. As required under Section 16(2)(b) of CEAA, project alternatives must be considered for a Comprehensive Study level of assessment.

In this section the purpose of the Project is stated, and the assessment of alternatives for a number of key Project components are summarized. The focus is on alternatives with potential for significant adverse environmental effects, including: transportation (access routes); location of site infrastructure; mining method; tailings storage and management; waste rock storage; effluent discharge; water supply; power supply, and aerodrome location.

For each of these components, the technically and economically feasible alternatives and associated environmental effects are discussed and the selection of the preferred alternative is described.

5.1 PURPOSE OF THE PROJECT

The purpose of the Project is to develop, operate, close and reclaim a mine to extract copper and precious metals in a profitable and responsible manner. The Proponent believes that the Project can be developed in a responsible manner and without material long-term adverse environmental effects.

5.2 ACCESS ALTERNATIVES

Determining transportation modes and access routes for concentrate, supplies and personnel was a key consideration for the Proponent establishing the viability of the Project. The Project will produce up to 730,000 (average 480,000) tonnes per year of copper/gold/silver concentrate, which accounts for the majority of material to be transported. Therefore reliable all-season transport of concentrate from the mill to a deep sea port for shipment overseas was crucial for Project viability. This section assesses access alternatives considered by the Proponent.

5.2.1 Screening of Initial Access Alternatives

In 2004, the Proponent evaluated and screened seven access alternatives: the Northern Route, Southern Route, Bradfield Canal, Berg Bay, Babbler Bay, Mess Creek and Stikine River Barge. The Proponent concluded that the following five options were not technically and economically feasible for the reasons described below, and therefore did not warrant further consideration:

- Bradfield Canal, Berg Bay and Babbler Bay alternatives: lack of an operating deep-sea port and potential for ongoing trans-boundary issues with the State of Alaska;
- Mess Creek alternative: requirement for a road through a British Columbia provincial park; and,
- Stikine River barge alternative: significant concerns regarding safety and operability due to seasonal variations in river depth and current velocity.

Only the original Northern and Southern routes appeared to be viable and were carried forward to further evaluation.

5.2.2 Evaluation of Two Access Routes

In January 2005, the Proponent prepared a report titled "Galore Creek Project Access Road Report" which provided an evaluation and ranking" of the Northern and Southern routes in terms of cost, construction schedule and environmental/permitting and long term operational issues. Based on this evaluation, in January 2005, the Proponent identified the Southern route as its preferred alternative.

Southern route

The Southern route would leave Highway 37 near Bob Quinn Lake and have a total length of 183 km, including 145 km of new construction through environmentally sensitive habitat. This principal route may result in various environmental effects, including:

- Archaeology: Moderate potential for the identification of gathering places related to seasonal fishing and sites related to travel along the Stikine corridor;
- Wetlands: Destruction (infill) of wetlands along 4 km of route, partial destruction (infill) of wetlands along 12 km of route, degradation of wetlands found within 100 m of road alignment along 40 km of route;
- Fisheries: Disruption of up to 12 ha of fish habitat in wetlands, degradation (road crossings) of salmon spawning areas in tributaries to Stikine and Iskut Rivers;
- Terrestrial wildlife: Degradation of 1139 km^2 of moose winter habitat, degradation of critical habitat for grizzly bear feeding on salmon in Stikine tributaries and wetlands; and
- Trapping and guiding: Impact on seven trap line territories and one guide outfitter territory.

Following the announcement of the Southern route as the preferred alternative, the Tahltan Central Council and government agencies expressed concerns about potential effects of this route on wetlands and other sensitive habitats along the Iskut and Stikine river valleys. These wetlands offer high value winter moose habitat, important feeding habitat for grizzly bears and rearing habitat for several species of salmon. The truck traffic could be disruptive to moose and grizzly bears and could cause collision mortality.

Modified Northern route

In response to the concerns raised by the Tahltan Nation and government agencies, the Proponent decided to consider a modified Northern route. This route would continue down the Sphaler valley to the Porcupine, and then up into the Scotsimpson valley. In order to overcome the technical uncertainty associated with the long tunnel from upper Sphaler Creek to the Galore Creek valley in the original Northern route, the Proponent replaced the tunnel with a road down Sphaler Creek to intersect the alignment proposed for the Southern route at Porcupine Creek.

Based on ground investigations and experience with similar sites elsewhere, the Proponent determined that it would be feasible to build a road through the Sphaler Creek Canyon, but that the road would have to be narrow (single lane only) and steep (up to 15% grades) with tight switchbacks. Furthermore, high avalanche ratings would make this section of the road difficult to maintain in winter and potentially subject to frequent closures.

The Proponent then investigated the feasibility of a 125 kilometres long concentrate slurry pipeline through the canyon buried under or adjacent to the road. This transportation mode would eliminate the need for 25 to 50 trucks per day (representing approximately 80% of the total traffic and virtually all of the loaded outbound traffic from the mine for the Project). The Proponent concluded that it could be done using conventional and proven technology and incorporating state of the art safety, leak detection and management systems, with an increased capital cost. The pipeline would allow the modified Northern access route to avoid disturbing the environmentally sensitive Stikine – Iskut corridor and effectively eliminate the risk of wildlife/vehicle collisions. It would also minimize the operational effects of road closures during severe winter storms, since the concentrate could be delivered to Highway 37 in all weather conditions via the pipeline. Since most of the pipeline would be buried, it would be secure from all but the most severe land slides and avalanches. Deeper burial of the line in anticipated geohazard areas would mitigate most of this risk. A leak detection system and shutoff valves would prevent significant spills in the event of pipe leakage or failure due to a severe event.

The Proponent further investigated and ultimately selected the option of constructing a second pipeline to deliver diesel fuel to the mine. This pipeline would eliminate the need for 500 tanker truck trips each year and would further reduce the mine's dependence on the road for day to day operations.

The modified Northern route may result in various environmental effects, including:

- Archaeology: Low to moderate potential for the identification of short term hunting camps, and sites related to overland travel for collection of obsidian for tool making;
- Wetlands: Degradation of wetlands found within 100 m of road alignment along 3 km of route;
- Fisheries: Disruption of up to 0.9 ha of fish habitat in wetlands, degradation of salmon spawning areas in Porcupine River;
- Terrestrial wildlife: Degradation of 220 km^2 of moose winter habitat, degradation of goat habitat and potential disturbance of goat natal areas in Sphaler Creek Canyon, degradation of grizzly bear summer foraging and denning habitat in alpine areas; and
- Trapping and guiding: Impact on four trap line territories and two guide outfitter territories.

5.2.3 Selection of Preferred Access Route Alternative

Both the modified Northern and Southern routes are economically viable. The modified Northern route would have a higher capital cost than the Southern route and would pose greater ongoing maintenance challenges due to snow avalanche and geohazard concerns. However, the modified Northern route has fewer predicted environmental effects and, with the slurry and diesel pipelines, would have lower long term operating costs and vehicular traffic. Consequently, the modified Northern route was selected as the preferred alternative.

5.2.4 Concentrate Transport from Highway 37 to Port

The closest port is at Stewart, which currently handles concentrate from the Eskay Creek and Huckleberry mines, both of which are expected to cease production before the Galore Creek mine would begin to ship concentrate. The Town of Stewart has assessed the implications of Galore Creek concentrate traffic flow and has considered a establishing a truck route to bypass the town centre. Concentrate could also be shipped through the Port of Prince Rupert.

The Proponent investigated several options to transport concentrate to a port, including trucking of dewatered concentrate directly from the processing plant, trucking of dewatered concentrate from the terminus of a slurry pipeline located near Highway 37, trucking dewatered concentrate to the railhead at Kitwanga, either from the processing plant or from the terminus of the slurry pipeline, and using a slurry pipeline to transport the concentrate from the processing plant directly to a port. This section describes and assesses these alternatives.

Trucking to Port

The alternative of dewatering onsite and trucking concentrate from the mine site to the port at Stewart was associated with the original Northern and Southern access route alternatives which were discarded in favour of a concentrate pipeline to a filter plant near Highway 37 as part of the preferred modified Northern route. The environmental effects of this alternative are described as part of the Southern route in section 5.2.2.

Slurry Pipeline to Port

The Proponent undertook a scoping level study to assess the technical feasibility of a slurry pipeline to transport concentrate from the mine to eliminate the requirement for truck transportation for all or part of the route to the port. Included in the assessment was a preliminary examination of the feasibility of a 368 kilometre concentrate slurry pipeline from the Galore Creek valley to a dewatering plant located near the port in Stewart. The route chosen for this preliminary examination was along the modified Northern route to Highway 37, along Highway 37 to Meziadin Junction and Highway 37A to Stewart. At an estimated capital cost of $231 million, this alternative was not considered economically feasible.

Slurry Pipeline to Highway 37 then Trucking to Port

The Proponent also completed a scoping level study of a concentrate slurry pipeline that would follow the modified Northern route alignment from the mineral processing plant in the Galore Creek valley to a filter plant located about three kilometres west of the alignment's junction with Highway 37. The environmental effects of this alternative are described as part of the modified Northern route in section 5.2.2 above.

Trucking or Slurry Pipeline Plus Trucking to Kitwanga for Shipment by Rail to Port

The Proponent investigated transporting concentrate to the railhead at Kitwanga via trucking or slurry pipeline and trucking from the pipeline terminus. Concentrate would then be shipped by rail to the port at Prince Rupert rather than using the port facilities at Stewart. These alternatives would entail an additional 112 kilometres of trucking, construction of new concentrate storage and handling facilities at Kitwanga and 230 kilometres of rail transportation between Kitwanga and the port at Prince Rupert. As such, these alternatives are not considered economically viable unless rail transportation is required to deliver concentrate to interior North American smelters (which is not currently contemplated).

Selection of Preferred Concentrate Management Alternative

Truck transportation of concentrates along the Southern route to Highway 37 and then to the existing port at Stewart would offer the least capital intensive alternative but was discarded due to its potential environmental effects described in section 5.2.2.

The slurry pipeline alternatives would add substantial capital costs, but reduce the magnitude of predicted environmental effects. A slurry pipeline for the full distance from the mine to the port is not economically feasible (at a capital cost of $231 million). The cost of the pipeline from the mine to the junction of the Northern route with Highway 37 is also high at over $100 million, but the benefits of this pipeline include reduced environmental impact, lower annual operating costs and more reliable and consistent concentrate delivery.

Consequently, the Proponent determined that its preferred alternative would be to construct a concentrate slurry pipeline along the alignment of the modified Northern route and a filter plant, with accompanying concentrate storage and loadout facilities and water treatment plant, near the junction of the access road and Highway 37, then to truck the concentrate from the terminus of the pipeline to the existing port at Stewart.

5.3 SITE INFRASTRUCTURE LOCATION ALTERNATIVES

The Galore Creek ore deposits are located in a very rugged and remote area. When evaluating siting options for mine infrastructure, the Proponent considered the following criteria: availability of sufficient flat ground for buildings; foundation conditions; geohazards; proximity to ore zones and tailings, waste rock and low grade ore storage areas, access for construction materials, personnel, operations consumables and for shipment of concentrates.

Three primary site configurations were considered and are discussed in the sections below.

5.3.1 Project Infrastructure with Processing Facilities in More Valley

This alternative was associated with the original Northern route and involved locating major components of the Project infrastructure in three major watersheds. These components included: open pits, waste rock disposal sites and accommodation and maintenance facilities in the Galore Creek valley; quarry, maintenance facilities and tailings impoundment in the More Creek valley, processing plant and an accommodation facility in the Sphaler Creek/Porcupine River drainage system. As discussed in section 5.2.2, uncertainties related to the technical feasibility of a tunnel between the More Creek and Galore Creek drainages made the original Northern route not economically feasible, effectively ruling out this infrastructure siting alternative.

5.3.2 All Project Infrastructure in Galore Creek Valley

The alternative of locating all project infrastructures within the Galore Creek valley was associated with the Southern access route, which was discarded due its potential environmental effects on wetlands and other sensitive habitats along the Iskut and Stikine river valleys. The environmental effects of this alternative are described as part of the Southern route in section 5.2.2. Each of these effects would be increased in magnitude as a result of the footprint of the proposed site infrastructure.

Road access to the valley would be through a four kilometre long tunnel from the West Fork of Galore Creek to the headwaters of Scotsimpson Creek. The general area of the tunnel portal is subject to rock fall and snow avalanches, but appropriate tunnel design and location would minimize these hazards. The 183 kilometre route from the tunnel to Highway 37 would be via the Stikine and Iskut river valleys (i.e., Southern access route). The 126 kilometre steep, narrow single lane alternative through the Sphaler, More and Iskut river valleys (i.e., as per original Northern route) was not considered technically feasible for concentrate trucks.

5.3.3 Project Infrastructure in Galore Creek Valley and Adjacent to Highway 37

The ultimate selection of the modified Northern access route with pipelines necessitated a modification of the Galore Creek valley options described in the previous section to accommodate pipeline infrastructure. All of the Project infrastructure for this option would still be located in the Galore Creek valley, with the exception of the concentrate slurry and diesel pipelines and relocation of the concentrate dewatering, storage and load out and water treatment facilities to the terminus of the slurry pipeline near Highway 37.

The area available for facilities development in the Galore Creek valley is limited and careful planning would be required to safely and efficiently accommodate the required infrastructure. The proposed camp and plant site near the junction of the west and east forks of Galore Creek is secure from geohazards and centrally located with respect to the known deposits and the proposed waste rock and tailings storage areas. The eight kilometre long storage area for tailings and waste rock (both potentially acid generating and not-potentially acid generating) would be impounded in the valley bottom behind a dam constructed of non acid generating waste rock.

The predicted environmental effects of project infrastructure being located in the Galore Creek valley and near Highway 37 include:

- snow avalanches and debris flows may compromise engineered structures such as tailings and water impoundment dams, resulting in the environmental effects described in Effects of the Environment on the Project (section 3.1) and Accidents and Malfunctions (section 3.2); and,
- concentrate dewatering, storage and load out and water treatment facilities to be constructed near Highway 37 will expand the footprint of the Project.

Positive environmental considerations are that the facilities near Highway 37 are easily accessible and potential water quality effects are predictable and manageable, and that the majority of the large project infrastructure is confined to the Galore Creek valley watershed rather than being spread into multiple watersheds.

5.3.4 Selection of Preferred Alternative

For the reasons described in sections 5.3.1 to 5.3.3, the Proponent has chosen to locate principal project facilities in the Galore Creek valley, with the exception of the concentrate dewatering facility, concentrate storage, concentrate load out and water treatment facility, which would be located at the terminus of the pipeline near Highway 37.

This alternative uses proven engineering approaches in terms of avoidance and management of geohazards, construction, management and deactivation of dams, dumps, the tunnel and road, and transportation of concentrate slurry and diesel by pipeline. This alternative has a higher capital cost than the second alternative that contains the entire mine infrastructure in the Galore Creek valley. This cost is offset by fewer predicted environmental effects, including a smaller project footprint, less potential for disturbance of sensitive habitats along the Stikine and Iskut Rivers, as well as lower operating costs.

5.4 MINING METHOD

The Galore Creek ore deposits are widely dispersed in a large volume of rock and are of a type and grade typically mined by conventional truck and shovel open pit methods at other mines around the world. Part B includes an assessment of the environmental effects of this technique in the context of this Project. The Proponent has concluded that it is unlikely that underground mining could attain the production rate necessary to achieve economies of scale of open pit mining and the rate of return required to finance the development of the Galore Creek deposits at this time. Furthermore, geotechnical investigations have identified areas of highly fractured rock, which would be a significant challenge for underground mining of the near-surface portions of the Galore Creek deposits. Therefore underground mining method alternatives were not considered to be economically feasible and the open pit mining method was chosen. However, the Proponent stated that underground mining may be considered in the future to supplement open pit production or milling of stockpiled low grade ore with selectively mined higher grade portions of deep Galore Creek resources.

5.5 TAILINGS STORAGE AND MANAGEMENT ALTERNATIVES

The Galore Creek mine is expected to produce about 500 million tonnes of tailings over the 20 year mine life. Tests completed to date suggest that the tailings would likely be potentially acid generating. The Proponent has indicated that the generally preferred method for long term management of potentially acid generating tailings in high precipitation environments is subaqueous disposal (permanent submersion under water to limit exposure to oxygen and prevent acid generation in the first place). An alternate method is subaerial disposal (on-land storage) with likely perpetual treatment of acidic drainage from the storage site. Perpetual treatment at the remote Galore Creek site would be challenging and not economically feasible due to the heavy precipitation and ongoing requirements for electric power and lime, maintenance of collection and treatment systems and disposal of sludge generated by the treatment process.

As a result, the Proponent determined that subaqueous disposal would be the most appropriate method for long term tailings management and investigated several potential tailings impoundment areas. Criteria for site selection included connectivity with major rivers with respect to potential to adversely affect fish and aquatic habitats, geohazard susceptibility, precipitation catchment area, tailings volume capacity, required dam height, foundation conditions for impoundment structures and distance and cost of access from the processing plant.

The Proponent identified and undertook a preliminary evaluation of eleven potential tailings sites in the vicinity of Galore Creek (**Figure 4**).

The two potential tailings storage sites selected for detailed evaluation were the Galore Creek valley (T-3) immediately north of the proposed Central pit, and the headwaters of the West Fork of More Creek (T-5). The Galore Creek site would be used for co-disposal of tailings and both potentially acid generating and not-potentially acid generating waste rock. The More Creek site would be used solely for tailings, with waste rock being deposited separately in the Galore Creek valley in the T-3 site and nearby locations. The general criteria and assumptions used for the design of the tailings impoundment facilities and waste dump(s) are described in the Application.

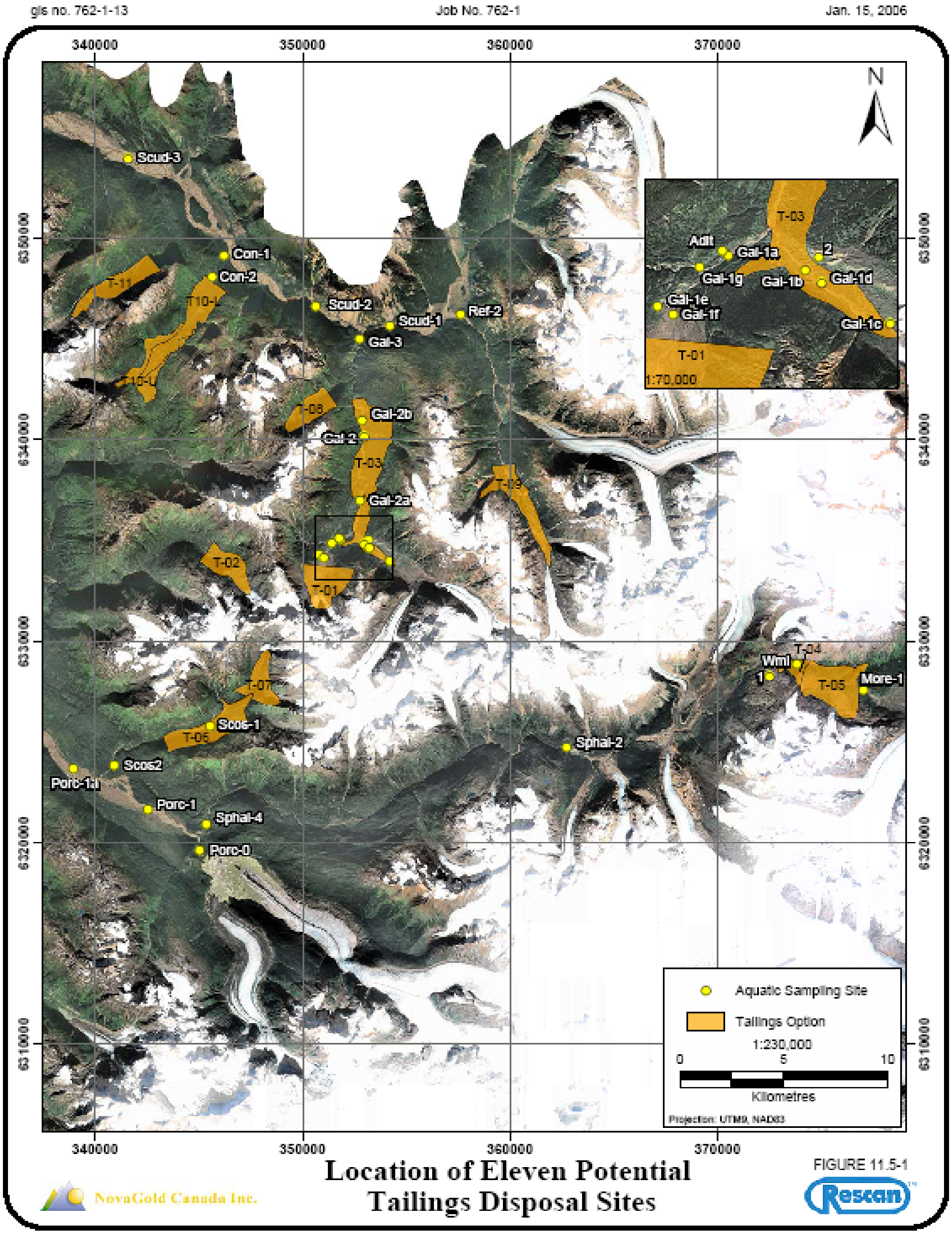

Figure 4. Location of Eleven Potential Tailings Disposal Sites

5.5.1 Galore Creek Valley Tailings Disposal Facility

The Galore Creek valley tailings disposal facility would require the construction of a water-retaining dam. Its location was optimized to achieve the maximum storage capacity with the least amount of embankment fill material and to avoid a deposit of lower Permian karstic limestone, which lies immediately downstream in the lower Galore Creek valley.

The main dam is proposed to be a rockfill dam with an impervious till core. The upstream shell would be constructed of compacted potentially acid generating (below the ultimate water line) and/or not-potentially acid generating waste rock and the downstream shell of compacted not-potentially acid generating waste rock. The rockfill would provide stability and resistance to earthquake forces and the compacted till core would provide an impermeable barrier to retain water.

Prefeasibility investigations indicated there are sources of borrow for dam construction within the Galore Creek valley. Glacial deposits are widespread throughout the valley and in some locations are up to 80 metres thick on the lower western slopes. Till borrow would be collected upstream, downstream and within the footprint of the tailings dam for the impervious core. Material for the sand and gravel filter zones and blanket drain will likely come from screened glacial deposits from the valley slopes.

Waste rock would be used for construction of the embankment shells because of its low unit cost in comparison to quarried rock. The waste rock would likely be gravel-sized throughout most of the mine life due to the highly fractured nature of the rock in and around the deposit. Near the end of the mine life, when more competent and less fractured rock is mined, the size of the waste rock would likely be cobble to boulder size ranges that could be used as riprap armour.

The high precipitation levels and large catchment area pose considerable challenges for the Galore Creek tailings disposal option. Diversion channels would be constructed to intercept and divert freshwater flows away from the impoundment, including the East Fork of Galore Creek, the eastern portion of the catchment above the tailings/waste rock impoundment, and areas of undisturbed natural ground above the Central and Southwest pits and the plant site.

Long term diversions along the western side of the tailings impoundment were not considered to be feasible due to the steep valley wall slopes. The total remaining catchment area draining to the tailings impoundment was estimated to be 37 square kilometres, including the tailings pond, the waste dumps (disturbed ground), natural undisturbed ground on the western side above the impoundment, and below the diversions on the eastern side. The year-to-year variation in each of these sub-areas over the mine life was estimated and included in the water balance model.

The Galore Creek diversion channel would be 11.4 kilometres long, 4.5 to 5.5 metres deep and have a minimum base width of 10 metres. Energy dissipation structures and sediment traps would be required in areas where the channel is intercepted by larger creeks or gullies. A road would be required to access the downstream ponds and dam toe for maintenance.

Potential environmental effects identified for the Galore Creek valley tailings disposal facility are as follows:

- <u>Fisheries</u>: Potential for uncontrolled release of tailings water to Scud River, resulting in degradation of fish habitat, including salmon spawning and rearing habitat;

- <u>Aquatic habitat</u>: Disruption of aquatic habitat in Galore Creek, which would be diverted for the life of the project; and

- Terrestrial wildlife: Disturbance of high quality goat habitat on valley walls surrounding the site.

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5.5.2 More Creek Valley Tailings Disposal Facility

The More Creek valley tailings facility was associated with the original Northern access route, which the Proponent determined to be not economically viable due to the uncertain technical feasibility of a 11 kilometre long tunnel required to transport ore by conveyor from the Galore Creek valley to the mill in the More Creek valley.

The More Creek valley tailings facility would consist of three water retaining dams, a main dam on the western or upstream end of the facility and two saddle dams on the eastern end. The tailings would be piped approximately two kilometres from the plant to the impoundment and spigotted into the facility off the main dam and saddle dams. A pond would be formed in the middle of the impoundment, with beaches against the upstream slopes of the three water retaining dams. At the end of the mine life, this impoundment would be approximately 2.2 kilometres wide and 2.5 kilometres long.

The More Creek valley main tailings dam was designed with a section similar to the proposed Galore Creek main tailings dam - a rockfill dam with an impervious till core. The tailings dams would have to be built using quarried rockfill for construction of the dam shells. Using quarried rockfill rather than waste rock (as in the Galore Creek site alternative) may be advantageous in allowing steeper rock slopes. However, the unit cost would be substantially higher and the footprint area of disturbance would increase.

Potential environmental effects identified for the More Creek valley tailings disposal facility include:

- Aquatic habitat: Disruption of aquatic habitat in Galore Creek, which would be diverted for the life of the project; and
- Terrestrial wildlife: Likely disturbance of high quality goat summer habitat on valley walls surrounding the site, likely displacement of high quality grizzly spring habitat.

5.5.3 Selection of Preferred Alternative

The Galore Creek tailings impoundment is the preferred alternative based on superior economics and a reduced magnitude of predicted environmental effects, including a smaller overall footprint, simpler monitoring and maintenance on closure and less dispersed receiving environments. The site is convenient to the mine and mill, allowing use of economical not-potentially acid generating waste rock for construction of the facility. All project facilities except the filter plant would be co-located in the Galore Creek valley, permitting efficient use of resources for mining, milling, dam construction and maintenance. A single impoundment would serve to flood both tailings and waste rock, confining the environmental footprint and post closure activities to a single drainage. The Proponent believes that it is feasible and reasonable to manage any and all potential environmental, economic and safety risks associated with this alternative.

5.6 WASTE ROCK STORAGE ALTERNATIVES

The Project would require the disposal of about a billion tonnes of waste rock. The rock would be produced mainly from five open pits with lesser volumes from numerous rock cuts for road and diversion channel construction and from the access tunnel. Test work to date suggests a conservative estimate of 50% of the waste rock from the open pits being potentially acid generating.

5.6.1 Storage of Potentially Acid Generating and Non-Potentially Acid Generating Waste Rock Adjacent to Open Pit

In terms of handling costs, the least expensive disposal option for waste rock is to dump it as close as possible to the source. This approach minimizes road construction and haul costs, but may leave potentially acid generating rock exposed to air and water where it could over time generate acid and leach metals into the environment. Management of acid rock drainage and metal leaching from surface waste dumps is a complex, expensive and typically requires perpetual operation of collection and treatment facilities. While perpetual collection and treatment of acidic drainage is technically and economically feasible, it is generally viewed as the least preferred method for managing potentially acid generating rock. The predicted environment effects of this alternative relate to the risk of uncaptured seepage or drainage, the accompanying release of acid and leach metals downstream, and the resulting degradation of aquatic habitat. .

5.6.2 Storage of Potentially Acid Generating and Non-Potentially Acid Generating Waste Rock Under Water

The Proponent indicates that subaqueous disposal is regarded as the safest long term disposal method for potentially acid generating rock. Since there may be a degree of uncertainty regarding the segregation of potentially acid generating and non-potentially acid generating rock, one alternative is to permanently submerge all waste rock under water.

The subaqueous disposal of all potentially acid generating and non-potentially acid generating rock would require the development of a substantial storage pond. Test work to date suggests that potentially acid generating rock could be exposed to air and water for decades before beginning to generate acid. This lag time would permit the construction of large lifts of waste rock in the dry prior to flooding of the impoundment.

On closure the impoundment would resemble a shallow lake. It is assumed that water quality would be acceptable for use by wildlife and for colonization by aquatic life. It may be feasible during the reclamation and closure phase to sculpt the shoreline to create a variety of habitats.

This alternative would result in the alteration of the Galore Creek valley in order to reduce the impacts resulting from the disposal of potentially acid generating and not-potentially acid generating rock. The predicted environmental effects relate to the potential loss of freshwater habitat due to failed rehabilitation, as well as the potential generation of acid rock drainage/metal leaching if local geohazards result in a loss of the water cover, either incrementally or through a single catastrophic event. The very large dams that would be required to store all waste rock under water would also increase the risk of a catastrophic dam failure (in addition to the engineering challenges of constructing such a facility).

5.6.3 Storage of Potentially Acid Generating Waste Rock Under Water and Storage of Non-Potentially Acid Generating Above Water

Assuming that segregation of potentially acid generating and non potentially acid generating rock can be successfully accomplished, it is reasonable to store only potentially acid generating rock under water and to store non-potentially acid generating rock in open air (subaerial) dumps. Subaerial dumps are less expensive to construct and less constricted by topography than subaqueous disposal sites, although slope and foundation conditions are still important factors. Diversion of Galore Creek would be required to create the necessary footprint for 500 million tonnes of non-potentially acid generating waste dumps.

The impoundment for this alternative would be somewhat smaller than would be required for full subaqueous disposal of all non-potentially acid generating and potentially acid generating waste rock, but would require similar engineering. Not-potentially acid generating waste rock dumps would fill the valley bottom, leaving a channel for eventual return of Galore Creek once the diversion channel is closed. Some non-potentially acid generating rock would also be dumped along the valley sides in engineered structures.

The success of this alternative would be dependent upon the effective segregation of potentially acid generating and non-potentially acid generating waste. Any failure in the segregation process could produce long term acid generation problems that may require perpetual collection and treatment.

This alternative would result in the alteration of the Galore Creek valley in order to reduce the impacts associated with the disposal of potentially acid generating and non-potentially acid generating rock. The predicted environmental effects are similar to those described in the previous alternative, but would be reduced by the smaller size of the impoundment and the potential for the more rapid rehabilitation of Galore Creek through the selective disposal of non-potentially acid generating. However, the risk of acid rock drainage/metal leaching from the non-potentially acid generating dumps is higher than for the full subaqueous disposal option (although still very small) due to the risk of inadequate segregation of potentially acid generating and non-potentially acid generating during mining.

5.6.4 Backfilling Open Pits

The Project area is subject to high precipitation and high ground water flows. On closure of the Project the open pits would be permitted to flood with water and would naturally fill to the spill point within a few years. Waste rock could be backfilled into mined-out pits (completed during operations) and be submerged when the pits flood. However, for this scenario to be economically feasible the mining sequence must provide nearby pit areas, preferably not upslope from the source of the waste rock, for disposal. Most of the waste rock at Galore Creek would be derived from the Central pit, which is the lowest elevation pit.

The mine plan was not sufficiently developed during the environmental assessment to confirm that this alternative is technically feasible (i.e., that waste rock could be scheduled for in-pit disposal). The Proponent stated that this alternative would be investigated more thoroughly as the proposed development proceeds. Also, this alternative reduces the flexibility of the mine plan, as there is some potential that mineralization found below the bottom of the open pits could be mined at some future date using underground methods. It would be important to ensure that waste rock disposal would not interfere with the potential to access additional ore in the future. Similarly, backfilling of open pits could reduce opportunities for future expansion of those pits if markets or technologies change to improve the economics of remaining mineralization.

5.6.5 Selection of Preferred Alternative

The Proponent has determined that the alternative with the lowest magnitude of predicted environmental effects would be to store all potentially acid generating waste rock and most non-potentially acid generating waste rock under water since subaqueous storage is very effective in preventing acid rock drainage. The dam to be constructed to create the tailings impoundment would flood a large enough area to accommodate most of the waste rock. A non-water retaining dam would be constructed across the Galore Creek valley about two kilometres upstream of the tailings dam to separate the waste from the tailings. The waste rock would be layered behind the dam with the potentially acid generating rock placed at lower elevations and covered by non-potentially acid generating rock. The proposed tailings and waste layout are shown in **Figure 5.**

Additional non-potentially acid generating rock from mining of higher elevation areas, such as the North Junction pit, would be placed in subaerial dumps between the open pits. Proper segregation and storage of potentially acid generating wastes would be important in these areas to avoid misclassification of potentially acid generating as non-potentially acid generating that could lead to acidic drainage which would require long term mitigation. Opportunities for backfilling of pits will be investigated as the operations develop. Non-potentially acid generating rock would also be used for the construction of dams in the Galore Creek valley.

5.7 EFFLUENT DISCHARGE ALTERNATIVES

As currently proposed, there would be two primary types of effluent from the Project mill: water discharged with the tailings slurry, and water discharged with the concentrate slurry at the filter plant at the pipeline terminus near Highway 37.

5.7.1 Tailings Impoundment Discharge

There are two alternatives for discharge of supernatant water from the tailings impoundment: direct discharge into Galore Creek, and discharge into the diversion channel on the east side of the Galore Creek valley.

The predicted environmental effects of both alternatives relate to the degradation of water quality and the productive capacity of aquatic habitat. Both alternatives mitigate these effects by storing the supernatant water during low-flow periods and discharging during high-flow periods, when there is greater dilution.

The distinctions between the two alternatives are largely operational. The diversion channel alternative has significantly higher pumping costs but has a slight environmental benefit of permitting greater mixing by the time the combined freshwater and tailings pond water reaches Galore Creek.

5.7.2 Concentrate Slurry and Batch Water Discharge

The combined slurry and batch water would be treated at the filter plant prior to release. The degree of treatment necessary would be somewhat dependent upon the available flow of freshwater at the discharge point to dilute the effluent to meet receiving water criteria. The alternatives considered were: discharge to Iskut River, and discharge to the Iskut River tributary.

The predicted environmental effects of both alternatives relate to the degradation of water quality and the productive capacity of aquatic habitat. Both alternatives mitigate these effects through the treatment of slurry and batch water prior to release. The difference between the alternatives relate to the level of dilution that would be achieved at the discharge point.

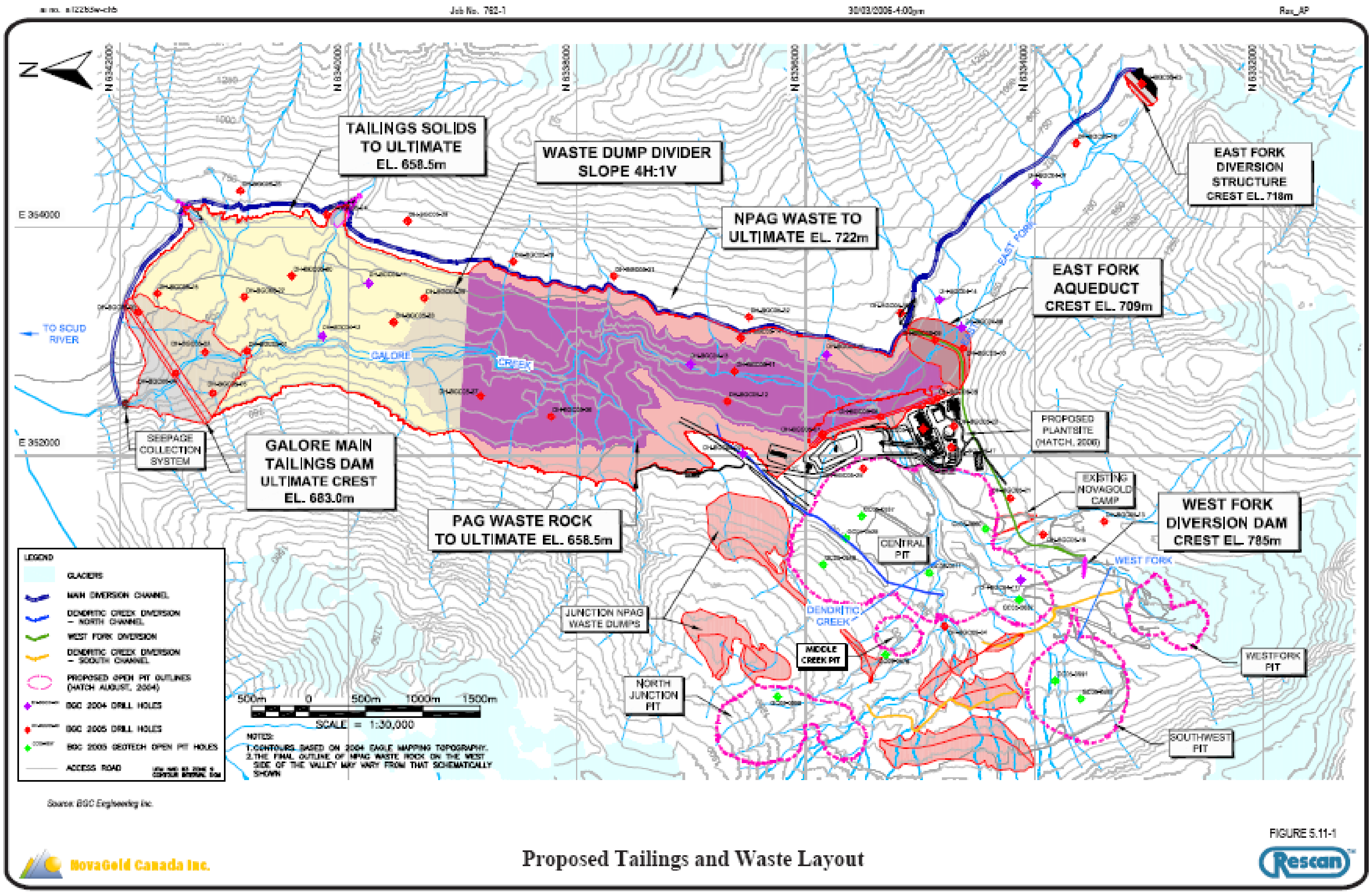

Figure 5 – Tailings and Waste Layout

Discharge into Iskut River

The first alternative would establish a discharge point at a narrow reach of the Iskut River approximately seven kilometres upstream of the confluence of the Iskut River and More Creek. The current at this point has a relatively high velocity, providing good mixing, and the year round flow rates are always sufficient to dilute the filtrate water. A single port diffuser (a simple pipe) will achieve dilutions in excess of the required 50:1 within about 50 metres of the discharge point. The narrow reach would be a reasonable discharge point from a fisheries perspective because the substrate materials in this area are less suitable for spawning in comparison with the areas downstream. The close proximity to the filter plant would require only a short pipeline. The disadvantage of this alternative is that the diffuser could be at risk during freshet when extreme flows could scour the river bottom and disturb the buried pipe. The very high dilution during freshet would mitigate any issues due to damage to the pipe, but the pipe and diffuser may have to be repaired or replaced from time to time.

Discharge into tributary of Iskut River

The second set of alternatives considered tributaries of the Iskut River crossed by the Project access road, including two forks of Thomas Creek, between the filter plant and the Iskut River. The advantages of the tributaries over the Iskut River as discharge locations would be the lower energy levels in the tributaries during freshet, reducing the likelihood of damage to the discharge structures, and shorter pipeline distances from the filter plant.

The principal disadvantage of these alternatives would be the lower natural flow levels in the tributaries relative to the Iskut River, resulting in a higher magnitude of predicted environmental effects due to insufficient dilution to achieve consistent compliance point water quality criteria. The option of establishing the compliance point below the junction of the tributaries with the Iskut River was not considered to be appropriate because of the length of tributaries that could be adversely affected by the high ratio of effluent to natural flow volumes.

5.7.3 Selection of Preferred Discharge Locations

Tailings impoundment discharge

The preferred alternative for the discharge of supernatant water from the tailings impoundment is to pump it over the dam and into Galore Creek. Although this alternative does not have the benefit of additional mixing in the diversion channel prior to water entering Galore Creek, the rate and turbulent nature of flow in Galore Creek below the dam would ensure rapid and complete mixing of impoundment discharge waters with natural flows and discharge from the diversion channel, mitigating environmental effects of tailings supernatant water quality. The economic advantage of this alternative was a key consideration.

Concentrate slurry and batch water discharge

The preferred discharge location for effluent from the filter plant is the narrow reach of the Iskut River approximately seven kilometres upstream of the confluence of the Iskut River and More Creek. This location involves the lowest magnitude of predicted environmental effects, providing ample year round dilution and good mixing with minimal in-stream construction. Fisheries impacts will be minimal and the proximity to the filter plant will keep the pipeline relatively short.

5.8 WATER SUPPLY ALTERNATIVES

The Galore Creek mill would require over 6,600 cubic metres of water per hour for the grinding and flotation processes. Much of the water, such as concentrate and tailings thickener overflow, could be reclaimed and recycled to the process water plant, but a significant volume of water would be lost to the tailings and concentrate slurries. Additional water would be required on an ongoing basis to make up process requirements. The Proponent investigated both groundwater and surface water sources of make up water.

5.8.1 Groundwater Supply Evaluation

An assessment of groundwater in the Galore Creek valley indicated that in-pit and perimeter dewatering wells would be required for development of economically viable pit slope angles. It was estimated that over 100 dewatering wells would be required, producing a minimum of 30,000 cubic metres per day of pumped water. This water could be discharged to the tailings impoundment or used as make up water in the mill.

The quality of dewatering well groundwater is variable, but would be suitable for use in the milling process. Since this water would otherwise be directed to the tailings impoundment, using it in the mill effectively reduces flows to the impoundment. Some of this water would be used for concentrate slurry water, further reducing flows to the impoundment.

The predicted environmental effects of the groundwater alternative include a reduced subsurface flow into riparian zones, and the associated degradation of fish habitat. However, this effect is offset by the reduced flow into the impoundment and the associated need for effluent discharge.

5.8.2 Surface Water Containment

The Galore Creek valley has a large catchment, high precipitation and seasonally variable flows. Using surface freshwater as make up water for the mill would consume a large part of the annual low flow volume (i.e., during winter months) with potential adverse environmental effects on aquatic habitat since there would be no discharge from the tailings pond at low flow periods. The flow impacts could be mitigated through the construction of containment structures with large capacity that could be drawn down as necessary to provide consistent volumes to the mill during low flow periods. Use of surface freshwater in the mill would increase the volume of water entering the tailings impoundment, assuming that water from dewatering wells is also discharged to the impoundment.

The predicted environmental effects of the surface water alternative include the reduced surface flow into riparian zones, and the associated degradation of fish habitat. This alternative also has the run-on effect of increasing the volume of water entering the tailings impoundment and increasing the associated need for effluent discharge.

5.8.3 Selection of Preferred Alternative

Water from dewatering wells is the preferred alternative for make up water for the mill. Surface water has better quality parameters and should be diverted around disturbed areas and the tailings impoundment so that it is available to maintain Galore Creek flows and support natural processes. Tailings pond water would be reclaimed as required to supplement dewatering wells. Surface freshwater would be used only rarely, if at all, for tertiary make up water for the mill, thereby reducing the predicted environmental effects associated with this activity.

5.9 POWER SUPPLY ALTERNATIVES

The Project would require a consistent and reliable source of electrical power of about 80 megawatts. The Proponent has examined a range of electrical power supply options to identify the most reliable and cost effective source with the least environmental impact. The Proponent determined that onsite diesel generation of the Project's electric power requirements would not be economically feasible.

The Proponent also commissioned a conceptual level study of the feasibility of generating electrical power on site by running the flow from the diversion channel through a turbine, or relying on a similar project being developed by Coast Mountain Hydro Corp. on the Iskut River near the confluence with Forrest Kerr Creek. However, both proposals would be run-of-river power plants that would not produce enough power to fully support the mine, and furthermore would be subject to significant seasonal variation in power production.

The Proponent has determined that the economic viability of the Project is dependent upon the availability of low cost electric power from the provincial electricity grid. Grid connection would reduce sensitivity to changes in fuel costs, reduce traffic (and accident risks) on the challenging access road and provide reliable and consistent power throughout the Project life. However, the location of the Galore Creek site and the limited capacity of the existing utility infrastructure represent technical challenges.

A preferred power transmission line alignment alternative would be economical, secure from avalanche and geohazard risks and minimize potential adverse environmental effects. Alternatives are presented for power transmission to the mine and mill site (sections 5.9.1 to 5.9.3) and to the filter plant (section 5.9.4).

5.9.1 Power Transmission Line Along Iskut and Stikine Valleys to Galore Valley (Southern Route Option)

The alignment of a power transmission line to the Project from either the Forrest Kerr hydroelectric plant or Bob Quinn would follow about 145 kilometres of the Southern road route. The environmental effects of this alternative are described as part of the Southern route in section 5.2.2. Each of these effects would be increased in magnitude as a result of the footprint of the proposed power transmission line. As discussed in that section, the Proponent determined that the Southern access route was not the preferred option, largely due to its high potential impacts on habitat.

5.9.2 Power Transmission Line from Forrest Kerr up Forest Kerr Valley to More Valley and to Galore Valley through Tunnel

The shortest route from the Forrest Kerr hydroelectric facility to the Galore Creek mine would be northwards along the Forrest Kerr Creek valley, up over the pass between the Andrei and Alexander glaciers to More Creek, along More Creek to its headwaters and through the tunnel proposed for the original Northern access route to the Galore Creek valley. However, the tunnel for the original Northern access route was not considered to be economically feasible (see section 5.2.2).

5.9.3 Power Transmission Line Along North Access Road to Galore Valley

The modified Northern access route is the preferred road route to the mine. A power transmission line alignment along this same route would benefit from the presence of the access road for construction and maintenance. Much of the route would be in high alpine country with snow and ice loading and avalanche concerns.

The proposed transmission line from the Forrest Kerr hydroelectric facility would follow the Eskay Creek mine road to Highway 37 near Bob Quinn Lake. A transmission line to Galore Creek using the Northern route could start from a switching station near Bob Quinn. The line would follow the east side of Highway 37 for six kilometres and turn northwesterly towards the Iskut River. The transmission line would not follow the access road in this section. The Iskut River crossing would be a short span and would not require special structures. The transmission line would for the most part follow the access road alignment, but would deviate when logistically necessary.

The predicted environmental effects of this alternative are largely the same as those described for the modified Nouthern route in section 5.2.2. Each of these effects would be increased in magnitude as a result of the footprint of the power transmission line.

5.9.4 Distribution Line from Bob Quinn to Filter Plant

The filter plant would operate at 25 kilovolts rather than the 138 kilovolt power provided by the transmission line. Rather than construct a separate major substation, it is proposed to reduce the voltage at the Bob Quinn switching station and construct a 15 kilometre distribution line from the switching station to the filter plant.

Line Along Highway 37

The distribution line could follow the Highway 37 right of way and mine access road to the filter plant. About the first eight kilometres of this route would parallel the 138 kilovolt transmission line to the point where the 138 kilovolt line turns westward. This route would require widening of the cleared highway and access road rights of way to accommodate the line. Poles for the distribution line could be installed without the need for new road construction.

The environmental effects of this alternative include adverse visual impacts from the highway, and the creation of more attractive ungulate habitat that may result in increased vehicle/wildlife collisions.

Straight Line from Bob Quinn to Filter Plant

The distribution line could also follow the 138 kilovolt transmission line parallel to Highway 37 for about eight kilometres, but then leave the Highway 37 right of way to follow the 138 kilovolt line westwards towards the Iskut River for another 1.5 kilometres before striking off northwards for a further three kilometres to the filter plant.

This route would require the clearing of a separate right of way for the last three kilometres of the route. Some new access road construction would be required, although much of the line could be installed using existing forest harvesting trails. The environmental effects of this alternative relate to the destruction of forest for the new right of way and the resulting creation of improved ungulate habitat in an area largely removed from vehicle traffic. There would not be any visual impact on vistas from Highway 37.

5.9.5 Selection of Preferred Alternative

A key factor in the viability of transmission line routes is the availability of road access in the vicinity to minimize construction and maintenance costs and reduce the area of disturbance. Ideally an access road and transmission line can share rights of way for at least part of the route. Although the transmission line alignment through the Forrest Kerr Creek valley is the shortest route from a likely point on the provincial electricity grid to the mine, it would require construction and the predicted environmental effects associated with right of way clearing through an otherwise undisturbed area. This alternative would also be contingent on the construction of a 11 kilometre long tunnel as part of the original Northern route, which was not considered economically feasible. For these reasons the Forrest Kerr route is not considered to be a preferred route.

Both the Southern and modified Northern route alignments are feasible. The Northern alignment is shorter and would require less right of way clearing because much of the route is in alpine areas. It would therefore likely have fewer predicted environmental effects. The Northern alignment would be more exposed to snowfall, ice loading and avalanche and geohazard risks, leading to less reliable availability. Costs for the two alignments are similar if the associated access roads are also built.

The Proponent's preferred road access route is the modified Northern route. Consequently, the Northern power transmission route, which follows the modified Northern route is the preferred alternative. The preferred alignment for the filter plant distribution line is away from Highway 37 to reduce visual impacts and minimize potential wildlife/traffic collisions.

5.10 AERODROME LOCATION ALTERNATIVES

Efficient operation of the Project will require construction of an aerodrome for the safe and economical transportation of workers between shift rotations and for timely delivery of perishable or otherwise time sensitive materials.

Safe airstrip design must avoid obstacles in the flight path and consider prevailing wind directions. The airstrip must have sufficient length to handle design aircraft in a variety of take off and landing situations. The mountainous terrain at Galore Creek limits the options for locating an airstrip suitable for the size of aircraft required to support construction and long term operation of the mine.

5.10.1 Galore Creek Valley Location

Earlier mineral exploration and development activities in the Galore Creek area made extensive use of fixed wing aircraft for access. Airstrips (aerodromes) were constructed by various operators near the mouth of Scud River, below the confluence of Sphaler Creek with Porcupine River and in the upper Galore Creek valley (two airstrips). The existing airstrips in the Galore Creek valley are less than 500 metre long and are not considered to be safe for day to day use. The Proponent has not used them to support its exploration activities. The lower airstrip is within the proposed footprint of the Central pit and the upper airstrip will be bisected by the Southwest pit. The weather in the Galore Creek valley is not reliable enough for regular fixed wing air access. In summary, Project use of these airstrip alternatives is not technically feasible.

5.10.2 Scud River Location

The historic Scud River airstrip is located on the floodplain of the Scud River near its confluence with the Stikine River. The site offers a reasonable flight path and could be lengthened to handle large aircraft. This alternative would require the construction of an additional 35 kilometre road between the airstrip and the mine. This road would create additional disturbance and expand the Project's footprint in the Scud River watershed. The terrain is extremely difficult with extensive areas subject to severe avalanche hazard.

The predicted environmental effects of the Scud River site include the disturbance of salmon spawning and rearing habitat adjacent to the site, moose winter habitat, waterfowl habitat, and areas where grizzly bears gather to feed on spawning salmon.

5.10.3 Porcupine River Location

The original Porcupine River airstrip was constructed adjacent to the active river channel and was used until the early 1990s. It is no longer useable due to partial erosion of the runway by lateral migration of the river channel. A new runway and permanent aerodrome would be constructed nearby, further from the river and away from sensitive fisheries habitat. The Porcupine aerodrome site could be accessed with a 3 kilometre spur road off the main access road to the mine. This road would require a bridge over the Porcupine River, just downstream of the mouth of Sphaler Creek.

The predicted environmental effects of the Porcupine River location include the disturbance of winter moose habitat, salmon spawning and rearing habitat, areas where grizzly bears may feed on spawning salmon, and wetlands used by migratory birds.

5.10.4 Selection of Preferred Aerodrome Site

The Proponent's preferred aerodrome location is the Porcupine River site. It would offer a safe flight path, provide a runway length long enough to accommodate Hercules aircraft and require only a short spur road from the main mine access road. The Scud River option with its much longer access road would have greater disturbance to wildlife habitat. The predicted environmental effects will be managed through appropriate mitigation measures, including fencing of the runway and stringent handling procedures for fuel and de-icing fluids.

PART B - REVIEW OF THE APPLICATION

1. CONSIDERATION OF POTENTIALLY SIGNIFICANT PROJECT EFFECTS

1.1 INFORMATION CONSIDERED

This Report and its conclusions are based on the review of the Proponent's June 26, 2006 Application (Volumes 1 – 16), supporting appendices and relevant documents listed in **Appendix A** and the comments submitted by the public, Canadian and U.S. federal, B.C. and Alaska State government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and local governments. Comments submitted by the public, government agencies and the Tahltan Nation and the Proponent's response to these comments are provided in **Appendices C, D and E** of this Report. Based on this review, the Proponent has made a number of commitments, which are identified in **Appendix F**.

The Proponent's Application, supporting appendices and relevant documents identified above described the components of the Project and assessed the Project's potential effects on air quality, surface water quantity and quality, groundwater, sediment quality, aquatic resources, fish and fish habitat, wetland functions, terrestrial ecosystems, vegetation and soils, wildlife and wildlife habitat, archaeological, cultural and traditional use, First Nation and non-First Nation communities and economy, noise, visual and aesthetic resources, navigable waters, alternative means of carrying out the Project, effects of the environment on the Project, accidents and malfunctions, cumulative effects, public health, land and resource uses, and capacity of renewable resources. These documents also described any effect of any change that the project may cause in the environment on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes by aboriginal persons and any structures, sites or things that are of historical, archaeological, paleontological or architectural significance where such changes are applicable.

1.2 BASIS OF REVIEW

The Proponent identified a number of components of the environment that are considered "valued" and of interest when considering the potential effects of a Project. These "valued ecosystem components[2]" are addressed in Part B of this Report.

For each topic heading, the Report provides:

- **Background Information** to describe the existing environment and setting of the Project, as well as spatial and temporal boundaries used in the environmental assessment as provided in the Application and supporting documents;
- **Potential Project Effects** as provided in the Application and supporting documents;
- **Issues raised by the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team and local governments** during the Application review that

[2] While all components of the environment are important, it is not practicable to assess every potential effect on every component. Consequently, the analysis must focus on the components that have the greatest relevance in terms of value and sensitivity to the particular circumstances of the development under review, that have a meaningful potential to be affected by the development.

required additional information or new commitments and/or mitigation measures from the Proponent to be considered as satisfactorily addressed;

- **Proponent response** to the issues raised by the public, government agencies, the Tahltan Heritage Resource and Environmental Assessment Team, including mitigation measures; and,
- **The significance of the predicted residual[3] effects** after mitigation arising from the Project as well as the likelihood of the effect occurring, as identified in the Application and supporting documents provided by the Proponent.

In some cases, topic headings also highlight issues that were frequently raised, and accordingly warranted reiteration of the Proponent's design features or mitigation measures to address these recurring issues.

A spatial boundary is the area examined in an environmental assessment. For the Project, a regional spatial boundary was established to encompass the areas most likely to be affected by Project construction, operation and decommissioning (**Figure 6)**. The regional environmental assessment area was determined based on watershed and associated ecological boundaries in the vicinity of the Project area. The area is bounded by the Scud River and More Creek drainages to the north and by the lower reaches of the Iskut and Stikine rivers spanning the Stikine River estuary to the south. Three local spatial boundaries were defined to encompass the Project footprint plus a 1,000 metre buffer area.

A temporal boundary is the period of time examined in an environmental assessment. The Application identified the temporal boundaries of the assessment to begin at the initiation of project construction and end approximately 250 years after the end of project decommissioning. This extensive boundary was established based on estimates of the time needed for old growth stage forest to re-establish following disturbance. The temporal boundaries encompassed the construction phase, the entire lifespan of the Project (expected to be approximately 20 years) and decommissioning for a total of approximately 25 years. During the Application review, the temporal boundary was extended to 1000 years. This timeframe was used to consider post closure long-term water quality predictions.

The evaluation of the nature and extent of the residual adverse effects and whether the adverse effects are significant involved utilizing a number of criteria including: timing, duration, geographic extent, direction, magnitude, frequency, resilience and probability of occurrence.

- <u>Timing</u> refers to when the effect will begin (construction, operation, decommissioning and closure, and post closure phases).
- <u>Duration</u> refers to the length of time the effect is expected to occur. Long term adverse effects may be considered significant.
- <u>Geographic extent</u> of the adverse effects refers to the spatial effect anticipated. Localized adverse environmental effects may not be significant. Alternatively, widespread effects may be significant.
- <u>Direction</u> refers to the direction of the change, positive, neutral or adverse.
- <u>Magnitude</u> refers to the severity of the adverse effects. Minor or inconsequential effects may not be significant. On the other hand, if the effects are major or catastrophic, the adverse environmental effects will be significant.
- <u>Frequency</u> refers to how often an effect will occur.

[3] A residual effect is defined as an environmental effect caused by the project that remains after mitigation is applied.

- Resilience is the ability of the Project issue to return to an equal or improved condition at the end of the Project life or the degree to which the adverse effects are reversible or irreversible. Reversible adverse effects may be less significant than adverse environmental effects that are irreversible.
- Probability of occurrence relates to how likely the effect is to occur.

The Proponent provided tables for each valued ecosystem component, which outlined mitigation measures, residual effects and their potential to be significant. This information was considered and a determination of the likelihood of significant adverse environmental effects arising from the Project after mitigation was determined.

1.3 TRADITIONAL KNOWLEDGE

The Proponent employed two Tahltan community researchers to undertake desk and field-based research. The Proponent also funded an archival project so that a Tahltan archivist would work full time collecting, documenting and transcribing Tahltan 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.

Interviews with the Elders provided information about seasonal rainfalls, which helped guide management options for discharges from the tailings storage facility.

During the pre-application stage, based on the knowledge gained through its consultations with the Tahltan, the Proponent decided to select a modified northern access route over a southern access route along the Stikine River. This decision was based heavily on information provided by Tahltan traditional knowledge, including the importance of the Iskut and Stikine rivers as well as fish and wildlife habitats, wetlands and vegetation found along the southern route.

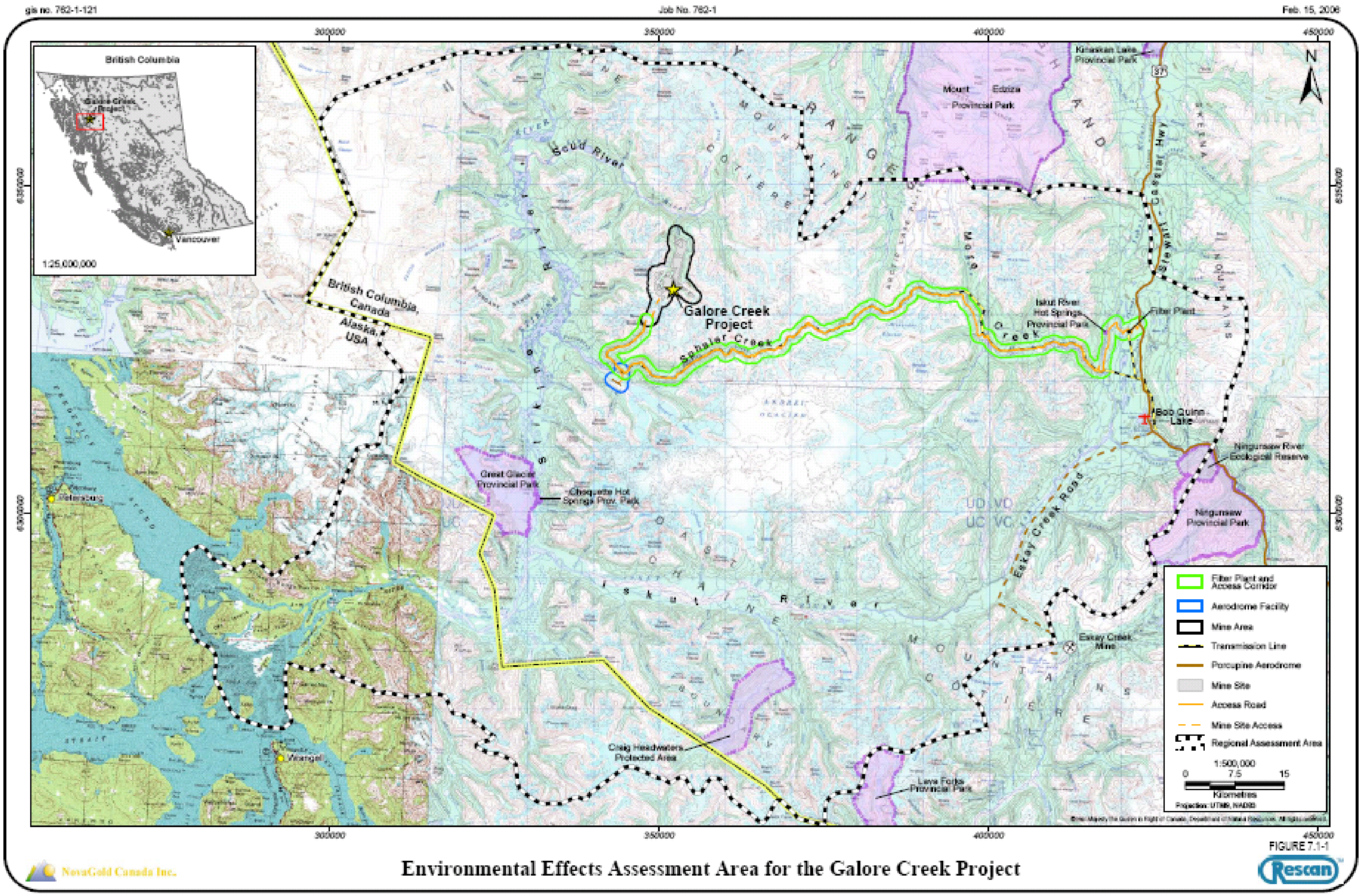

Figure 6. Spatial Boundaries for the Environmental Effects Assessment

2. ENVIRONMENTAL AND SOCIO-ECONOMIC EFFECTS

2.1 CLIMATE

2.1.1 Background

Climate describes the predominant weather patterns of an area. The climate is relatively consistent across the regional project area and hence the environmental setting applies to the filter plant site, access road corridor, aerodrome facility and mine site.

The Project area is located in the humid continental climate zone of coastal B.C. It is characterized by cool summers and cold humid winters, with several months of snow cover. Summer temperatures may be above 20°C and minimum winter temperatures well below -20°C. Average annual precipitation for the Galore Creek mine site is 2,200 millimetres, of which approximately 65% falls (mainly as snow) from October until the end of May. June and July tend to receive the least amount of precipitation, typically 40 to 60 millimetres of rain per month. April and October can be considered transitional months, when both rainfall and snowfall can occur.

2.1.2 Project Effects

Climate was selected as a valued ecosystem component because it is a fundamental aspect of the natural environment. Changes to the climate will affect many other ecosystem components and could lead to alterations in local glacial cover, hydrologic regime and vegetative and wildlife communities.

The significance of effects to the climate as a result of the Project are assessed by comparing projected project emissions and impacts on large scale carbon sinks to provincial and national standards. Climate effects assessed are considered to have a transboundary geographic extent.

Potential Effects and Evaluation

The Project has the potential to affect the climate by contributing to atmospheric greenhouse gas levels, as well as by reducing large scale carbon sinks resulting from vegetative clearing. Effects are anticipated for construction and operation including decommissioning and closure though not for post closure.

<u>Projected Greenhouse Gas Emissions</u>

Diesel fuel and electricity are the two energy sources for the Project. Diesel will be used for all mine vehicles (with the exception of two electric shovels and two electric drills) as well as for transporting mining supplies from Stewart to the mine site and ore concentrate from the filter plant to the port of Stewart. The mean annual consumption of diesel is listed by activity below. Electricity will be used for all other energy demands of the Project, which are estimated to average 80 megawatts.

Table 1. Projected Mean Annual Diesel Consumption for the Project

Activity	Number of Return Trips Per Day	Mean Annual Consumption (ML per year)
On-Site Mining Operations	–	32.3
Transportation of Supplies Between Filter Plant and Mine Site	20[1]	1.1
Transportation of Concentrate and Supplies Between Filter Plant and Stewart	70[1,2]	5.1
Total		38.5

ML = 10^6 litres

1 – Based on assumption that all supply trips are made by B – Trains, although some trips will be made by smaller vehicles.

2 – Based on a conservatively high estimate of 50 return trips per day for concentrate transport.

Direct greenhouse gas emissions will result from the combustion of diesel fuel and indirect emissions will result from the production of electricity. The Canadian Standards Association CO_2 Calculation Tool was used to estimate the greenhouse gas emissions in carbon dioxide equivalents (CO_2e) based on estimated fuel and power use. Estimated mean total annual greenhouse gas emissions from the Project are summarized below.

Table 2. Estimated Mean Annual Energy Use and Greenhouse Gas Emissions from the Project

	Energy Use		Emissions			
Source	Quantity	Energy (TJ)	Direct Emissions (kt CO_2e)	Indirect Emissions (kt CO_2e)	Total Emissions (kt CO_2e)	Total Emission Intensity (kt CO_2e/ TJ)
Diesel	38.5 ML	1 487	106.3	–	121.3	0.029
Electricity	745 GWh	2 681	–	15.0		

ML = 10^6 litres; GWh = 10^6 kWh; TJ = 10^{12} joules; kt = 10^3 tonnes

The estimated greenhouse gas emission intensity for the Project is much lower compared to the rest of the metal ore mining industry. In terms of emissions per unit of productivity, the Project is less than 30% of the metal ore mining sector and less than 60% in terms of energy consumption based on a comparison of data obtained from the Canadian Industrial Energy End-Use Data and Analysis Centre, which monitors energy use by industrial sectors. This is attributed to the high energy efficiency of the Project, which has an energy intensity 85% greater than the sector standard (85% more production for the same amount of energy consumed), as well as the use of hydro electricity to supply a large portion of the Project's energy demands.

The Proponent's decision to use slurry and diesel pipelines will reduce the number of truck trips by up to 52 return trips per day, substantially decreasing fuel consumption by up to 2.8 ML per year and greenhouse gas emissions by up to 7.8 kt CO_2e per year. Further electricity will be supplied primarily by hydroelectric sources rather than higher-emission sources such as diesel generators. The largest mining equipment including the largest drill and cable shovel as well as all mineral processing equipment will use electrical energy

Project Effects on Large-Scale Carbon Sinks
Based on methodology outlined in *Canada's Greenhouse Gas Inventory: 1990–2003* (Environment Canada, 2005), the approximately 1900 hectares of forest to be cleared for the mine area and access road removes 1.5 kt of carbon per year from the atmosphere. This loss will begin during the construction phase of the Project and will continue throughout the operational phase.

2.1.3 Issues Raised and Proponent Response

During the Application review, government agencies sought clarification on some of the information presented in the Application related to climate. The following key issues were raised:

- The Proponent should sponsor vegetation planting as greenhouse gas mitigation strategy.

  The Proponent responded that the carbon uptake across the surface of the waste rock and tailings storage pond and the carbon sequestering of phytoplankton will reduce the net greenhouse gas emissions. In addition, the ongoing reclamation commitment includes revegetation of the disturbed areas.

- Questioned the potential for climatic change implications of ice dam recurrence in Porcupine Lake.

  The Proponent noted that in the short-term climate warming might tend to increase the likelihood of ice calving from the glaciers; however, in the medium term glacier retreat might decrease the amount of floating ice within Porcupine Lake. The Proponent has committed to undertake a flood risk assessment during the final design for the Porcupine aerodrome. Potential impact on climate change will be assessed.

- Provided several comments related to the glacier monitoring program. Commented there is a need to know if the glacier mass balance in the region is changing and if so, whether this change is resulting in an increase or decrease of discharge in the affected watersheds. Noted the Application includes a mass balance and extent characterization but does not contain any attempt to characterize firn layer hydrologic processes. Understanding the firn layer processes may significantly improve the predictability of glacier runoff and the assessment of climate change effects.

  The Proponent has committed to conduct glacier mass balance monitoring starting in 2007 with a monitoring plan to be developed and reviewed by relevant agencies and the Tahltan Heritage Resource and Environmental Assessment Team. The Proponent will consider incorporating monitoring of firn layer hydrology into the glacier monitoring program.

2.1.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following commitments and mitigation measures to minimize greenhouse gas emissions and to evaluate climate effects:

- use high-efficiency technologies for diesel mining equipment
- use electrical energy for the largest mining equipment including the largest drill and cable shovel as well as all mineral processing equipment.

- use pipelines for moving concentrate and diesel fuel to reduce the number of haul truck trips and the consequent amount of diesel emissions;
- examine energy reduction programs to minimize CO_2 emissions;
- implement various methods of power reduction and energy conservation;
- consider energy efficiency when purchasing new and replacement equipment;
- consider energy efficiency policies of outside service providers (e.g. shipping companies) when acquiring their services;
- monitor fuel and electrical consumption;
- replace land area cleared by reforestation during reclamation;
- undertake a flood risk assessment during the final design for the Porcupine aerodrome which will include consideration of potential impacts on climate change; and,
- conduct glacier mass balance monitoring starting in 2007 with a monitoring plan to be developed and reviewed by relevant government agencies and the Tahltan Heritage Resource and Environmental Assessment Team.

The Proponent has committed to climate change and glacier monitoring and follow-up (see section 4.2.1), including documenting greenhouse gas emissions from the Project to support or verify the predictions made on environmental effects.

2.1.5 Significance of Residual Effects

The mitigation measures committed to by the Proponent are intended to minimize greenhouse gas emissions. There will be residual release of atmospheric greenhouse gas and a reduction of carbon sinks after mitigation.

<u>Greenhouse Gas Emissions</u>

The primary greenhouse gas emission sources for the Project will be due to energy consumption in the form of diesel fuel and electricity. The projected mean annual greenhouse gas emissions from the Project are 106 kt CO_2e of direct emissions and 15 kt CO_2e of indirect emissions. Although this will classify the Project as a Large Final Emitter, annual emission intensities will be lower than the averages for the metal ore mining industry. This is a result of high energy efficiency and the use of hydro-electricity for supplying a relatively high proportion of the Project's total energy demands.

The Proponent determined that residual effects are anticipated during the construction and operational phases. The identified adverse environmental effect by the Proponent was considered to have a moderate magnitude for the intensity of greenhouse gas per unit energy consumed. The effects are anticipated to occur beyond the regional boundary and will be mainly continuous during the life of the mine, with some periodic or one time events during construction. The duration however will only be for the life of the mine and be reversible in the long term. An effect on climate may occur. The Project will be subject to any future regulations targeting Large Final Emitters.

<u>Large-Scale Carbon Sinks</u>

Upon closure much of the carbon removal pathway will be replaced by reforestation during reclamation. The open pits and tailings storage facility will be flooded to become lakes. This will result in a permanent annual carbon removal loss of 0.4 kt, which is considered negligible by the Proponent.

2.1.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential climate effects of the Project; and responses from the Proponent.

Based on the information in this Report, and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project will not likely result in significant adverse environmental effects on climate.

2.2 AIR QUALITY

2.2.1 Background

There are currently no anthropogenic sources of air emissions and air quality is very good in the Project area. Results of the Proponent's baseline air quality monitoring reflect the absence of any major sources of particulate matter or fugitive dust emissions in the area. For example, two common anthropogenic sources that contribute to impaired ambient air quality in rural B.C. – forest harvest debris burning and beehive burners – were not factors at Galore Creek. No debris burning areas were observed, no forest fires were burning in the region at the time, and there are no beehive burners within several hundred kilometres of the Galore Creek valley. In addition, there are no agricultural activities or commercial, industrial or residential sources of fine particulates in the region. There are no unpaved roads to and from the Galore Creek exploration site, and road dust was not a factor during the baseline study.

The only existing anthropogenic sources of particulates found were the exploration drills in the Galore Creek valley and activities at the Galore exploration camp. In addition, dry ground conditions that could result in fugitive dust from the exposed river valleys were not expected or observed.

Little information exists on natural background levels of fine particulates in Canada, since most monitoring is done in urban centres. The nearest active Environment Canada inhalable particulate matter (PM_{10}) monitoring stations for the National Air Pollution Surveillance (NAPS) network are the three at Kitimat, Haul Road, Rail and Riverlodge. These monitoring stations are approximately 390 kilometres southeast of Galore Creek and do not collect baseline data because of the numerous anthropogenic sources of fine particulate in the immediate area. Other nearby stations that are actively monitoring fine particulate are located at the Houston Firehall, Smithers St. Joseph's School and Telkwa. The Ministry of Environment operates continuous PM_{10} and respirable particulate matter ($PM_{2.5}$) monitors in Terrace as well as a non-continuous PM_{10} monitor in Stewart. These stations are also part of the NAPS network.

2.2.2 Project Effects

Air quality was selected as a valued ecosystem component because it is important for health and safety and a pathway for contaminants to enter the terrestrial and aquatic food chains. Air quality issues associated with all industrial developments have the potential to extend to regional and global scales to include potential acidic depositions (acid rain) and climate effects (global warming). There will be air emissions during construction, operation, decommissioning and closure; negligible air emissions are expected during post closure phase.

Potential Effects and Evaluation

The air quality effects assessment considered potential effects on air quality associated with all phases of the Project, including point and mobile sources (such as vehicle exhaust) and particulates and potential effects on biological receptors such as vegetation, fish, wildlife and human health. The potential effects of air quality were evaluated using criteria established for human health and industrial guidelines. No potential pathways were identified for potential effects on biological receptors such as vegetation, fish or wildlife.

Potential effects could arise from activities such as: blasting; ore concentrate transport; top soil, waste rock and ore storage; incinerator operations; and operation of the aerodrome and temporary heliport including aircraft operations.

Air emissions from the Project will consist primarily of diesel emissions from mobile mining equipment and to a lesser extent fugitive dust during the two driest summer months from drilling, blasting and traffic along the unpaved haul and access roads.

Both the Canadian federal and B.C. governments have ambient air quality objectives that are intended to ensure long-term protection of public health and the environment. These objectives were established for Criteria (or Common) Air Contaminants (CACs) using the categories “desirable”, “acceptable” and “tolerable” for the national objectives and Levels A, B and C for the provincial objectives. In general, the three provincial categories follow the same objective levels as the three national categories. The “desirable” and Level A objectives are the most stringent and protective. Occupational exposure limits are established by the B.C. Ministry of Energy, Mines and Petroleum Resources for various air contaminants.

The CACs included in the air quality effects assessment for the Project are summarized in Table 3.

The B.C. and Canada ambient air quality objectives were applied to all areas outside a 100 metre buffer zone around the active mine area. Inside of this buffer zone would be considered a work area and occupational exposure limits under the *Mines Act* would apply.

Modeling of maximum sulphur dioxide concentrations at the edge of the 100 metre buffer zone predicts expected ambient SO_2 concentrations will be at least 5 times lower than established B.C. air quality objectives for all averaging periods.

Ground level NO_2 concentrations were found to be below Canada ambient air quality objectives with the exception of 1-hour concentrations estimates that assume 100% conversion of NO to NO_2. In this case, NO_2 concentration for summer (June/July) and winter (January) were close to or exceeded air quality objectives, respectively. However, applying the ozone limiting method for all model predictions for ground level NO_2 were found to be below the Canada ambient air quality objectives.

Modeling of maximum carbon monoxide (CO) concentrations at the 100 metres buffer zone predicted the expected ambient CO concentrations will be at least 40 times lower than established B.C. air quality objectives for both 1-hour and 8-hour average concentrations.

Table 3. Criteria Air Contaminants Included in the Air Quality Effects Assessment

Compound	Description
Sulphur dioxide (SO_2)	Fossil fuel contains a small amount of organic sulphur compounds. During fuel combustion, the sulphur is oxidized and emitted as SO_2 gas with the engine exhaust. In the atmosphere, SO_2 can further oxidize to sulphate particles, which contributes to acid deposition.
Oxides of nitrogen (NO_x)	NO_x gas primarily consists of nitrogen oxide (NO) and nitrogen dioxide (NO_2). These gasses are emitted with exhaust from combustion engines and products from blasting operations. NO_x can be converted to nitric acid in the atmosphere and thus contribute to acid deposition.
Total suspended particulate (TSP) matter	TSP consists of airborne particles that have a diameter of 30 µm or less. Sources of TSP include vehicle and engine exhaust and fugitive dust. Most particles with diameters between 2 and 30 µm are a result of fugitive dust. Fugitive dust is derived from the mechanical disturbance of granular material exposed to the air. Common sources of fugitive dust include unpaved roads, aggregate storage piles and construction operations. Particles can be composed of a wide range of materials, including minerals (sand, rock dust), engine soot, organic materials or salt.
Inhalable particulate matter (PM_{10})	PM_{10} consists of airborne particles that have a diameter of 10 µm or less and are thus a subset of TSP. The majority of PM_{10} particles are from fugitive dust sources. PM_{10} have the potential to enter the respiratory systems and have been linked to health problems.
Respirable particulate matter ($PM_{2.5}$)	$PM_{2.5}$ is a subset of PM_{10} and is defined as particles with a diameter less than 2.5 µm. The majority of particulate matter emitted with diesel engine exhaust are $PM_{2.5}$. These particles are small enough to enter deep into the respiratory system. There is no apparent lower threshold for effects of $PM_{2.5}$ on human health.
Carbon monoxide (CO)	Carbon monoxide is formed as a result of incomplete combustion of fossil fuels. The gas prevents oxygen from attaching to red blood cells and is therefore toxic at high concentrations.

The model predictions for maximum concentrations of particulate matter at the 100 metre buffer zone around the active mine area show that predicted concentrations of $PM_{2.5}$ are well below Canada-Wide Standard, concentrations of PM_{10} and total suspended particulate are well below the B.C. Ambient Air Quality Objectives. However, caution is needed when interpreting results as there are uncertainties associated with model predictions for ambient concentrations of $PM_{2.5}$. Precipitation and the high moisture content for the ore will provide some natural mitigation for fugitive dust.

Modeling of acid and dust deposition at the edge of the 100 metre buffer zone found deposition values decrease rapidly with distance from emission sources. The results show that the predicted maximum total acid deposition values (40 kilograms/hectare/year) are in the middle range of median critical loads reported for different areas of Canada. Even though the model predictions are in the middle range of critical loads, the Galore Creek valley is unlikely to be highly sensitive to acid deposition. The natural water chemistry in the Galore Creek valley is relatively basic (pH is approximately 8.0) and would neutralize the relatively small amount of acid deposited from the atmosphere. Fugitive dust deposition is well below B.C. Pollution Control Objectives for the Mining, Smelting and Related Industries (1979).

It was found that the CAC concentrations resulting from activities along the access road were negligible compared to mine site emissions. Estimated maximum SO_2 concentrations were marginally higher than estimated background concentrations.

Maximum concentrations predicted inside the 100 metre buffer zone did not exceed the B.C. occupational health exposure limits. The maximum CAC concentrations were located near the central pit haul road, which was the single most active area for diesel equipment.

2.2.3 Issues Raised and Proponent Response

During the Application review, government agencies sought clarification on some of the information presented in the Application related to air quality. The following key issues were raised:

- Use of scrubbers and incinerator is not evident.

  The Proponent advised that the air emissions from the waste incinerator at Galore Creek were based on Canadian Council of Ministers of the Environment (1992) incinerator emissions criteria and an estimated throughput of 100 kg/hr that was deemed typical for a remote mine camp. A typical incinerator is manufactured by Westland Incinerators, Edmonton (Series no. CY-100-CA) and this unit includes a double chamber cyclonator with an acid gas scrubber. Estimated air emissions are provided in the table below.

  Table 4. Estimated Emmissions from Waste Inceneration

Parameter	Units	Value
Particulate Matter (TSP)	g/s	0.011
SO2	g/s	0.138
NOx	g/s	0.212
NOx as NO2	g/s	0.021
CO	g/s	0.030

  NovaGold is compiling the necessary information for its permit application pursuant to the *Environmental Management Act* and will provide details to regulators as part of permitting once the final selection decision has been made.

- Justify the use of the Saturna monitoring station.

  The Proponent responded that while Galore Creek is not located on the coast, the climate is coastal. Saturna is the only monitoring station in B.C. and the closest to the Project.

- Emissions from smoke during open burning of land clearing not identified.

  The Proponent committed to abide by the Open Burning Smoke Control Regulation during construction.

- Given the size of the Project and that this environment is pristine it is necessary to have a minimum 3-5 years of non-continuous air quality monitoring once the mine begins operation. Need to ensure that an appropriate long-term air monitoring program is established that includes PM_{10}, $PM_{2.5}$, dustfall identification and other monitoring as required.

  The Proponent has committed to develop a site-wide air quality monitoring program acceptable to the ministries of Environment and Energy, Mines and Petroleum Resources during the permitting stage.

2.2.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following measures and commitments to mitigate potential air quality effects:

- implement an Air Emissions and Fugitive Dust Management Plan;
- use appropriate emissions control equipment such as scrubbers;
- use high-efficiency technologies for diesel mining equipment;
- develop and implement a site-wide air monitoring program during permitting to assess the effectiveness of the mitigation strategies employed;
- use appropriate control methods such as road watering and vehicle speed regulations to minimize the generation of fugitive dust;
- use preventative maintenance to ensure optimum performance of light-duty vehicles, diesel mining equipment, aircraft and the incinerator;
- make reasonable efforts to use post-2005 diesel equipment to minimize air emissions;
- use the lowest sulphur-content fuel reasonably available on the market;
- implement a recycling program to reduce the amount of incinerated wastes and hence CO_2 emissions;
- segregate waste prior to incineration to minimize toxic air emissions;
- develop a dust deposition monitoring program to measure dust/chemical deposition from mining activities;
- use a dust suppression system for the primary crusher to reduce fugitive dust and keep ore drop height to a minimum;
- cover the conveyors and ore stockpile thereby reducing fugitive dust;
- inform employees, contractors and sub contractors about policies for managing air quality (e.g., trucking contractors will be informed of the requirements for speed limits and no idling);
- implement dust control at the intersection of the access road and Highway 37;
- use appropriate covers for concentrate trucks to minimize the loss of concentrate due to dusting;
- if tarpaulins are used to cover concentrate trucks, develop an operating procedures manual for correct tarpaulin use and provide training for transportation contractors;
- participate with other industrial users of Highway 37 and government agencies to monitor for potential metals contamination resulting from concentrate dusting along the highway;
- participate with other Port of Stewart users and the Ministry of Environment in a joint air quality monitoring program;

- monitor workplace contaminates to ensure compliance with occupational health exposure limits pursuant to permitting requirements; and,
- abide by the Open Burning Smoke Control Regulation during construction.

The Proponent has committed to air quality monitoring and follow-up (see section 4.2.2 of this Report) to support or verify the predictions made on environmental effects.

2.2.5 Significance of Residual Effects

The Proponent predicts that air emissions from the Project will have an adverse effect on the existing ambient air quality because it will cause a change from the baseline conditions. The proposed mitigation measures and commitments will reduce effects from air emissions and fugitive dust.

The B.C. and Canada National Ambient Air Quality objectives define estimated concentrations that are acceptable for protection of human health and other biological receptors. Since none of the criteria for air contaminant concentrations exceeded these objectives, potential effects of air quality changes in the Project area on biological and human receptors are predicted to be negligible.

Based on the air dispersion modeling, the magnitude of the effects to air quality for all project activities is predicted to be moderate because there will be a change from the average baseline conditions, but all of the air quality parameters will be below ambient air quality objectives at 100 metres beyond the mine footprint. The duration of the air quality effects will be the life of the mine. The geographic extent of the air quality effects was classified as local since the effects from the emissions were all confined to within the local ambient air quality study area.

The effects are anticipated to be mainly continuous during the life of the mine, with periodic effects from operation of the aerodrome. The effects are reversible in the short term (within the active life of the Project). There is a high probability that an effect on air quality will occur.

2.2.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential air quality effects of the Project; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on air quality.

2.3 NOISE

2.3.1 Background

There are currently no anthropogenic sources of noise in close proximity to the Project. Natural noise sources include avalanches and ice calving off the glaciers.

The lowest average baseline noise level (average integrated equivalent continuous sound level, or Leq) was 38.4 dBA, recorded in Galore Creek East Fork. The second-lowest noise levels were at the Porcupine airstrip, where the Leq was 38.5 dBA. The third-lowest average noise levels (Leq = 39.0 dBA) were recorded at the filter plant site. The lowest minimum noise level, 31.6 dBA, was recorded at the filter plant sample station. The highest average noise levels (Leq = 51.8 dBA) were recorded at the Sphaler Creek sample station, probably due to helicopter traffic associated with fish and road survey crews that were working in Sphaler Creek during the baseline study.

Overall the most representative set of baseline noise data was from the filter plant site because it was not influenced by local helicopter traffic associated with mineral exploration activities; hence, an undisturbed baseline noise level of approximately 38 dBA was established.

2.3.2 Project Effects

Noise was selected as a valued ecosystem component because it has intrinsic value for employees and wildlife. High noise levels from mining operations have the capacity to negatively affect employee performance by distracting them from the task at hand and are therefore a concern to health and safety. In addition to human impacts, high noise levels have the potential to cause wildlife to leave their preferred foraging, resting and breeding habitats. Excessive noise and vibration can also trigger avalanches during winter and rock slides during summer.

This effects assessment included the construction, operation and decommissioning phases of the Project, point and mobile sources of noise, and tonal and impulse noises. The construction and operation phases will produce a variety of noises including continuous noise from a drill or haul truck or an impact noise from a blast in an open pit. Noise from mining activity will be ongoing in the areas adjacent to the pits and the process plant. There will also be noise associated with aircraft including noise from aircraft landing and takeoff and helicopters.

Since predictions were made for the noisiest phases of construction, they would also represent the worst case for decommisioning and closure when the buildings are dismantled and the mine site is decommissioned.

Potential Effects and Evaluation

Potential noise effects on wildlife are considered in section 2.11 of this Report. There are no communities or residences within the Project area, so noise from the Project is not anticipated to affect communities or residential areas.

Noise from the Project includes: steady, continuous noise typically associated with the continuous operation of stationary equipment (e.g., primary crusher, process plant) at the mine site, short-term, intermittent noise, typically associated with the effects of vehicles hauling ore and waste rock, aircraft at the Porcupine River aerodrome, and drilling and blasting in the open pit.

Workplace noise at mine sites is regulated under a different set of regulations than environmental noise. For this assessment, the Proponent applied a standard for workplace noise as regulated by the occupational health section of the Health, Safety and Reclamation Code for Mines in British Columbia (B.C. Ministry of Energy and Mines 2003). In the workplace the maximum permissible noise exposure for unprotected ears on a daily basis is eight hours of continuous equivalent noise level of 85 dBA. Applying this standard, and noting that the work shifts at the Galore Creek mine will be 12 hours, the maximum permissible noise exposure for a 12 hour work day is 83 dBA. The 12 hour shift would also be standard for the construction phase.

Access Road – Construction Phase

Sources of noise during road construction will include chainsaws, dozers, rock drill, dump truck and excavator. Supplies for the three staging areas will be delivered using heavy-lift helicopters based out of Bob Quinn Lake near Highway 37.

Results of the noise modeling indicate that daytime noise levels during construction will be generally below 51 dBA at a distance of 1,000 metres from the road centreline. The highest noise levels were predicted at the first staging area along More Creek. Sound levels drop quickly with distance from the work areas due to a high level of attenuation provided by the forest.

The areas where workers may be exposed to a 12 hour continuous equivalent noise level of 83 dBA during access road construction are very limited, typically within a radius of 100 metres from work sites.

Access Road – Operation Phase

Noise sources include the filter plant, concentrate pipeline booster station pump house located near kilometre 83 and traffic along the access road. Day and night noise levels along the access road during midlife are predicted to be negligible. During the day time the equivalent noise levels are near background within a distance of 100 metres from the road centreline.

The zone of influence for noise from the concentrate haul trucks between the filter plant and Highway 37 during night is slightly larger than the day predictions and the access road predictions. However, the day and night equivalent noise levels from the concentrate haul trucks are near background within 200 or 300 metres of the road centreline.

Mine Site – Construction Phase

Daytime and night time noise levels during year 1 and 2 are generally lower than 50 dBA within a 1,000 metre buffer zone around the Project footprint and year -2. The noisiest areas are near the aqueduct construction and along the bottom of the Galore Creek valley as material is hauled to the main tailings dam.

Other areas with average noise levels above 50 dBA are the three construction headings for the water diversion ditch on the east side of the Galore Creek valley. The helicopter flight path along the Galore Creek – East Fork valley indicates noise levels above 50 dBA during the daytime.

Areas where workers may be exposed to a 12 hour continuous equivalent noise level of 83 dBA or greater during construction at the Galore Creek mine site are very limited, typically within a radius of 100 to 200 metres from the active work sites.

Mine Site – Operations Phase

The primary noise generating activities during midlife are drilling and blasting in the Central Open pit, waste hauling to the main tailings dam lift, ore hauling to the crusher, crushing and process plant operations. Ancillary noise sources include road watering and snow removal.

Generally predicted noise levels are higher during the day than night primarily due to the open pit mine blast. The predicted average noise levels during the day at the edge of the 1,000 metre buffer zone around the mine footprint were in the range of 51 to 57 dBA.

Areas where workers may be exposed to a 12 hour continuous equivalent noise level of 83 dBA during midlife operations at the Galore Creek mine site are limited, typically within a radius of 100 to 200 metres from mining activities.

Blasting within the Galore Creek valley is expected to occur at least once per day for each active open pit. The noise level from a mine blast and duration will depend on the total charge weight, the number of delays, the time between delays and any echoing in the valley. The typical duration for an open pit blast is 2 seconds. The daytime equivalent sound level would be approximately 50 dB lower than the maximum level for an open pit blast.

Noise modeling conducted for an open pit blast estimated a maximum sound level of approximately 126 dBA. Hence, the day time equivalent sound level for the blast would be 76 dBA. This equivalent sound level would then be logarithmically added to the sound level due to all other noise sources and ambient noise to get the overall equivalent sound level at a particular point. The sound level due to all other noise sources in the Galore Creek valley (at a 1,000 metres distance from the mine footprint) was approximately 48 dBA. Hence, the result from logarithmically adding these two sound levels (76 dBA from blasting and 48 dBA from other noise sources) results in an equivalent sound level of 76 dBA at 1,000 metres from the Project footprint. In essence the sound level from the blast dominates or masks the sound level from all the other noise sources during the day.

Blast noise from the open pits will gradually decrease as the open pits get deeper. During the initial years of operation the open pit blasts will be close to the original elevation of the ground. However, as the pits become deeper, the perimeter edges of the pit will attenuate the blast noise. Hence, the blast noise will gradually subside as the open pits get deeper.

Porcupine Aerodrome – Construction and Operation Phases

The highest noise levels were estimated for the construction phase because of more frequent helicopter flights between the Porcupine aerodrome and the Galore Creek valley. For operations, the primary noise sources are takeoff and landing for Dash 8 aircraft carrying passengers and Hercules carrying cargo and fuel.

The Proponent estimated that during construction there would be 16 one way heavy-lift helicopter trips and 4 trips for Bell 205 helicopter between the aerodrome and the Galore Creek valley. Noise levels within a 1,000 metre buffer zone from the aerodrome are in the range of 45 to 51 dBA during construction.

Within 1,000 metres from the flight centreline the 1.5 minute noise levels were below 57 dBA. The area affected by the Hercules takeoff is larger than what was found for the mine site and access road because the averaging period is much shorter and the principal noise source (Hercules aircraft) is above ground for most of the takeoff distance and therefore there is less noise attenuation available from the forest.

Areas where workers may be exposed to a 12 hour continuous equivalent noise level of 83 dBA during construction at the Porcupine aerodrome are very limited, typically within a radius of 100 to 200 metres from the airstrip.

2.3.3 Issues Raised and Proponent Response

During the Application review, Health Canada sought clarification on some of the information presented in the Application related to noise and provided the following comment:

No modeling of predicted indoor noise in living quarters for off-shift workers was conducted. Health Canada requested the Proponent conduct noise monitoring to measure indoor noise in workers living quarters and that noise attenuation be implemented, if necessary, to reduce levels to acceptable community noise standards, particularly for sleep and quiet recreation. HC recommended that noise levels measured in the accommodation complex be compared to levels that are associated with sleep disturbance in the World Health Organization's Guidelines for Community Noise. If noise levels exceeded these guidelines it is recommended that technically and economically feasible mitigation be applied.

2.3.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following measures and commitments to mitigate potential noise effects:

- as much vegetation as possible will be maintained along the access road, Porcupine aerodrome, Round Lake heliport and mine footprint to provide the highest attenuation possible;
- abide by the noise-related provisions in the Occupational Health section of the Health, Safety and Reclamation Code for Mines in B.C.;
- monitor noise levels in the accommodation complex once the mine begins to operate to confirm noise levels; and,
- compare the results of noise monitoring in the accommodation complex to sound levels related to sleep disturbance in the World Health Organization Guidelines for Community Noise (1999). In the event that sound levels exceed these guidelines, the Proponent will undertake technically and economically feasible mitigation measures.

The Proponent assumes that haul trucks purchased will comply with the manufacturer's noise limits for heavy duty trucks.

The Proponent has committed to noise monitoring and follow-up (see section 4.2.3) to support or verify the predictions made on environmental effects.

2.3.5 Significance of Residual Effects

Noise emissions from the Project will have an adverse effect on the existing background noise because it will cause a change from the baseline conditions. The proposed mitigation measures and commitments are intended to protect humans during construction of the facilities, access road and powerline, as well as those working at the mine site, filter plant and aerodrome.

The results of the noise modeling indicates that noise levels during construction, operation and decommissioning will generally be below 57 dBA at a distance of 1,000 metres from the Project activity considered in the noise modeling. The exception is with blasting. The environmental assessment predicted there will be an equivalent sound level of 76 dBA at 1,000 metres from the Project footprint.

When comparing sound level values it is often useful to know the average noise levels from some familiar activities or sources. Some typical noise levels (dB) are as follows: rustling leaves 20, living room and humming of refrigerator 40, normal conversation 60, business office 65, average city traffic 80 to 85, jack hammer 100, jet take-off at 100 metres distance 130, motorcycles, firecrackers and small arms fire up to 140. Sounds of less than 75 dB after long exposure are unlikely to cause hearing loss. The human pain threshold is 130 dB.

The zone of influence where workers may be exposed to noise above the occupational limits is typically limited to within a 100 to 200 metre radius from the active work site. As indicated above, the proper hearing protection would be prescribed according to the Health, Safety and Reclamation Code for Mines in British Columbia (B.C. Ministry of Energy and Mines 2003). No significant residual noise effects on humans and workers are predicted.

2.3.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential noise effects of the Project; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects related to noise

2.4 SURFACE WATER QUANTITY AND QUALITY

2.4.1 Surface Water Quantity

2.4.1.1 Background

The construction and operation of mine infrastructure has the potential to impact surface water flows in a number of watersheds including Galore, More, Sphaler, and Scotsimpson creeks. Impacts may also affect the major river systems lying downstream of these watersheds; namely the Scud, Iskut, and Stikine rivers. Surface water quantity for the Project has international transboundary implications because the Stikine River flows into Alaska.

A regional hydrological assessment was undertaken to describe the surface water hydrology of the Project area and to calculate values for key hydrological parameters such as annual runoff totals, monthly flow rates and flood flows.

Annual Flow Volumes - Consistent with the regional precipitation gradient, baseline data collected during 2005 showed a decrease in annual runoff for watersheds further to the east. Relationships were also observed between annual runoff and watershed elevation, glacier coverage and watershed area.

Monthly Flow Distributions - Winter flows in the study area are low, with only 10% of the annual runoff total occurring between November and April. The majority of the annual flow volume

(65%) occurs from June to August. Although there are some differences between the monthly flow values for each watershed (depending on the influence of factors such as the presence of glaciers, size of the watershed and its location), overall the monthly distribution of flows is fairly constant across the study area.

High Flows - High flow (i.e., flood) conditions in northwestern B.C. are produced by three main mechanisms: *rapid snowmelt* – during spring or summer months (June to August); *rain falling on melting snow* – during spring or summer months (June to August), or during early winter (November or December); *heavy rainfall* – during September or October.

Low Flows - Across the study area, flows are maintained in main channels throughout the winter months, primarily due to groundwater. Headwater streams can be covered in snow and have very limited to negligible flow, but few streams were observed to be fully frozen to their beds.

The access corridor will cross a number of streams and rivers, including numerous small tributaries as well as the main channels of the Iskut and Porcupine rivers, and More and Sphaler creeks.

The filter plant will discharge treated concentrate filtrate water into the Iskut River. Estimated annual average flow at the location of the filter plant is 80 cubic metres per second. The watershed area of the Iskut River is around 3,800 square kilometres at this location.

At the location of the aerodrome, estimated annual average flow is 46 cubic metres per second. Outwash floods from the lake, although not observed during baseline studies, may have occurred in the past, as indicated by the geomorphology of fluvial deposits within the Porcupine River valley.

At the mine area, there are two main headwater tributaries in Galore Creek. The eastern tributary, East Fork, is the larger and is dominated by two major glaciers. In contrast, the West Fork of Galore Creek, where the pits and process plant will be located, is smaller, has lower elevations and contains small headwater glaciers. Given the lower elevations and smaller glaciers, one would expect lower runoff totals at West Fork than at East Fork. However, the flow data indicated similar levels of runoff from both tributaries.

This can be explained by rain gauge measurements and snow depth data that indicated higher precipitation in West Fork, which compensated for the lower elevations and limited glacier coverage of the western tributary. Higher precipitation totals in the West Fork are consistent with the regional precipitation gradient and suggest local orographic effects.

Galore Creek flows into the Scud River. The Scud River has a watershed area of 575 square kilometres upstream of the confluence with Galore Creek. This compares to a watershed area of 145 square kilometres for Galore Creek.

In the study area surface water is not used as a resource in itself (e.g., a major source of drinking water), the river systems close to the mine site are not used for navigation, and there are no towns close to the mine site that could be affected by flooding.

2.4.1.2 Project Effects

Surface water quantity is considered a VEC because of its importance for the maintenance of conditions for aquatic and terrestrial life. The evaluation of potential Project effects on water quantity is separated into five areas for various project components (mine site, tunnel, access corridor, filter plant, and aerodrome):

Flow paths and drainage areas **-** Flow paths define the hydrological network in any watershed and describe the linkages between different streams and river systems. Changes to flow paths or drainage areas can impact downstream flow rates, access to upper reaches of the watercourse and the downstream supply of nutrients.

Annual Flow Volumes **-** The annual flow volume is a measure of the total volume of water flowing through a site of interest. An assessment of the impact of development on the annual flow volume will indicate the large-scale effects of the Project on the water available for aquatic and terrestrial life.

Seasonal Distribution of Flow **-** Within the study area stream flows vary throughout the year, with high flows during summer months (e.g., June to August) and low flows during winter (e.g., December to April). The monthly flow distribution reflects the annual cycle of temperature and precipitation within the study area and is in balance with the natural life cycle of many aquatic organisms. The assessment considered the impact of the development on the natural monthly distribution of flows.

High Flow Conditions **-** Peak (i.e., flood) flows have impacts on human and natural environments. Floods can result in damage and loss of life, but also provide a natural source of sediment and water to sustain wetland and floodplain areas along river valleys. The assessment considered the impact of the Project on high flow conditions.

Low Flows **-** A minimum flow is required to maintain the health of aquatic ecosystems. A decrease in low flow conditions can impact aquatic life and water quality. The assessment considered the impact of the Project on low flow conditions.

MINE SITE (INCLUDING TUNNEL)

Changes to Flow Paths and Drainage Areas

During construction, water will be diverted around the main construction sites (e.g. plant site, dam, pre-stripping of pit areas). There will be local changes to flow pathways within Galore Creek valley.

During mine operations much of the main stem of the Galore Creek valley will be flooded at the waste rock and tailings storage facility behind the main dam. At the beginning of operations the main dam will have a spillway elevation of 548 metres above sea level, and at closure the spillway elevation will have increased to 674 metres. Diversion channels will capture water from non-disturbed areas of the watershed (East and West Forks of Galore Creek and a large proportion of the eastern slopes of Galore Creek valley) and direct these flows away from the storage facility; finally discharging into Galore Creek, downstream of the main dam. Runoff from non-disturbed watersheds on the west side of the Galore Creek valley will also flow into the storage facility. Under normal operating conditions outflow from the storage facility will be controlled by pumps that will discharge from the main dam at the approximate elevation of the spillway. The spillway in the main dam will operate under emergency conditions only and has been designed to pass the Probable Maximum Flood without overtopping of the dam. In the first year of operations, a coffer dam located upstream of the waste rock/tailings divider will capture all of the runoff from the upstream watersheds and divert flows into a temporary diversion channel. During this time only a small watershed area will report to the tailings storage area and be retained behind the starter dam.

The five open pits (Central, Southwest, Middle Creek, West Fork and Junction pits) all lie within the West Fork of the Galore Creek watershed. Ditches lying between the West Fork Diversion Channel and active pits will capture runoff from upstream of the pits and these flows will be directed to enter the tailings and waste rock storage facility. The pits will be ringed by groundwater dewatering wells, which will pump groundwater at a combined rate of approximately 30,000 cubic metres per day. Given the size and depths of the pits, the pumping rates will be higher than natural groundwater flow rates to Galore Creek.

The tunnel, which drains towards Galore Creek, will intercept groundwater that would originally have drained into the Scotsimpson watershed. Based on estimated groundwater inflow rates, the tunnel will contribute 0.05 cubic metres per second of additional flow into the Galore Creek valley.

In summary, the development of mine site infrastructure will dramatically alter the flow paths and drainage areas within the Galore Creek valley. However, downstream of the main dam where the pumped outflow from the storage facility will mix with flow from the main diversion channel, the mine site will not change the natural flow paths and drainage areas in the lower reaches of Galore Creek or in the Scud River. At closure the diversion channels within the Galore Creek valley will be decommissioned and all runoff will enter the flooded tailings and waste rock storage facility. The storage facility will operate as a freely overflowing reservoir or lake. In West Fork, the pits will be allowed to fill and will overflow into the storage facility.

Annual Flow Volumes

During construction, there will be no storage of runoff within the Galore Creek valley. As a result, annual runoff volumes at the mouth of Galore Creek are expected to be the same as baseline conditions.

During operations, water flowing into the waste rock and tailings storage facility will be pumped out of the pond and into Galore Creek. There will be losses and gains to annual flow volumes at the mouth of Galore Creek due to factors such as: water held in pore water space within waste rock and tailings behind the dam; water in concentrate pumped out of the Galore watershed; pit dewatering wells pumping rates higher than natural groundwater flows to the Creek; areas disturbed by activities have higher runoff rates than natural vegetated areas, increased evaporation from the pond surface. The sum total of these factors is estimated to result in annual flow volume decreases of: 2% for dry year conditions and 1% for average and wet year conditions at the mouth of Galore Creek; 0.3% for average year conditions in the Scud at the confluence with Galore Creek; 0.2% for average year conditions at the mouth of the Scud, less than 0.1% for average year conditions in the Stikine.

Upon closure, the waste rock and tailings storage facility will discharge freely over a spillway. The hydrology of the watershed during closure will be affected by higher runoff from disturbed areas and higher evaporation from the large reservoir retained by the main dam. However, the impact is likely to be small compared to the high volumes of annual runoff experienced in the Galore Creek valley. In addition, over time with re-vegetation of disturbed surfaces, runoff should return close to baseline conditions.

Seasonal Distribution of Flow

The distribution of flows and average monthly flow rates at the mouth of Galore Creek will primarily be affected by the retention of water in, and the controlled release from, the storage facility. Operation of the facility will attempt to maintain the lowest possible free water volume within the storage area, so there will always be a maximum possible storage volume in case of a malfunction of the pumps or water quality issues. The minimum free water volume within the pond will be that required to maintain a depth of 4 metres above the tailings solids.

Discharge from the facility will only take place if the water quality in the tailings storage area complies with the site effluent discharge permit. Further discussion on this issue is included in section 2.4.2.2.

Pumping rates will be paced to follow natural flows within the receiving environment of Galore Creek and, under normal operation, be limited to the annual open water period of May 15th to October 15th. Pumping rates are expected to start low in early spring, before increasing to a maximum of 20 cubic metres per second through freshet.

The total volume of water discharged during the pumping period will exceed natural conditions as water stored in the facility during winter is discharged during the summer months. The calculations show that under average runoff conditions and normal operations there could be up to a 20% difference in average monthly flow rates during summer months at the mouth of Galore Creek. This will produce a measurable difference in flow rates at the mouth of Galore Creek, however, changes in flow rates are likely to be within the range of natural variations. The impact of pumping decreases downstream with less than 10% difference within the Scud and less in the Stikine.

As a result of no discharge from the storage facility during winter months (October 16th – May 14th), winter flows at the mouth of Galore Creek and further downstream will be lower during operations than under baseline conditions. The results indicate that flows at the mouth of Galore Creek could decrease by 30% during winter months when the mine is operating. Downstream of Galore Creek the impact on winter flows is lessened, with the decrease in flow less than 10% of baseline conditions and likely to be within the range of natural flow variations. These results assume that the unit response of watersheds flowing into the diversion channels is the same during operations as baseline (i.e., the decrease in flow at the mouth of Galore Creek is proportional to the decrease in watershed area flowing into the storage facility). However, during operations there is the potential for blockages to the diversion channel and losses of groundwater flow from the diversion channel. A blockage could result in a decrease in winter flows of up to 80% when compared to baseline conditions. However, the diversion channel has been designed to minimize the likelihood of a blockage (e.g., sediment control structures located on canyons upstream of the channel; access to the channel to allow rapid clearing of any debris).

During closure, diversion channels will be decommissioned and all watershed areas upstream of the main dam will flow into the storage facility and then discharge over the spillway of the dam. It is anticipated that post-closure the seasonal flow distribution at the mouth of Galore Creek and downstream will return to baseline conditions.

High Flow Conditions

Baseline studies identified that peak flows (or flood flows) in the Galore Creek valley can result from three main flood-generating mechanisms; heavy rainfall, rapid snowmelt and rainfall on melting snow. Analysis of historical flow records at the More Creek Water Survey of Canada hydrometric station and other stations located close to the proposed mine site, indicated that the highest flood flows were associated with extreme rainfall events occurring in the period from September to November. These events were typically short-lived with steep rising and falling limbs to the flow hydrographs. As a result, although they have very high peak flow rates, they do not contain very high flow volumes. In contrast high flow events that occur during freshet and summer (May to August) have lower peak flows, but higher total volumes.

During operations changes to peak flood flows at the mouth of Galore Creek could result from: storage of flood flows within the waste rock and tailings storage facility; altered flow routing through diversion channels, and changes to hydrological conditions in the watershed (e.g., increased runoff from disturbed areas).

Given the strategy of maintaining maximum storage volume within the tailings pond as discussed in the previous Seasonal Distribution of Flow section, estimated runoff volumes from areas that flow to the storage facility, even for the extreme case of a sustained 1 in 200 year peak flow, are less than the available storage area within the tailings pond. Hence, during operations, flood flow events will be able to be stored within the tailings pond, with no or limited overflow. As a result, peak flows downstream of the storage facility will be lower than natural flow conditions during mine operations.

During operations there is likely to be decreased peak flows at the mouth of Galore Creek, with no change in the timing of peak flows. A range of alternative flood hydrographs could be produced by considering different design storms and/or the effect of snow melt. However, the impact of the mine site on flows would remain the same (i.e., a decrease in peak flows).

During closure, all diverted flows will discharge into the storage pond, which will operate with free overflow through the spillway. In effect, over 85% of the Galore Creek watershed will drain into a large lake and outflow from the lake will be controlled by the spillway. The impact of large lakes and reservoirs on flood flows is well-documented, resulting in a downstream decrease in peak flows and a delay in the timing of the peak flow.

The downstream impact of the Project on flood flows will depend on the probability of peak flows in Galore Creek coinciding with peak flows within the Scud and Stikine rivers. Galore Creek is likely to respond to very intense, short-lived rainfall events, produced by meteorological conditions local to the valley. In contrast, floods in the Stikine River and to a lesser extent the Scud River, will be produced by lower intensity, but longer duration rainfall events, produced by weather fronts extending over a wide geographic area. However, even if flood peaks occurred at the same time in all the rivers the impact of the Project on peak flows in the Scud and Stikine rivers will be low.

A dam break analysis indicated that a break would have major implications for flow rates at the mouth of Galore Creek and within the Scud River, with peak flow rates in the order of 7,000 cubic metres per second at the mouth of Galore Creek and 4,500 cubic metres per second at the mouth of the Scud River. Although the impact of a dam break on flows in Galore Creek and the Scud River is high, the likelihood of a dam break event is extremely low.

Low Flows

The main effect of operations on extreme low flows at the mouth of Galore Creek is that there will be no discharge from the waste rock and tailings storage facility during winter months. Hence, during winter, stream flow at the mouth of Galore Creek will be supported by flows from the main diversion channel and from the watershed areas downstream of the main dam. The watershed areas downstream of the storage facility are not impacted by the Project. As a result, it is expected that winter flows from these areas will be unchanged from baseline conditions.

Modeling results show that under normal operating conditions there could be at least a 25 – 30% decrease in low flows at the mouth of Galore Creek. If there were a blockage of the diversion channel then low flows could decrease by as much as 80%. Both situations would result in a measurable decrease in low flows. The impact of these low flow conditions on aquatic life are assessed in the Aquatic Resources and Fish and Fish Habitat sections.

Under normal operating conditions the impact of the Project at the mouth of the Scud River is likely to be low and less than 5% of baseline conditions. Downstream of the mouth of the Scud, within the Stikine River, the impact will be less than 1% of baseline conditions. However, if there is a blockage of the diversion channel associated with low flow conditions then the impact on flows in the Scud River is likely to be measurable and between 10 – 20% of baseline flow. As discussed in the preceding Seasonal Distribution of Flow section, the diversion channel will be designed to minimize the likelihood of blockage and to provide access to allow rapid clearing of debris.

During closure the main diversion channel will be decommissioned and discharge from the storage facility will be over a spillway. As a result there will be discharges from the storage facility during winter months in balance with the inflows to the pond. As the whole watershed area of Galore Creek will now be able to report to the mouth of the watershed it is expected that low flow conditions during closure will return to baseline conditions.

ACCESS CORRIDOR

Bridges and stream crossings

Culverts and bridges will be constructed at all stream and river crossings along the access corridor. Minor bridges and culverts will be designed to pass the 100-year instantaneous peak discharge and major bridges and culverts will be designed to pass the 200-year instantaneous peak discharge. Thus, under most flow conditions, the culverts and bridges will be able to convey discharge with no impact on natural stream flows. During extremely high flows (i.e., exceeding the design instantaneous peak discharge), culvert or bridge structures may partially obstruct flows, which could result in elevated upstream water levels (backwatering) and overtopping of the structure.

It is expected that the impact of bridge overtopping on peak flows will be relatively small and limited to reaches close to the affected bridges. Impacts on flows along the main stream channels (i.e., More, Sphaler, and Scotsimpson creeks and Iskut River) will depend on the geographical extent of any storm-generating rainfall event. Small localised storms that impact only a few watersheds will have spatially limited impacts, while storms over a wider geographic extent could affect streams over the whole watershed.

At closure, bridges will be decommissioned and removed, removing any impediment to flood flows.

Interception of natural flow paths and road drainage issues

The access corridor will cut across natural surface and shallow subsurface drainage pathways. As discussed above, bridges and culverts will maintain existing channelized surface flow. However, small drainage features and hillslope sections between stream crossings will be intercepted by the road surface and hillslope cuts made during road construction. Ditches will capture surface and subsurface flows and cross-drains will pass water under the road surface.

It is likely that impacts on surface water quantity will be limited to streams and hillslope areas within tens to a few hundred metres from the access corridor. Drainage structures are likely to interrupt natural flow pathways upstream of the road and concentrate flows downstream of the road at locations where there are cross-drains. This may change the timing of hillslope runoff; intercepting subsurface flow and directing it into surface ditches will increase runoff, while ponding upstream of cross-drains may tend to impede flow. However, road drainage structures are unlikely to affect the overall runoff volumes entering the main rivers. In the main streams there is expected to be no measurable impact on flows.

<u>Change in runoff characteristics due to forest clearance and presence of compacted road surfaces</u>
Vegetation has a significant role in the hydrology of a watershed by affecting surface runoff rates, infiltration, evapo-transpiration, temperature, snow accumulation, and snowmelt. Changes to the amount of vegetative cover within a watershed can lead to changes in timing and volume of stream discharge.

Based on watershed modeling, vegetative clearing associated with the proposed road access/transmission line/pipeline corridor results in less than 1% change in baseline conditions for all measures of hydrological response for More Creek. Localized effects may include more rapid melt of snow-pack along the cleared right-of-way; however, this will not have a measurable impact on the timing or volume of flows in streams.

<u>Pipeline Rupture</u>
Flow rates within the concentrate slurry pipeline are negligible when compared to flow rates in the main channels of More, Sphaler and Scotsimpson creeks or the Iskut River. Should a rupture in the concentrate pipeline occur, the amount of water released to the environment would be as much as 1240 cubic metres, at a rate of less than 0.03 cubic metres per second. This is a negligible contribution to water quantity under all but extreme low flow conditions in the smallest tributary creeks along the access corridor. Water inputs from a ruptured pipeline would also be short-lived. Hence, apart from small streams close to a leak, the impact of a pipeline rupture on water quantity would be negligible.

The effect of a pipeline rupture on water quality is assessed in section 2.4.2.2.

FILTER PLANT

Concentrate is de-watered at the filter plant and the water will be treated before being discharged through a diffuser into the Iskut River. The impacts of the diffuser discharge on flows and surface water quantity within the Iskut River are anticipated to be very low to negligible. The outfall discharge is much less than 0.1% of the annual flow volume at the site. Even under extreme low flow conditions the outfall discharge will be less than 0.5% of natural flows in the Iskut River.

AERODROME

The impact of the aerodrome on surface water quality will be similar to those produced by the access corridor.

The bridge crossing of the Porcupine River to connect the aerodrome to the access corridor will be designed to pass the 200-year flood flow (Q_{200}), with an additional 1.5 metres of clearance for debris accumulation. For flows less than the Q_{200} the bridge will not impact flows within the Porcupine River. Under extreme flood conditions (greater than Q_{200}) the bridge may result in locally raised water levels upstream of the structure (backwatering) and it may change the timing and magnitude of peak flows downstream of the bridge. However, it is likely that these impacts will be restricted to the river reach close to the bridge.

The aerodrome will be constructed on the floodplain of the Porcupine River. Construction will involve placing a layer of compact crushed stone on top of gravel. This will produce additional runoff from the airstrip, which will be captured by drainage ditches. However, given the small area of the airstrip this will have negligible impact on flows in the Porcupine River.

The airstrip will be surrounded by a berm to provide some protection against flood flows. Although this may change some local flow paths the impact on flows in the main river will be negligible. Flooding will have more impact on the operations of the aerodrome than vice-versa.

2.4.2 Surface Water Quality

2.4.2.1 Background

The geographic extent of the Project area encompasses the following watersheds: Galore, Scud, Iskut, More, Sphaler, Porcupine, Scotsimpson and Stikine. Baseline studies were conducted in the mine area (Galore and Scud watersheds), filter plant (Iskut watershed), access corridor (More, Sphaler and Scotsimpson watersheds) and aerodrome facility (Porcupine watershed) as well as the Stikine River, the downstream receiving environment.

Baseline levels of a number of water quality variables in the Galore receiving environment are above B.C. water quality guidelines. This reflects the highly mineralized nature of the region.

Water from streams, lakes and wetlands in the Project area were sampled and analyzed for physical parameters, nutrients, dissolved anions, total organic carbon, total cyanide, pH and total and dissolved metals.

Toxicity testing of stream water was conducted for key sites to gain an understanding of existing water quality conditions in the Galore and Iskut receiving environments.

Principal Component Analysis (PCA) was used to examine trends in water quality data within the following areas:

- stream sites across the entire study area;
- stream sites focusing on the mine area (Galore and Scud watersheds only);
- stream sites within the filter plant area (Iskut River sites); and,
- lake and wetland sites along the access corridor.

The spatial boundaries were confined to the mainstem of the rivers and creeks that drain the watersheds. The assessment area included wetlands and small lakes downslope of the access road and any tributaries crossed by the access corridor. **Figure 7** identifies the creeks and rivers which are potentially impacted with respect to water quality due to the various project components.

2.4.2.2 Project Effects

Surface water quality is an indicator of environmental health because it is linked to other key ecosystem components such as fish and fish habitat, aquatic resources (benthos and periphyton), soil, vegetation and wildlife. Furthermore, surface water quality for the project has international transboundary implications because the Stikine River flows into Alaska. The Project has the potential to affect water quality in streams and rivers as well as downstream wetlands and small lakes. Although the issues are intricately linked they are presented in separate sections: contaminant loading; discharges, surface runoff, siltation and associated water chemistry effects.

Contaminant Loading

Metal Leaching and Acid Rock Drainage

Open Pits - Metal leaching/acid rock drainage from pit walls will be influenced by groundwater seeping through the northern and western walls. Static test results show that some areas of the pit walls are potentially acid generating. Water from the open pits will be routed to a pond adjacent to the process plant and used as plant make up water. Metal leaching rates were assumed to be those of waste rock.

Low-Grade Ore Stockpile - Acid rock drainage is possible but not anticipated due to the relatively short duration of storage. Based on kinetic tests of waste rock and the lack of observed acidic conditions in core from the 1960s, acid rock drainage generation of potentially acid generating waste rock is conservatively estimated to take at least 22 years after the rock is exposed. Similarly, it is expected that acid rock drainage from the low-grade ore will not be generated within the life of the mine. Metal leaching from the low-grade ore stockpile is likely. Any drainage that may emanate from the pile will flow into the tailings and waste rock impoundment.

Tunnel - Excavated rock from the tunnel construction will be stockpiled and characterized for metal leaching/acid rock drainage during the construction phase. If rock is determined to be potentially acid generating, it will be transported to Galore Creek valley for proper disposal after the tunnel is finished. On completion, the tunnel will be subject to groundwater discharge, which could, depending on the geology, result in the generation of metal leaching/acid rock drainage. Drainage from the tunnel will flow into Galore Creek valley, where it will be diverted into the tailings and waste rock impoundment.

Diversion Channel - The metal leaching/acid rock drainage characterization of this mine component will be conducted during the construction phase and adaptive management implemented to ensure that excavated rock is properly managed and disposed such that water quality in Galore Creek is preserved. Furthermore, the channel will be constructed with an impermeable liner in areas of high permeability to control seepage.

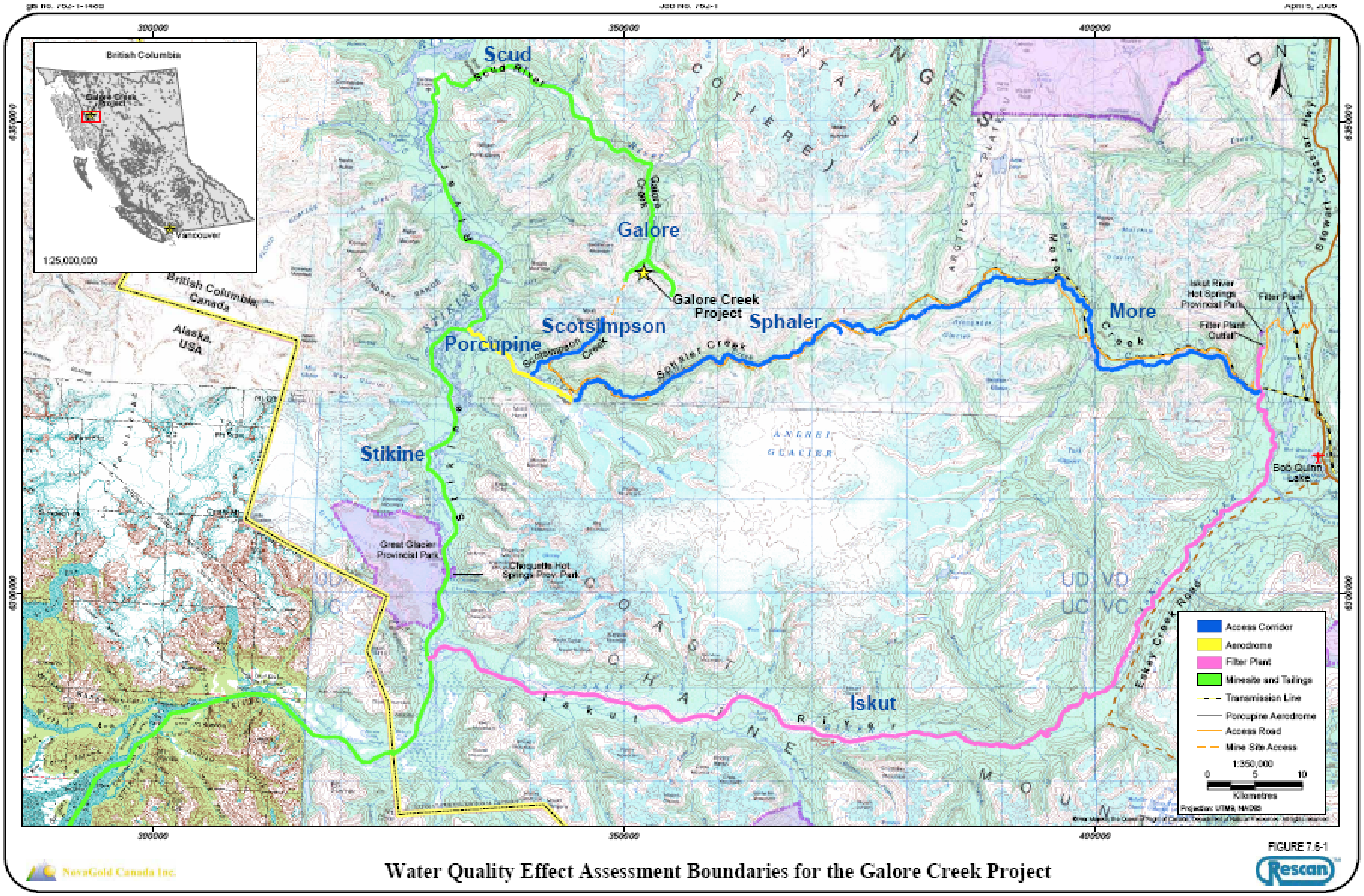

Figure 7 – Creeks and Rivers in the Galore Creek Project Area

Loadings – Mine components predicted to be the primary contributors to contaminant loadings to the waste rock and tailings impoundments include: waste rock (potentially acid generating and non-potentially acid generating); tailings and process water, including pit drainage, dam runoff due to precipitation. The cumulative absolute contaminant loading from the mine components was highest for sulphate, total organic carbon, ammonia, dissolved calcium, fluoride, dissolved aluminium and manganese.

All waste rock types in the five ore zones (Central, Southwest, Junction, North Junction and West Fork) contain significant acid-buffering capacity as carbonate minerals with varying potential for net acid generation. The spatial distribution of potential for acid generation has shown that potentially acid generating waste rock occurs in large blocks in well-defined areas and will be used as the basis for segregation. The effects of potentially acid generating waste rock will be controlled by submerging it in the tailings and waste impoundment, adjacent to but separate from the tailings disposal area. The water cover will control the rate of oxidation of sulphide minerals under non-acidic conditions, such as the leaching of cadmium, selenium, zinc and copper.

Other variables indicated elevated concentrations of several elements known to be associated with specific minerals in the deposit. These included copper (chalcopyrite), zinc (sphalerite), lead (galena) and fluorine (fluorite). Initial results from kinetic tests demonstrated that most elements leach at low rates. However, copper, cadmium, fluoride, manganese, selenium, sulphate and zinc were leached at concentrations greater than typical water quality criteria. The water quality model determined that other variables, including calcium, barium, aluminium, iron, boron, molybdenum, lead and antimony, would have significant loadings from waste rock to the tailings facility.

Tailings and process water generated from the copper flotation process will be discharged and stored in the tailings pond area of the tailings and waste rock impoundment. Acid base accounting test work of the tailings from the pilot plant testing indicated that the tailings are not-potentially acid generating and have an appreciable excess of neutralization potential. However, preliminary bench scale tests indicated that tailings may be potentially acid generating and the conservative approach to permanently submerge the tailings was incorporated into the tailings impoundment design. The process water will have three sources of contaminant loading: pit drainage, constituents solubilized during ore processing and trace amounts of organic reagents used in the process.

Concentrations of the organic reagents in the tailings facility will be monitored by measuring total organic carbon, which has been incorporated into the water quality model. The process water, including pit drainage, is the primary source of total organic carbon to the impoundment. The process water is a relatively significant source of sulphate and dissolved fluoride and will have the largest loadings over the life of the mine for the following variables: sulphate, calcium and dissolved manganese, iron, zinc, aluminium, copper, lead, boron, molybdenum and selenium. Metal levels in the impoundment water will be managed through scheduled and paced release of effluent to Galore Creek.

Results of bioassays indicated the undiluted pilot plant tailings supernatant is toxic to the development of rainbow trout embryos and that the LC50 was 10.2%.

Results of green algae bioassays performed on tailings supernatant and with Galore Creek water were variable. The results demonstrate that water quality of Galore Creek inhibits growth during certain times of the year and at lower concentrations than process water.

Bioassays for duckweed were also conducted and show that for growth, background water showed no toxicity for two of the four samples tested; however, the other two samples had effects at the lowest concentration, and the tailings supernatant had no effect at the lowest concentration.

Chronic toxicity bioassays for *Ceriodaphnia dubia* demonstrated that Galore Creek water can be as toxic as undiluted tailings supernatant.

Results of hydrological modeling indicate that in the month of June the tailings supernatant will be diluted ten-fold in the tailings and waste rock impoundment. Therefore, toxicity would be reduced and would potentially mimic background levels.

Runoff in the form of precipitation and snowmelt along the northern, exposed face of the dam will contain low loadings of leached metals, as indicated by the water quality model. Water quality variables that have the highest loadings due to dam runoff include sulphate, calcium, iron, aluminium, nickel, cadmium, boron, copper, selenium and antimony. The leachate will be collected by a secondary dam downstream of the main dam and pumped into designated tailings storage areas.

Areas of the access corridor characterized as having high potential for acid rock drainage include: alongside Scotsimpson Creek; near the confluence of the Porcupine River and Sphaler Creek, discrete 2 to 3 kilometre segments immediately east and west of Round Lake.

During construction, excavated rock will be stockpiled and characterized for acid rock drainage. If rocks are determined to be potentially acid generating, they will not be used for road construction purposes and will be securely stored for eventual disposal. It is anticipated that this waste rock will need to be stockpiled longer than the rock excavated for tunnel construction because transport to secure disposal sites will not be possible until the road is completed. If exposed side slopes are determined to be net acid generating, water upslope will be diverted to minimize drainage flow on the wall, and limestone-lined collection ditches will be constructed at the bottom. The Proponent has proposed encapsulation as a mitigation strategy.

Leaching of Nitrogen Residues Generated from Blasting

Mine Site

Any leaching of nitrogen-based blasting residues generated at the mine site (with the exception of the diversion channel, as discussed below) will ultimately be diverted and stored in the tailings and waste rock impoundment and was therefore incorporated into a water quality prediction model. In terms of relative loadings from all inputs to the tailings and waste rock impoundment, blasting residue leachate is the largest source of ammonia (99%) Nitrate is 51% and nitrite is 79%. Ammonia is a nutrient and is readily assimilated and transformed by plants and micro-organisms. Release of effluent from the tailings and waste rock impoundment to Galore Creek will be restricted to the period of mid-May to mid-October and subject to water quality permit levels.

Other Canadian mine developments have experienced chronic leaching of ammonia salts from explosives storage areas that subsequently contaminated adjacent watercourses. To ensure ammonia contamination is avoided at Galore Creek, appropriate mitigative measures will be implemented. These include baghouses, storage silos with non-corrosive liners, an impermeable apron with a sump at the loading/unloading area, and a Spill Management Plan.

Access Corridor
Changes in water quality along the road route due to leaching of blasting residues was evaluated using hazard quotients. Based on the results of this evaluation, only the More, Sphaler and Scotsimpson watersheds have potential for low-level effects to aquatic life due to changes in water quality in these regions.

The model applied is considered a conservative estimate of blast residue leaching because it assumes all nitrogen residues are transported to the aquatic receiving environment and are taken up by aquatic receptors. More likely, some of the nitrogen residues will be assimilated in the terrestrial environment. Furthermore, baseline concentrations were assumed to be the maximum measured concentrations.

Atmospheric Deposition
Dust particle sizes generated from the use of explosives are expected to be relatively large such that particles will fall within 30 to 100 metres of the blast site. During dry conditions, the dust cloud would be larger, but overall the dust will be suspended for a relatively short time prior to deposition. In the mine area, the moisture content of the ore and waste rock is relatively high (~5%), which will help control the dust transport distance. Along the access corridor, small blasts will occur at discrete intervals for short periods. When considering these factors, the effects of dust on water quality from blasting are projected to be negligible.

Compared to baseline water quality data of total suspended solids, sulphate and nitrate in Galore Creek, aqueous concentrations due to atmospheric inputs are from 2,000 to 20-fold lower. Therefore, atmospheric loading to Galore Creek will not affect the water quality in the receiving environment.

Discharges

Effluent Discharge

Mine Site
The Project will discharge effluent from two areas: the mine site and the filter plant.

Effluent from the mine site will be discharged from the tailings and waste rock impoundment into Galore Creek from mid-May to mid-October. This effluent will be a composite of leachate from various project components and natural background flow. The receiving environment is defined as Galore Creek, as well as the Scud and Stikine rivers.

Water quality in Galore Creek will be maintained by storing effluent during the winter low-flow periods and scheduling release during high-flow periods (mid-May to mid-October).There may be discharge during winter, provided water quality standards are met, to maintain base flow conditions in lower Galore Creek. No significant changes are expected to water quality during low-flow events in the winter.

In the case of inadequate dilution at the beginning of the discharge period (May), the impoundment has sufficient capacity for additional freshet storage of up to two months. As a result, the effluent discharge period would be compressed.

Effluent discharged during mid-May to mid-October of each year will alter the water quality in the receiving environment from baseline conditions.

The mineral gypsum ($CaSO_4$) is ubiquitous in the Galore Creek valley. Because gypsum is soluble, background levels of sulphate are elevated. During discharge periods the sulphate concentrations will increase from baseline, particularly during mid-May. The dramatic increase in mid-May reflects the beginning of the discharge period, at which time water quality in the tailings and waste rock impoundment will be at its worst and dilution is low. This decline in water quality is due to winter storage, at which time there will be contaminant loading to the tailings and waste rock impoundment with relatively little dilution (due to low winter flows). Also, peak freshet commences in late June. Therefore, the natural surface runoff flows in May, although relatively high, are lower than later in the discharge season. As previously discussed, discharge will be delayed up to two months if water quality does not meet permit levels.

Ammonia is the only nutrient that has baseline levels higher than guidelines. Similarly, ammonia is the nutrient that will have the largest loading to the tailings and waste rock impoundment. During the discharge period, ammonia levels will be elevated relative to baseline. The largest change from baseline is during May, the beginning of the discharge period.

The removal of total suspended solids from the tailings facility discharge will cause a dramatic drop in total suspended solids in the receiving environment relative to baseline. Total metal concentrations, which are largely particle-bound metals, will therefore also decrease in the Galore receiving environment. This holds true for many metals, including total copper, although there are exceptions such as total selenium. Model predictions of total copper show lower concentrations in the Galore receiving environment than at baseline from mid-May to August. However, at the end of the discharge period, levels are slightly elevated relative to baseline. Conversely, total selenium levels are elevated relative to baseline during the entire discharge period. This increase is due to the loading of dissolved selenium from project activities and also baseline levels of total selenium that is near the analytical detection limit. The greatest deviation in total selenium levels from baseline is during June.

Contrary to total metals, baseline levels of dissolved metals are greatest during the low-flow period. During the discharge period, all dissolved metals levels are above baseline levels, to varying degrees. Environmental effects monitoring during operations will monitor the temporal and spatial behaviour of all water quality variables.

The potential for impacts to aquatic life related to changes in receiving environment water quality were assessed using hazard quotients. Hazard quotients were not calculated from mid-October to mid-May because there will be no effluent discharge and thus no impact on water quality concentrations during this period.

Baseline levels of a number of water quality variables in the Galore and Skud are above water quality guidelines; this reflects the highly mineralized nature of the region. These results indicate that there is the potential for impacts to aquatic receptors in the existing receiving environment. However, benthic communities in the area apparently have adapted to high metal concentrations. Guidelines that were created to be protective for all waterbodies in Canada do not necessarily consider the specific environmental conditions of the aquatic ecosystems in Galore Creek and Scud River. Therefore, site-specific water quality objectives for specific contaminants of concern will be developed to provide relevant benchmarks for the long-term aquatic effects monitoring program.

There is potential for riparian vegetation and wildlife to uptake metals and other chemicals. Riparian vegetation in Galore Creek and Scud River, downstream of its confluence with Galore Creek, is sparse. The channel substrates of Galore Creek and Scud River are dominated by boulders with lesser amounts of sediment, to which there are no projected effects due to effluent discharge. A wildlife and vegetation survey at a metals-contaminated wetland at a Superfund site found a lack of population or community-level effects on terrestrial habitats at the site[4]. This finding coupled with the fact that effluent discharge, and therefore changes to water quality, will be periodic, terrestrial vegetation in the receiving environment should not be affected.

Upon mine development and operations, the Environmental Effects Monitoring Program will identify actual changes in water quality due to the Project and effects of such changes, if any. If the mine applies for Recognized Closed Mine status at closure, a modified Environmental Effects Monitoring Program will commence and extend into post-closure, until it can be determined that no effects to water quality are occurring. If the mine does not apply for Recognized Closed Mine status, then the Environmental Effects Monitoring Program is not modified from Schedule 5.

There are no water quality predictions downstream of the Scud-2 site. In the absence of this information, it has been conservatively estimated that effects could potentially extend as far as the confluence of Contact Creek (approximately 6 kilometres downstream of Scud-2). It has been calculated that Galore Creek flow comprises 0.3% of the Stikine River flow. Therefore, effluent release to Galore Creek is anticipated but it is not expected to significantly affect water quality in the Stikine River.

The likelihood of an overflow from the tailings and waste rock impoundment to the receiving environment will change over the lifetime of the mine, depending on the dam height at the time and pumping capacity. An overflow event could only happen during the high flows of summer months (June to August) or the fall. High water flows have been managed by engineering the dam to pass a Probable Maximum Flood event. Furthermore, the tailings and waste rock impoundment has the ability to store a 1-in-200 wet year until mid-July. To avoid uncontrolled discharge, the tailings and waste rock facility will be operated to optimize maximum storage volume as well as maintain lowest available water level in the impoundment.

In the event that water flow to the tailings and waste rock impoundment exceeds the discharge pumping capacity and an overspill event occurs, then the excess water would provide extra dilution such that water quality for dissolved metals would not be exceeded. Total suspended solids, however, would likely exceed the *Metal Mining Effluent Regulations* permit level of 15 mg/L because the suspended load will not have adequate settling time prior to discharge. Total suspended solids levels would be below baseline levels and there would be no effects to water quality due to elevated total suspended solids or solid-phase (particulate) total metals.

Filter Plant

[4] Pascoe, G.A., Blanchet, R.J. and Linder, G. 1996. Food Chain Analysis of Exposures and Risks to Wildlife at a Metals-Contaminated Wetland. *Archives of Environmental Contamination and Toxicology* 30, 306-318.

Concentrate slurry produced in the Galore Creek process plant will be sent to the filter plant, where the slurry will be dewatered. The excess liquid from the filtering unit will undergo water treatment to remove contaminants and render it suitable for discharge. Treatment will include flocculation, settling, fine filtering, removal of dissolved organics and adjustment of pH. The filtrate treatment solids (sludge) will be blended into the concentrate prior to shipment.

The site for the diffuser was chosen to protect more sensitive areas in which juvenile fish occur. In addition a straight reach was chosen to confine the broad unified plume to one side of the river until substantial dilutions are achieved. Surveys at winter low flow defined a low flow channel approximately 40 metres wide, indicating a maximum diffuser length (distance across stream) of 20 metres.

Baseline water quality values for some variables in the Iskut River exceed guidelines for the protection of aquatic life (i.e., Canadian Council of Ministers of the Environment and B.C. Water Quality Guidelines). The benthic communities at the Iskut monitoring site exhibited some of the highest levels of abundance and richness of all stream sites in the Project area. Also, the monitoring site had many Ephemeroptera, Plecoptera, Trichoptera (i.e., mayflies, stoneflies, caddisflies) and chironomids compared to most other sites, which indicates good water quality and adaptation of benthos to high metal concentrations. As with the Galore receiving environment, site-specific water quality objectives for specific contaminants of concern will need to be developed for the filter plant receiving environment to provide relevant benchmarks for the long-term aquatic effects monitoring program.

For annual average flow as well as the 7-day low flow scenario, there is potential for low-level effects to aquatic receptors due to changes in water quality from filter plant effluent discharge. Downstream of the diffuser the river flows through a narrow canyon where the water is turbulent. To be conservative, potential for effects during annual average flow conditions are projected to extend to 100 metres. The potential effects during the 7-day low flow scenario should not extend below the confluence of More Creek and Iskut River (approximately 6 kilometres downstream of the diffuser).

There is potential for riparian vegetation and wildlife to uptake metals and other chemicals. Impacts to riparian vegetation would be limited to the first 7 metres downstream of the diffuser. Considering the small scale of the potentially affected area, effects to vegetation and wildlife are not anticipated.

<u>Sewage</u>
Sewage has the potential to affect water quality through nutrient and phosphate loading. Sewage produced at the mine site, the construction camps and the filter plant will be treated in rotary biocontactors. The sewage waste disposal facilities will consist of a tile field for liquid effluent and a lined disposal site for sludges to undergo further decomposition. The tile fields will be located at least 100 metres from the nearest waterbody. Groundwater flow is the only pathway for sewage contaminant transport; therefore, sewage would biodegrade during its slow transfer from the tile field to any surface watercourses. Management of sewage in such a fashion will ensure good water quality upon intersecting surface water. There are no projected impacts related to the small construction-phase camps. However, the potential exists for nitrogen and phosphorus nutrient loading from sewage generated at the larger mine site operations camp. The Environmental Effects Monitoring Program will monitor cumulative nutrient loading from the mine site to the receiving environment. All flows from the mine site camp will drain into the tailings and waste rock impoundment.

<u>Seepages</u>

At mines, seepage from various mine components such as dams and berms could potentially be introduced into the receiving environment. The main dam at the tailings and waste rock impoundment is the only mine component located directly upstream of the receiving environment. The main dam will be constructed with a till core and a bituminous liner; therefore, seepage through the dam is predicted to be negligible. Seepage through the dam and via groundwater will be collected by the downstream surface recovery pond or by the groundwater wells and pumped back into the impoundment.

Spills

Pipeline ruptures due to geohazards are predicted to be 1% per year, or 18% over the life of the mine. A break in either pipeline has the potential to affect water quality, depending on the proximity of the leak to streams, lakes or wetlands.

Both pipelines will be engineered to minimize spills in the event of a breach. The diesel pipeline will have a leak detection monitoring system and shut-off valves. The slurry pipeline will have five pressure monitoring stations to detect leaks; the forecast emergency response time is 2 to 10 minutes. No shut-off valves will be provided on the concentrate pipeline because experience has shown that abrasive substrates, such as slurry, tend to generate leaks at these points. Upon detection of a leak, the slurry in the pipe section between the access tunnel and upper Sphaler Creek will drain to a 1,200 cubic metres storage tank near kilometre 115 of the access road, near the low point of the pipeline in the lower Sphaler Creek area. To maintain a constant flow of fluid in the pipe, process plant water will be pumped through the pipeline when the slurry flow ceases.

Stream crossings for the pipelines will be completed by directional drilling at four crossings, by site isolation and dewatering methods at 40 crossings, and by attachment to bridges at 19 crossings. Where the pipelines are attached to a bridge, the likelihood of pipeline rupture over a watercourse is low because the bridges are designed for 1 in 200 year and 1 in 100 year flood limits.

The dewatered concentrate from the filter plant will have a moisture content of 8 to 10% and a high specific gravity, and will be highly insoluble. Therefore, with the exception of a haul truck overturning into a stream or other waterbody (lake, wetland), the likelihood that spilled concentrate will enter a watercourse is very low. In the event concentrate were to enter a waterbody, the insoluble nature would aid in its recovery.

The aerodrome will be operational during the winter months, when the airplane wings may need to be de-iced. The de-icing will be done on a concrete apron equipped with a sump so that the fluid can be collected for recycling or treatment. These management measures will minimize the introduction of de-icing fluid into the fish-bearing Porcupine River. No regular fuelling of aircraft or scheduled maintenance will be performed at the aerodrome.

Surface Runoff and Siltation and Associated Water Chemistry Effects

Physical disturbance of the terrain will increase surface runoff of water in the Project area. This could accelerate local erosion rates and, if not managed properly, result in siltation that could deteriorate the water quality of the receiving environment. Landslides and debris along the road route could also generate siltation in the receiving watercourses.

With the exception of the transmission line, surface runoff and siltation could affect all areas of the Project during construction. The transmission line right-of-way will remain vegetated, and construction access will be via the access corridor or helicopter. Best management construction practices will be followed to ensure that proper sediment and water management plans (sedimentation ponds, silt fencing, drainage ditches) are implemented throughout the Project area. Environmental monitors will also be on site during construction to ensure watercourses are not affected.

During operation, siltation and surface runoff from facilities outside of the Galore Creek valley, such as the construction camps, filter plant, heliport in More valley and aerodrome will be minimal. These facilities will be constructed with appropriate mitigative structures to prevent erosion and siltation.

Mine Area and Receiving Environment - Because the tailings area will act as a settling pond, siltation in receiving waters resulting from the Project is predicted to be minimal during operations. The diversion channel will be designed with integral sediment management systems, and energy dissipation structures at the outflow will minimize scouring of the creek bed.

Access Corridor - During the access corridor feasibility study, terrain mapping was conducted to assess areas of high geohazard risk, i.e., avalanches or landslides. Landslides could potentially generate siltation in watercourses. The probability of such an event is low, and is therefore considered not to have significant effects on water quality.

2.4.3 Issues Raised and Proponent Response

During the Application review, the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team raised the following key issues related to potential effects on surface water quality and quantity.

- Potential water quality effects from ore stockpile runoff.

  The Proponent responded that no drainage is expected under winter conditions. The Proponent is interested in minimizing oxidation in the ore stockpile in order to maximize mineral recovery in the process plant. The Proponent will manage and monitor the ore stockpile during operations.

- Conduct ongoing monitoring on all ore and marginal ore stockpiles throughout the mine life and after closure to determine if contaminants are being released.

  The Proponent responded that during operations, drainage from the ore and marginal ore stockpiles will not flow into the receiving environment. It will be diverted to, and stored in, the tailings and waste rock storage facility. Water from the tailings and waste rock storage facility will be discharged according to a discharge schedule. Ongoing monitoring will confirm that water discharged meets water quality criteria as defined by *Metal Mining Effluent Regulations* and permit conditions. Once the mine is closed, the ore and marginal ore stockpiles will cease to exist as they will have been processed in the mill. There will be a contingency plan for any marginal ore that may not be processed.

- Drainage chemistry from ore stockpile.

  The Proponent commented that the ore grade material was included in the overall predictions for waste rock drainage chemistry. The volume of marginal ore is insignificant relative to the overall volume of waste rock. Stockpile drainage will be monitored on an ongoing basis.

- Further information was requested on the measures that would be undertaken to identify, handle and manage potentially acid generating rock encountered during road construction as there are many segments of high and extreme acid rock drainage potential rock within the Porcupine River drainage. A detailed assessment of the effectiveness of encapsulation of the strong potentially acid generating material exposed during road construction will be required by the Ministry of Energy, Mines and Petroleum Resources.

  The Proponent noted the Application presented a preliminary management plan for metal leaching/acid rock drainage materials generated during road construction. The Proponent undertook acid rock drainage sampling and geochemical testwork along the access road corridor the summer of 2006 and this report will be made available to government agencies and the Tahltan Central Council. The Ministry of Energy, Mines and Petroleum Resources noted that ongoing assessment and monitoring and mitigation options could be discussed during construction.

- Potential effects of drainage from the Scotsimpson tunnel on pit water drainage chemistry predictions.

  The Proponent has committed to developing a plan for managing tunnel drainage during the permitting stage.

- Likelihood of there being water of sufficient quality in storage facilities during low flow conditions.

  The Proponent indicated the assessment suggests that sufficient water will be available to supplement low flow downstream at the mouth of Galore Creek. If surface water flows are not sufficient, the Proponent will provide additional water such as pumping from groundwater wells.

- Hydrologic record is relatively short.

  The Proponent noted the stream flow data set will be updated through the lifetime of the mine as part of the Aquatic Effects Monitoring Program. With regard to high flow assessment, in 2006, the Proponent conducted a dendrochrology assessment of flood flow conditions on the Porcupine River.

- Total suspended solids exceedances of *Metal Mining Effluent Regulations* in the tailings impoundment discharge.

  If required, a floating thickener will be used. It allows the use of settling aids (flocculants) to enhance settling. During operations, the Proponent will update the modeling of quality of discharge waters at closure to ensure that appropriate management systems are in place for closure

- Further details related to the installation and operation of the filter plant location.

  The Proponent recognizes that during the permitting stage additional review and design is required to ensure that water quality requirements for discharges are met. Further details on the concentrate loadout facility will be provided by the Proponent during the permitting stage.

- Toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing.

  The Proponent indicated that toxicity testing at end-of-pipe and in the receiving waters of the Galore/Scud and Iskut watersheds will continue throughout the life of the mine to ensure downstream environments are not impacted by the discharged effluents from the Project. A post closure monitoring program will be developed in conjunction with regulators and the Tahltan Heritage Resource and Environmental Assessment Team.

- Modeling of predicted metal concentrations in sediment and water did not predict a measurable increase in metal concentrations downstream of the Scud River.

  The Proponent noted that tissue testing for heavy metals was conducted on fish from the mouth of the Scud River and monitoring in Galore Creek will continue as part of the requirements of the *Metal Mining Effluent Regulations* and provincial permits for the life of the mine and beyond. Effluent management practices will be adjusted if monitoring reveal elevated tissue metal concentrations at these near-source sites.

- Effects of increased flow on erosion and downstream morphology.

  The Proponent predicts that peak flow rates will be lower than baseline conditions during operation, closure and post closure due to the retention and/or attenuation of storm run-off within the storage facility. Hence, erosion rates in the channel downstream of the dam may be lower than baseline. However, as the dam will act to trap sediment from the headwaters of the Galore Creek, it is likely that over time the amount of bedload in the channel of the creek downstream of the dam will decease as sediment is transported out of the reach while less sediment is supplied to the reach from upstream. Despite the presence of the dam, fresh sediment will still enter Galore Creek from the diversion channel as well as the hillslopes and tributaries downstream of the main dam. Hence, although bedload is likely to decrease close to the dam site, it is thought that changes would not be obvious near the mouth of Galore Creek, due to these other sources of sediment. Such channel morphology changes are often seen downstream of large dams and reservoirs. The Proponent will monitor sediment transport in Galore Creek.

- Assess the implications of using a neutralization potential ratio of 1.3 rather than 2.

  The Proponent calculated the impact of changing the ratio to 1.3. The reduction in the tonnage of potentially acid generating rock was approximately 86 Mt. This corresponds to a reduction in volume of 43 Mm^3 in the tailings storage facility. This would result in an overall reduction of approximately 5 metres in the tailings dam crest elevation.

- Post-closure pit lake water quality.

  During the Application review, the Proponent submitted a report updating post closure pit and impoundment water quality. The report describes the oxidation of pit walls and resulting potential for copper and zinc to be released from the facility at levels exceeding provincial and federal guidelines. The Proponent is committed to maintain high alkalinity in the pit lake with the addition of lime and will develop a closure management plan. The Proponent has also committed to water treatment options for post closure, including, but not limited to, a water treatment plant, during the permitting stage.

2.4.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake a number of measures and commitments to mitigate potential effects on water quality and quantity including:

- mitigating acid rock drainage through subaqueous disposal of potentially acid generating rock in waste rock facility;
- storing metal leaching/acid rock drainage and process water in tailings facility with scheduled release subject to effluent quality and receiving environment flow monitoring;
- using a conservative neutralization potential ratio of 2 to segregate the potentially acid generating from not potentially acid generating waste rock for underwater disposal. Will continue to monitor to verify pre-mining conditions and update the operational management plan for waste rock, tailings, low grade ore and construction materials as more information is gained from the site. This document will be a living document with updates submitted to the Ministry of Energy, Mines and Petroleum Resources and Ministry of Environment for approval whenever significant changes occur;
- restricting the use of potentially acid generating rock for construction to areas that will be submerged behind the dam;
- assessing acid rock drainage potential during access road, diversion channel and tunnel construction and develop appropriate mitigation;
- continuing test work during operations to identify means to reduce the volume of waste rock requiring sub-aqueous disposal, thereby reducing the required impoundment size and dam height;
- submerge any remaining marginal ore stockpiles in the waste rock storage impoundment at closure;
- controlling total suspended solids at 15 mg/L during operations to meet federal *Metal Mining Effluent Regulations* for discharge. If required, a floating thickener will be used. It allows the use of settling aids (flocculants) to enhance settling;
- ensuring that discharge from the diffuser to the Iskut River meets federal *Metal Mining Effluent Regulations* criteria;
- assessing water treatment options for post closure, including, but not limited to, a water treatment plant, during the permitting stage;
- meeting or exceeding all water quality criteria established in permits to maintain water quality downstream; and,
- conducting further water quality modeling during operations to characterize pit and impoundment water quality after closure.

Other commitment and mitigation measures related to surface water quality and quantity are identified in Appendix F.

The Proponent has committed to surface water quantity and quality monitoring and follow-up (see section 4.2.5) to support or verify the predictions made on environmental effects.

2.4.5 Significance of Residual Effects

2.4.5.1 Water Quantity

Flow Pathways within Galore Creek valley will be substantially altered at the mine site by diversions and ground disturbances (including pits). Annual flow volumes, seasonal flow distributions, high flows and low flows will also be substantially altered due to the changes in flow pathways. Much of the Galore Creek valley will be submerged at the waste rock and tailings storage facility. This altered flow pathway cannot be mitigated. The residual adverse effect will occur during construction and operations. At closure, diversions will be decommissioned but pathways will still be altered from baseline conditions. This residual effect will continue far in the future (more than 100 years). The magnitude of the effect is high or predicted to differ from baseline conditions so that there will be a detectable change beyond the range of natural variation. It is anticipated that the altered flow pathways will be contained in the local area (this includes within Galore, More, Sphaler and Scotsimpson creeks, and Porcupine and Iskut rivers at the filter plant diffuser). The effect cannot be reversed.

The Proponent has suggested that as surface water in the Project area is not used as a resource in itself (e.g., a major source of drinking water), the river systems close to the mine site are not used for navigation, and there are no towns close to the mine site that could be affected by flooding, the changes to the local surface water hydrology (flow pathways, annual flow volumes, seasonal flow distributions, high flows and low flows) are considered not significant. This ranking does not refer to the impacts of changes to surface water hydrology on water quality or aquatic life. Effects of water quality and aquatic resources are addressed in section 2.4.2 and 2.7.

Annual Flow Volumes will be altered by: the groundwater de-watering wells around the pits (increase); water used in tailings slurry pipeline (decrease); inputs to the storage facility (decrease); consumption of potable water (decrease); vegetative clearing associated with the access corridor (increase), filter plant outfall discharges to the Iskut River (increase). The effect will occur during construction and operations, generally during the life of the Project. There will be longer term effects due to vegetation clearing and evaporation in the storage facility. The Proponent considered the effects to be neutral or that the effect creates conditions for other valued ecosystem components that are neither better or worse relative to baseline conditions. The magnitude of the change is considered low (varies by effect and location but is generally 2% or less of annual flow volumes). The geographic extent however is expected to be transboundary or to the mouth of the Stikine River. The component specific annual flow volume changes will be reversible over the life of the Project except for continued evaporation for the storage facility. The residual effects of the Project on the environment related to annual flow volumes are not considered to be significant.

Seasonal Flow Distributions will be altered during operations as a result of water flows from the mine site into the waste rock and tailings storage facility. On a landscape scale, at the mouth of Galore Creek and Scud River, and on a regional or transboundary scale at the mouth of the Stikine River, reduced winter flows and increased summer flows are expected due to storage of runoff behind the main dam in winter and discharge from the main dam in the summer. The adverse effect will be continuous for the life of the Project. The effect can be mitigated by pacing discharges to match the natural hydrograph. However, the Proponent has indicated that at the mouth of Galore Creek, there is the potential for 30% decrease in monthly winter flows and 20% increase in monthly summer flows under normal operating conditions and around 35% higher under compressed operating conditions. There would be a 10% decrease in winter flows in the Scud River. This is considered a moderate magnitude as it differs from the average value for baseline conditions and approaches the limits of natural variation. The effects on monthly flows are expected to be immeasurable in the Stikine River with a negligible effect. Seasonal flow distributions are expected to be reversible upon closure as the main dam will then discharge via the free overflow spillway.

Other activities that affect seasonal flow distributions include: blockage or breach of the main diversion channel, and vegetative clearing. Though there is a low probability of a blockage or breach of the diversion channel, this can result in reduced flows to the mouth of Galore Creek. Mitigation to be implemented by the Proponent (avalanche control and debris flow structures) will reduce but not eliminate the adverse effect. After mitigation, it is expected that blockage may occur and would affect flows over a short term (less than 1 week). Vegetative clearing during construction has the potential to change the timing of snowmelt and change in runoff response. Vegetative clearing effects would extend past the life of the mine but are reversible in the long term. Overall, the Proponent anticipates the residual effects of the Project on the environment related to seasonal flow distributions are not considered to be significant.

High Flows

High flow events have high probability of occurring periodically. During operations, storage in the facility is expected to retain runoff from most flood flow events. Post closure, the reservoir is to attenuate the peak of flood events. This could result in a reduction in peak flows at the mouth of Galore Creek. Routing through the diversion channel may impact the timing and magnitude of peak flows. Flows in excess of the capacity of the diversion channels will drain into the storage facility. Outfall from the filter plant discharge may also affect peak flows. There are also potential residual effects during construction along the access corridor due to the removal of vegetation, construction of compacted surfaces and stream crossings. Increased runoff from impacted areas and construction activities at the crossings may increase peak discharges during annual flood events with effects generally limited to small streams close to the access corridor and crossings. The effect on high flows during operations would be reversible upon closure. The magnitude of the mine site operational activities and access corridor construction activities on high flows is considered to be low or negligible. Overall, the Proponent anticipates the residual effects of the Project on the environment related to high flows are not considered to be significant.

Low Flows

There is a high probability of reduced or low flows downstream of the tailings and waste rock storage areas as there are no discharges from the facility during winter months. This periodic effect is reversible in the short term (life of the Project). The effect is predicted to be greater in the landscape study area than the regional or transboundary area. In the landscape area, annual flows and 7 day Q10 at the mouth of Galore Creek is predicted to decrease by around 30% during operations. Low flow at the mouth of the Scud River decreases by 4-13%. This effect is considered to be moderate as it approaches limits of natural variation. As with high flows, blockage of the main diversion channel during low flow periods may result in decreased flows at the mouth of Galore Creek. The effects of a blocked diversion channel on low flows would result in detectable change beyond the range of natural variation (high magnitude). The Proponent has indicated that after mitigation, there is a low likelihood of blockage occurring at the same time as extreme low flow conditions. Overall, the residual effects of the Project on the environment, excluding water quality and aquatic resources, related to low flows are not considered to be significant. Effects on water quality and aquatic resources are addressed separately in section 2.4.2 and 2.7.

2.4.4.2 Surface Water Quality

Contaminant loading can come from metal leaching and acid rock drainage; leaching of nitrogen residues from blasting, atmospheric deposition. Contaminants originating from project activities are a primary concern with respect to the water quality.

Metal leaching/acid rock drainage has the greatest potential to degrade water quality. This can arise from mining operations as well as construction of the diversion channel and operation of the access road/pipeline. Acid rock drainage is to be mitigated through subaqueous disposal of potentially acid generating rock in the waste rock storage facility. Tailings process water and water in contact with the waste rock, open pits, low-grade ore, access tunnel and the northern face of the tailings dam will be diverted to the tailings and waste rock impoundment.

Water quality in Galore Creek will be maintained through scheduled discharge from the tailings and waste rock impoundment with the releases subject to effluent quality monitoring. Given the mitigation proposed, no residual effects on water quality from metal leaching/acid rock drainage during mining operations is anticipated. There are anticipated residual effects from construction of the diversion channel with metal leaching/acid rock drainage from the diversion channel draining into Galore Creek.

There are also residual effects anticipated from metal leaching/acid rock drainage originating from high walls along the access corridor. The residual effects will be long term over the duration of the mine and extend within the local area (limited to the site of disturbance or localized section of watershed). The magnitude of effects can range from negligible to moderate. A moderate magnitude is a detectable and temporary change in water quality baseline conditions whereby changes temporarily generate the potential for moderate level effects on aquatic receptors (i.e. hazard quotients hazard quotient greater than 10). These residual effects are reversible in the long term. The Proponent has indicated that the probability of occurrence is unknown.

No residual effects (after mitigation) are anticipated for leaching of nitrogen residues from blasting and atmospheric deposition.

Discharges associated with the Project have the potential to alter receiving environment water quality, including effluent discharge from the tailings and waste rock impoundment and from the filter plant; sewage from operations and construction camps; seepage associated with the main dam and/or berms, spills of various substances, *i.e.,* fuel, slurry, concentrate.

Anticipated environmental effects from effluent discharge include: effluent discharges to Galore Creek from the tailings facility; uptake of metals and chemicals of potential concern by riparian vegetation related to effluent discharge; overflow of the tailings impoundment into Galore Creek; tailings dam failure, effluent discharge from the filter plant into the Iskut River. Both effluent discharge into Galore Creek and Iskut River have residual effects after mitigation. All other effluent discharges are either mitigated or has a low probability of occurring.

Effluent discharge from the tailings and waste rock impoundment in Galore Creek valley to the receiving environment has the potential for low magnitude effects within Galore Creek and a localized area of the Scud River. These effects are predicted not to reach the Stikine River. Effluent discharge from the filter plant to receiving environment has the potential for low magnitude impacts, restricted to a localized area of the Iskut River immediately downstream of the diffuser. These effects do not reach the Stikine River.

The Proponent's assessment indicates that no residual effects (after mitigation) are anticipated from sewage effluent from the construction and operation camps or from seepage from the tailings dam, berm or other structure.

There is the potential for degraded water quality from spills such as a rupture of the diesel or slurry pipeline and release to a stream, and airplane de-icing fluid seeping into Porcupine River. Pipeline spills has the potential for moderate magnitude impacts. The probability of occurrence is low and the effects are reversible. More information on spills can be found in the accidents and malfunctions section of this Report.

Surface runoff and siltation during construction, as well as introduction of sediments from land slides along the access corridor, has the potential to degrade water quality. It is anticipated that mitigation as outlined in the Erosion Control and Sediment Management Plan, together with having an environmental monitor present during construction will adequately mitigate effects.

2.4.6 Conclusion of Effects and Mitigation

During the review of the Application, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the Project on surface water quality and quantity; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects related to surface water quantity and quality.

2.5 GROUNDWATER

2.5.1 Background

2.5.1.1 Groundwater Quality

Groundwater samples were collected from four baseline wells in 2004 and from 10 additional wells installed during the 2005 program.

Parameters measured included physical aspects, nutrients, general ions, and dissolved and total trace metals. Values for pH ranged from 7.56 to 8.20, and electrical conductivities (EC) ranged between 141 and 2,290 µS/cm, reflecting a wide range of major ion concentrations. Groundwater samples were characterized by near-neutral pH, low EC (less than 700 µS/cm) and variable alkalinity (43 to about 142 mg/L). The range in alkalinity is due to the natural variation in carbonate content of aquifer materials.

In the upper Galore Creek valley (West Fork), where groundwater is derived from the vicinity of the proposed mine pits, the quality reflects the influence of mineralization. Some wells have high sulphate concentrations ranging from 664 mg/L to 1,429 mg/L, indicating intensive groundwater-rock interactions within the broken rock aquifer at these well locations.

Trace metal concentrations ranged widely in the Galore Creek valley groundwater. Trace metals such as beryllium, bismuth, lithium, mercury, phosphorus and silver had no detectable dissolved concentrations in most wells. Dissolved trace metals present in detectable but mostly very low concentrations included antimony, arsenic, boron, cadmium, chromium, cobalt, lead, molybdenum, nickel, thallium, tin, titanium, uranium, vanadium and zinc. Detectable levels of dissolved calcium, magnesium, potassium, sodium and strontium were below recommended drinking water maximums. Dissolved trace elements concentrations above B.C. drinking water standards were identified for aluminum (0.3 mg/L), iron (0.339 and 0.453 mg/L), manganese (0.45200 mg/L) and nickel (0.00149).

Total organic carbon concentrations in groundwater at the Galore Creek valley ranged from below detectable levels to 8.7 mg/L and averaged 1.19 mg/L. All groundwater wells recorded total organic carbon concentrations less than 2 mg/L with the exception of sampling site RES02-BR, which recorded the maximum concentration of 8.7 mg/L, possibly due to sediment contamination in the sample.

Nutrient, nitrite and phosphorus concentrations in Galore Creek groundwater appear to be fairly consistent across the mine area and with depth. Nitrite and phosphorus concentrations are consistent across the mine area. Nitrite concentrations ranged from below detection to 0.0127 mg/L, and phosphorus concentrations ranged from below detection to 0.76 mg/L. Nitrate and ammonia concentrations ranged from below detection to 0.457 mg/L for nitrate and from below detection to 0.0787 mg/L for ammonia.

2.5.1.2 Groundwater Quantity

Groundwater data were collected from 83 piezometers located at 46 sites within the Galore Creek valley.

The broken rock layer underlies the mixed sedimentary layer and is composed of fragmented, weathered and fractured rocks. Thickness is estimated to be between 150 metres and 200 metres. Groundwater flow in this layer represents the dominant groundwater regime.

The Galore Creek groundwater regime relevant to the mine area is considered to be represented by the zone between the stick rock layer and the ground surface, estimated to range between 200 and 250 metres in thickness. The mixed sedimentary layer caps the aquifer in more than one location depending on the thickness and degree of compaction of the glacial till, thus confining the groundwater within the fractured middle rock layer.

Recharge to groundwater contained in the mixed sedimentary layer is mainly from rainfall and surface runoff of glacier and snowmelt waters. Secondary sources for groundwater recharge may include subsurface flow from waterbodies within the Galore valley watershed. Recharge of groundwater from surface waterbodies may occur when groundwater elevations are below those of surface water in the creeks and rivers.

Overall recharge to groundwater within the Galore Creek watershed from all sources is estimated at 378 millimetres/year based on a calibrated MODFLOW groundwater model Precipitation varies with elevation and is approximately 2,761 millimetres/year (including glacier melt of ~100 millimetres/year) at high elevations within the Galore Creek watershed and is available for groundwater recharge. Based on this total and on the average calibrated recharge value of 378 millimetres/year, groundwater recharge is rendered as ~14% of the total input.

Current depth to groundwater in the vicinity of the mine site itself varies from 50 metres below ground surface to as high as 32 metres above. The potentiometric surface appears to reflect topography, suggesting hydraulic continuity within the water-bearing units across the site. In general, the groundwater potentiometric surface in the Galore Creek valley seems to be subdued and follows topography.

Surface and groundwater flows are inward from the surrounding hills toward the valley bottom along the West Fork, East Fork and main channel of Galore Creek. Lower Galore Creek represents the gateway for exiting surface and groundwater from the Galore basin toward the Scud River.

Local groundwater in the area of the proposed tailings impoundment (mid Galore) flows from the surrounding hills toward Galore Creek, while the regional flow remains directed toward the Scud River.

Groundwater flow is directed downward at 10 of the well sites but upward at 15 sites. Most of the wells with artesian conditions are located at lower elevations on the east and west banks of Galore Creek, and two are found in the upper and lower East Fork area.

2.5.2 Project Effects

Groundwater was selected as a valued ecosystem component because of its importance within the water cycle. Many mine components could have the potential of impacting groundwater quality and quantity in the absence of mitigative measures. The potential effects of mine components on groundwater elevations, aquifer storage and flow patterns as well as groundwater quality are discussed in this section.

Potential Effects and Evaluation

<u>Groundwater Quantity</u>
Groundwater Level and Aquifer Storage

The primary impact on groundwater levels and storage is expected to result from dewatering of the open pit areas, construction and operation of the tailings impoundment, construction of water control and routing structures and the access tunnel, and any additional abstraction of groundwater as a supplementary water source for usage during construction and operation.

Open Pit Dewatering:
Dewatering in the pit areas for pre-commencement of mining activities will lower the groundwater table in and around the pits. The planned abstraction rate of perimeter and in-pit dewatering wells of the open pits (Central, North Junction, Southwest and West Fork pits) during the construction phase is estimated at an average of 29,000 cubic metres per day. The pumping rate of groundwater during this phase could reach 50,000 cubic metres per day depending on the amount of in-pit seepage and the number of pumping wells activated. Part of the pumped water is planned to be used for processing (~23,000 cubic metres per day) and the remainder (~6,000 cubic metres per day) will be discharged in the tailings impoundment.

This abstracted daily amount is not significant compared to average aquifer area recharge estimated at 0.15 Mm3/day (based on 2.67 m average annual precipitation and catchment area of 145 square kilometres for the Galore Creek watershed.
At the end of the operation phase, the total maximum abstraction of groundwater from dewatering the open pits (not including additional production wells for use of groundwater as a resource) at the proposed average dewatering pumping rate of 29,000 m3/d is estimated to be ~212 Mm3. The proposed dewatering wells (109 in-pit and perimeter wells proposed) will produce a drawdown cone of depression with a radius of influence of approximately 1.5 kilometres. The drawdown radius of influence will cover an area of about 7 square kilometres. This area comprises loss of recharge to the aquifer of about 2.6 Mm3/year, which is included in

the dewatering volume. Recharge to the aquifer outside the perimeter of the radius of influence will continue unaffected.

Tailings Impoundment:
The tailings impoundment is expected to have complete hydraulic containment and will behave as a discharge and recharge zone to the Galore Creek valley aquifer. Discharge of groundwater will occur mainly from high elevation areas and hill slopes on the east and west into the impoundment. Recharge is expected to occur from the bottom of the impoundment to the groundwater system. The unmitigated groundwater seepage amount from below the impoundment is expected to be 74 L/s, as a best case estimate.

The upper bound groundwater seepage rate for the ultimate dam is 740 L/s. This scenario is plausible since the Broken Rock Layer beneath the tailings impoundment exhibits a high degree of weathering and fracturing. Estimated hydraulic conductivities (K) range from 1 x 10-7 m/s to 1 x 10-5 m/s with an average of 1 x 10-6 m/s. The thickness of the overburden, which would slow seepage from the tailings impoundment to groundwater, is highly variable beneath the impoundment structure. In the case where the seepage rate is 740 L/s, this requires pumping back 23.3 Mm3/year (or ~64000 m3/d) to the tailings impoundment. A significant amount in the Galore Creek watershed surface water budget (8% of 300 Mm3/y) will be managed through the tailings impoundment.

Site Runoff Diversion Channels and Access Tunnel:
Proposed construction of diversion channels and ditches as well as the construction of the access tunnel will have minimum impact on the groundwater quantity of the Galore Creek valley aquifer. The West and East Fork diversion channels will drain surface water and transfer it downstream of the proposed main dam discharging into Galore Creek. This change in the hydraulic system will cause the diversion channels to be a recharge source to groundwater in some areas and a discharge source in others. The recharge and discharge amounts are expected to be insignificant in terms of impacting groundwater quantity.

The Application indicates the construction of the access tunnel will yield an estimated 50 L/s of drainage water (based on assumed hydraulic conductivities for different bedrock units and depth of cover and fault zones), which will flow into the Galore Creek valley. This tunnel water will become part of the surface runoff and will be collected in the tailings impoundment, and thus become a recharge component to the groundwater. The estimated drainage rate from the tunnel amounts to 1.6 Mm3/year, which is not a major amount in the water budget of the Galore Creek watershed.

Changes to Groundwater Flow Patterns

Open Pits:
The proposed dewatering of the open pits during the construction and operation phases will lower the groundwater table within these pits considerably. The existing regional northward groundwater flow direction, originating from the south end of Galore Creek valley toward the Scud River, will not change with the dewatering conditions. However, steeper gradients will result from the large difference in head within the surrounding rocks and the head within the pits (~800 metres at sea level around the perimeter of the Central pit vs. ~275 metres at sea level at its bottom).

The proposed dewatering of the Central pit will lower the groundwater table within the pit to less than 275 metres at sea level toward the end of the operation phase. The existing regional groundwater flow direction originating from the western and southern boundaries will be interrupted with the dewatering conditions. The open pits are expected to behave as sinks to ground and surface water flows during dewatering. In the vicinity of the pit areas, local groundwater flow that would normally be oriented east and northeast toward Galore Creek is expected to be oriented toward the pit areas as result of the dewatering.

Concentrate Slurry and Diesel Fuel Pipelines:
Construction of the trench that will host the concentrate slurry and the diesel fuel pipelines, along the access road from Bob Quinn Lake to the Galore Creek valley, may influence groundwater flow patterns. This could occur if the backfill material used to cover the pipelines has higher hydraulic conductivity than the surrounding sediment or rock. In this case, the trench becomes a preferential path for water flow. Surface and ground waters seeping into the trench structure may flow and discharge at low elevation points at various locations along the access road.

Environmental impacts on groundwater quantity after cessation of mining activities are expected to be mainly from the operation of the tailings impoundment and the capture wells downstream of the dam. The impact of capture wells downstream of the tailings impoundment on groundwater quantity may be of significance if the seepage rates below the dam, and hence, the pumping rate of the capture wells, approach the upper limit bounds of the ultimate dam. However, with construction and installation of a grout curtain beneath the dam, seepage rates could be managed effectively through the capture well-pump back system.

Environmental Impacts during Closure and Post-Closure

Tailings Impoundment Seepage:
Potential seepage through the structure of the dams is designed to be low by use of low permeability till core and liners (bituminous and geotextile on the upstream face of the dam). Below the dam seepage originating from the tailings impoundment could impact groundwater quantity. It is anticipated that a secondary seepage recovery dam and a pump back station, to be installed prior to commencement of tailings placement in the tailings impoundment, is able to capture below dam seepage and return it to the impoundment. The seepage collection and pump back system is expected to interrupt a large amount of groundwater flow that would normally flow to the Scud River. Installation of a grout curtain beneath the till core of the dam is expected to reduce seepage rates by 66-72%, resulting in better management of seepage amounts ranging between 6.4 and 7.8 Mm3/year instead of the unmitigated amount of 23.3 Mm3/year.

Although loss of hydraulic containment is not anticipated through the ridges closest to the main tailings dam, higher than expected seepage rates may result if the overburden on the left abutment has higher than estimated hydraulic conductivity. Further evaluation of the hydraulic conductivity properties of the overburden of the left abutment of the tailings dam will be conducted.

<u>Groundwater Quality</u>
The construction of many of the Galore Creek mine facilities will involve blasting and stripping of the top overburden layer which could potentially expose faults and weathered rock areas within the Galore Creek valley as well as along the access road and around the aerodrome and filter plant areas. Faults and weathered rock areas represent direct travel paths of potential contaminants to aquifers.

Blasting and Use of Explosives
Chemicals, such as ammonium/ammonia and nitrate, from explosives used in the open pits, tunnel and access road construction are a potential source of contamination to groundwater. All surface and groundwater flow from the pit areas will be directed into the tailings impoundment so it is expected that most contaminated water will be captured and diluted to low concentrations in the tailings impoundment.

Metal Leaching/Acid Rock Drainage
The short term exposure of potentially acid generating rocks during the construction phase of the Project may generate a small amount of acid rock drainage and metal leaching. Over the construction phase period, any leached metals have the potential to enter the groundwater system; however, given the small area of rock exposure during the construction phase, the amount of leached metal is not expected to be significant.

Dissolved metal concentrations in the supernatant of the tailings in the tailings impoundment (tailings pore water) are not expected to be high. Furthermore, since this water will be pumped over the dam to supplement the flow in Galore Creek, the supernatant water will have to meet surface water criteria/guidelines for aquatic life. Total metal concentrations in tailings solids are expected to be high as result of metal adsorption to surfaces of solids and actual composition of the solid phase. Since the pH of the tailings is expected to be around eight, potential mobility of trace metals is expected to be low.

Tailing Impoundment Seepage
Seepage of water from the tailings impoundment to the groundwater regime is expected. The potential of groundwater contamination from the tailings impoundment is an issue if seepage below the impoundment dam carries contaminants and the flow is not captured before it is discharged into Galore Creek or the Scud River. Seepage below the dam may reach the limestone formations immediately downstream of the impoundment dam, and eventually be transported to the Scud River.

Of the three fault systems in the tailings impoundment area, the main and limestone faults may represent potential preferential flow paths for groundwater below and downstream of the tailings dam.

Fluids: Effluents, Oils, Solvents and Fuels
During construction and operation of the Project, many of the mine facilities will be storing, consuming and releasing oils, solvents, fuels and effluents. In mine facilities such as the ammonium nitrate fuel oil, storage site, leakage of ammonium nitrate salt, which is very soluble in water may take place. Aerodromes, which will have airplane maintenance warehouses, may generate leaks and spills of solvents, fuels, and de-icing compounds. However, these facilities will have containment structures for spills and leaks as well as proper collection and disposal systems where none of the fluids and effluents will enter the groundwater system. At present, the groundwater aquifers beneath facilities located within the Galore Creek watershed are not characterized which renders the extent and magnitude of the potential environmental impact unknown. The Proponent has committed to install additional groundwater monitoring wells at mine components locations outside of the Galore Creek valley.

2.5.3 Issues Raised and Proponent Response
During the Application review, the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team raised several key issues as follows:

- Clarification was sought on the main tailings dam seepage assessment, post closure groundwater regime and hydraulic conductivity values.

  In response to these comments, the Proponent provided further information in a report entitled "Memo from L. Wilchek, J. Brash and I. Bruce, Galore Creek – Tailings Dam Geologic Conditions Update" dated November 14, 2006. This report provided further information on the characterization of the main dam geology and borrows materials and the foundation conditions for various earthwork structures (i.e., East Fork and West Fork Diversion dams, Central pit seepage control structure, waste dumps and primary cofferdam), the plant site and filter plant. It also provided information on subsurface conditions along the diversion channels and at the Bear and Friendly crossings. This information helped address the comments.

- Additional numerical modeling, using different downhill boundary conditions, was requested for the diversion channel seepage assessment. This was done by the proponent thereby resolving the comment.

- It was pointed out that the proponent's use of a 2D numerical model to assess seepage from the tailings impoundment is inappropriate for convergent groundwater flow systems and may lead to large predictive errors. The proponent was asked to perform a 3D numerical analysis of seepage from the impoundment.

  In response to this comment, the proponent has committed to perform the requested modeling during the permitting phase of the project and to submit a report of results to government agencies for technical review.

- The proponent was asked to modify the existing 3D regional-scale numerical model so as to reflect the presence of the tailings impoundment, and thereby to properly characterize residual project effects on the groundwater flow regime and hydrology of the Galore Creek watershed during the post-closure period.

  In response to this comment, the proponent has committed to perform the requested modeling during the permitting phase of the project and to submit a report of results to government agencies for technical review.

- It was suggested that a compacted clay liner and double synthetic liner be used to fully contain tailings inside the impoundment.

  The Proponent noted as a contingency, in case seepage water quality is poorer than predicted, a seepage collection and pump back system has been designed and will be installed immediately downstream of the dam. This response addressed the comment.

- Contingency planning for dealing with nitrate-based compounds in surface or groundwater.

  The Proponent has committed to address potential ammonia leakage from the explosives manufacturing facility through mitigation measures. These measures include non-corrosive storage silos, an impermeable apron and a spill management plan.

2.5.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following measures and commitments to mitigate potential groundwater effects:

- Install groundwater wells downstream of the main dam to intercept any seepage exceeding effluent permit limits;
- undertake groundwater monitoring in the Galore Creek watershed;
- use capture wells north of the tailings impoundment for groundwater quality monitoring. Groundwater wells for mine components outside of Galore Creek valley such as the aerodrome site, camps and the filter plant, will be established to characterize the aquifer(s) underneath these sites and monitor groundwater quality as part of the monitoring program. The number and location of the monitoring wells will be decided during the permitting stage;
- construct and install a grout curtain directly below the core of the main dam;
- develop a tailings beach to reduce the driving force of seepage through the eastern and western ridges as well as the main dam during operation;
- monitor groundwater levels and quality in existing and new groundwater monitoring wells along and downstream of the ridgelines;
- evaluate the status of the foundation below the starter dam during its construction;
- modify the current 3D MODFLOW regional model used for pit dewatering predictions to represent long-term post-closure conditions in the groundwater flow system during the permitting stage;
- perform a 3D numerical analysis to predict seepage from the Galore Creek impoundment;
- modeling to address potential ammonia leakage from the explosives manufacturing facility through mitigation measures. These measures include non-corrosive storage silos, an impermeable apron and a spill management plan; and
- in the event of a spill, install additional monitoring wells for the purpose of monitoring any groundwater plume and to evaluate its potential to impact drinking water sources.

The Proponent has committed to groundwater monitoring and follow-up (see section 4.2.5 of this Report) to support or verify the predictions made on environmental effects.

2.5.5 Significance of Residual Effects

Groundwater level and aquifer storage

A number of mine activities can contribute to a change in groundwater level and aquifer storage including: pit dewatering, flooded pits, seepage from the tailings pond, and construction of the diversion channels and access tunnel. Pit dewatering and the associated lowering of the groundwater table and decrease of net groundwater amount in the aquifer will occur during the construction and operation phase. It is expected that the system will revert to natural conditions once pumping stops. Groundwater recharge is expected from seepage from the tailings impoundment with the associated increase of the net groundwater in the aquifer. Seepage is to be mitigated by the construction of a grout curtain underneath the dam. Groundwater recharge is expected from the site runoff diversion channels and access tunnel. Some discharge may occur also from the diversion channels. The overall magnitude of the changes to groundwater levels is expected to be generally moderate where ground water levels will differ from the average value for baseline conditions and will approach the limits of natural variation. The magnitude of effects to the aquifer storage is expected to be low. The impact from the dewatering of the pits will be restricted to the mine footprint. Outside of the pit area there will be minimal changes to the groundwater levels and aquifer storage. No significant residual effects on groundwater level and aquifer storage are expected by the Proponent.

Change to Groundwater Flow Patterns
A change in groundwater flow patterns around the pit areas is not expected to impact the regional groundwater flow direction towards Galore Creek and the Scud River. A change to groundwater flow due to construction of the trench for the pipelines can alter the recharge patterns to aquifers and streams downgradient of the access road. This situation can be avoided during the construction of the pipeline trench by use of backfill material with hydraulic conductivity similar to the native sediment. Changes to flow patterns are expected to be moderate due to pit dewatering and seepage from the tailing impoundment area with minor changes outside of the mine footprint. No significant residual effects on groundwater flow patterns are expected.

Groundwater Quality
Groundwater quality can be affected by a number of activities including: blasting in open pits; metal leaching below the dam from tailings impoundment; acid rock drainage from the open pit, tailings and waste rock; spills and leaks from the concentrate slurry; fluid spills and leaks; surface runoff; berm seepage, discharge of treated sewage. Expected residual effects are from uncaptured or untreated contaminants, specifically from metal leaching, acid rock drainage, concentrate slurry and effluents.

The least predictable and potentially important residual impact is the possible mobilization of metals from the submerged waste potentially acid generating rocks and tailings solids pore water components of the tailings in the impoundment. At this time, alkaline conditions are projected in the tailings mass, which will lower metal ion mobility. Therefore, metals mobilization is expected to be minimal.

The tailings impoundment will have seepage collection dams as well as a pump back seepage recovery system to collect any losses from the impoundment for re-circulation into the tailings impoundment. With installation and operation of the pump back system that will collect and return higher than permitted seepages below the dam to the tailing impoundment, no significant residual effects on groundwater quality are expected by the Proponent.

2.5.6 Conclusion of Effects and Mitigation
During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the Project; on groundwater quality and quantity; and responses from the Proponent.

Based on the information in this Joint Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on groundwater.

2.6 SEDIMENT QUALITY

2.6.1 Background

In general, metal concentrations in the sediments of most watersheds in the Project area were found to be elevated, a result also observed in water quality, reflecting the high level of mineralization in the region. Many metals, including arsenic, cadmium, chromium, copper, iron, nickel and zinc, naturally exceeded federal or provincial guidelines at many of the sampling sites. Concentrations of several other metals, including antimony, bismuth, selenium, silver, thallium and tin, were generally below the analytical detection limits at most sites. Cyanides were not detected in streams or rivers, but were present in a few wetlands and lakes.

Considerable variability in sediment characteristics was demonstrated at three stream reference sites, four reference lakes and four reference wetlands, which encompassed the range of variability seen at potentially exposed sites.

FILTER PLANT AND ACCESS CORRIDOR

Total organic carbon concentrations were low in all streams except for one area in More Creek. Phosphate concentrations were generally low in all streams except for Scotsimpson Creek, which had slightly elevated levels. Total nitrogen values were low or below detection limits in all streams.

Federal and provincial guidelines for arsenic, chromium, copper, iron, nickel were exceeded in all access corridor watersheds except Scotsimpson Creek. Areas along the Iskut River showed the highest arsenic, chromium and nickel concentrations of all sampled watersheds, although some Iskut sites had relatively low metal concentrations. Upstream sites in the Iskut River had the highest mercury concentrations of all sampled watersheds in the Project area. Copper concentrations were generally lower along the access corridor, including Scotsimpson Creek, compared to those in Galore Creek. Cadmium guidelines were exceeded in some areas of Sphaler Creek, similar to Galore Creek, but concentrations were lower elsewhere along the access corridor. Chromium and nickel concentrations were higher along the access corridor than in the Galore and Scotsimpson watersheds. Iron was high throughout the streams in the access corridor. Aluminum concentrations were highest at Iskut and Scotsimpson stream sites. Cyanides were not detected in any stream sites along the access corridor.

Total organic carbon was not detected in most wetlands except in the Porcupine watershed, where concentrations were variable. Total organic carbon was present in lakes and was found at particularly high concentrations in lakes of the Iskut watershed, which are surrounded by forest. Nutrients concentrations were also higher in lakes, particularly those of the Iskut watershed, than in wetlands.

With regard to wetland sediment quality, the highest concentrations of seven metals – arsenic, cadmium, chromium, copper, lead, nickel and zinc – were found in the Porcupine watershed, often exceeding guidelines. Mercury exceeded federal and provincial guidelines in lakes and wetlands of the Iskut area.

With the exception of copper, which was most elevated in the Sphaler valley, the highest metal concentrations within lakes along the access corridor were observed in the upper More Creek area. Aluminum concentrations were highest in lakes and wetlands in the Porcupine and upper More watersheds, and iron was three to four times higher in wetlands of the More valley than in other watersheds. Molybdenum was highest in lakes of the Sphaler and Porcupine watersheds and lowest in wetlands of the Iskut and More watersheds. Selenium was not detected in any wetland or lake. Cyanide was detected in sediment from only isolated patches within five wetlands and lakes along the access corridor.

AERODROME
Sediment in the Porcupine River is composed mainly of sand and exceeded five metal guidelines (arsenic, chromium, copper, iron and nickel). Compared to the More and Iskut sites, the lake and wetlands in the Porcupine valley had the highest levels of total organic carbon, silt and metals, which exceeded guidelines. Cyanides were detected in low concentration at the one lake sampled in the Porcupine valley.

MINE AREA
Total organic carbon values were very low or below detection limits in sediments from the Galore, Scud and reference watersheds. Sand was the predominant substrate in all these areas, and small amounts of silt were present, reflecting the high water velocities in these streams. Nutrient loadings in the streams of the receiving environment were very low, based on total available phosphate and total nitrogen concentrations. Reference sites had slightly higher phosphate concentrations.

Galore Creek has the highest copper concentrations in sediment relative to all other watersheds and exceeded guidelines at all sites. A spatial trend of copper concentrations increasing downstream in Galore Creek was noted and was attributed to the downstream flushing of eroded copper-bound particulates from exposed rock and stream banks. Lead concentrations in the Galore watershed stream sediments were three to ten times higher than all other watersheds, with some samples in upper Galore Creek exceeding the Lowest Effect Level derived from the B.C. Compendium of Working Guidelines, 2006 Edition, and Canadian Council of Ministers of Environment interim guidelines. Mercury concentration in stream sediments was lowest in the Galore and Scud rivers, intermediate in the Stikine and Iskut rivers and highest along the access corridor and aerodrome areas (though guidelines were not exceeded). Molybdenum was slightly elevated in Galore and Sphaler streams compared to other areas. Chromium and nickel levels were lowest in the Galore watershed. The Scud River, of which the Galore Creek is a tributary, had lower arsenic, cadmium, copper, lead, iron and zinc concentrations relative to the Galore watershed, but higher levels of nickel and the highest chromium levels of all watersheds.

STIKINE RIVER
Sediment was composed mainly of sand at all sample sites, with higher percentages of silt at sites on side channels where water velocities were lower. Total organic carbon concentrations at the Stikine sites closely matched those of the Iskut River, the only other river of similar magnitude in the Project area. Low concentrations of both available phosphate and total nitrogen were observed at Stikine River sites, similar to nutrient values in other studied watersheds. Concentrations of chromium, copper, iron and nickel exceeded sediment quality guidelines, as seen in all other watersheds.

2.6.2 Project Effects

Sediment quality is a valued ecosystem component because of its relationship with water quality and its importance to various groups of aquatic life such as periphyton, macrophytes, benthic invertebrates and fish. Sediment particles and pore water within sediment can interact with river or lake water to act as sinks for various contaminants, releasing them back into the aquatic environment under changing environmental conditions. Sediment quality studies are also part of the federal *Metal Mining Effluent Regulations* program. Key issues include effects of siltation and water chemistry as well as physical and chemical changes to sediment quality.

Potential Effects and Evaluation
For the assessment of sediment quality, discharges refer to any controlled or accidental release of materials (liquid or solid) into the environment. These discharges include:

- scheduled release of effluent from the tailings storage facility or the filter plant;
- release of diversion channel waters;
- accidental release of effluent or diversion waters due to avalanche or dam failure;
- spills at the mine site (fuels, ammonium nitrate and fuel oil, and process chemicals including potassium amyl xanthate, methyl isobutyl carbinol and lime);
- spills at the Porcupine aerodrome and More heliport (fuel, de-icing fluid);
- spills at the filter plant (concentrate, surfactants, flocculants, acids); and,
- spills along the access corridor (concentrate or diesel fuel).

The effect of spills and accidental releases are also addressed in section 3.2 (Accidents and Malfunctions) of this Report.

Discharges into the aquatic environment have the potential to reduce sediment quality through the introduction of contaminated materials. This includes deposition of liquids or particulates containing chemicals of concern (e.g., total and dissolved metals, anions) from the Project area. Indirect metal loading from suspended solids is also possible, based on the transfer of metals from effluent receiving waters to the sediment layer. There is also the potential for sewage waste to affect nutrient and organic loading to sediment in receiving environment.

The primary source of potential impacts to sediment quality in Galore Creek and further downstream in the Scud River is the discharge of mine tailings effluent during operations.

Potential impacts to sediment quality are also associated with the discharge of filter plant concentrate effluent, as well as accidents related to spills of fuel, ore concentrate, or filter plant chemicals (surfactants, flocculants, acids). There is also a potential for metal leaching/acid rock drainage from cut rock along the access corridor.

Controlled Discharge

Effluent from the tailings pond will be comprised of water (containing various chemicals and metals) as well as unsettled tailings fines. In order to assess potential changes to sediment quality caused by effluent discharge from the tailings facility, several effects pathways were assessed. These include direct loading of particulate-bound metals, as well as precipitation or adsorption of metals from the water column into streambed sediment.

The discharge schedule was designed to have adequate dilution of effluent with the diversion channel flows. The tailings impoundment will act as a settling pond so that total suspended solids in the effluent can conform to levels in the *Metal Mining Effluent Regulations*.

The potential effects to sediment quality from dewatering of ore concentrate at the filter plant are predicted in the first seven metres downstream of the diffuser. Metal loadings to sediment will be minor considering the small increase in water concentrations of metals and the naturally high metal concentrations already present in Iskut River sediment.

The concentrate will be covered and transported by truck to Stewart. No significant effects to sediment quality are associated with the transportation of the concentrate.
Sewage from camps at the filter plant, More Creek heliport and from the aerodrome will be treated for solids separation and sewage effluent will be deposited within a tile field situated 100 metres away from nearby waterbodies. No impact to sediment quality is predicted from sewage effluent and treatment.

<u>Accidental Discharge</u>
No accidental events were predicted to cause significant changes to sediment quality.
There is low likelihood of major leaks or seepage events and these events are not related to effects to sediment quality.

In the case of a dam breach at the tailings facility, large volumes of total suspended solids and metal-enriched effluent would be released downstream in Galore Creek and Scud River. This would result in significant degradation of sediment quality. This effect could be expected to extend quite far down the Scud River, and, depending on particulate settling rates and season, could impact sediment quality of the Stikine River. Effects would be more serious and longer lasting in Galore Creek and Scud River than in the Stikine River.

With the potential progression of global warming, glacial melt in the upper Galore Creek valley will be expected to increase over the next hundred years, contributing significant amounts of meltwater, which will flow into either the tailings facility or the diversion channel for release to Galore Creek. These increased volumes, as well as periods of high precipitation and avalanche events within the valley, could result in a tailings overspill event, leading to unscheduled discharges into the lower Galore Creek valley. An overspill event could result in increased metal loadings to the Galore Creek and the Scud River. The geographic extent of significant degradation to sediment quality would probably be confined to the upper portions of the Scud River, but this would be proportional to spilled volume and the time of year in which the accident occurred. The likelihood of such occurrences is judged by the Proponent to be of very low probability, since the dam height will be based on containment of a 1-in-100 storm event.

In summary, accidental discharges from the mine area are predicted to have little or no impact to sediment quality in the Galore and Scud watersheds, due to reduced loadings of most metals based on permitted discharge of total suspended solids, and the low potential for transfer and accumulation of metals in sediment from dissolved metals in the water column. No effects to sediment quality are predicted in the Stikine River and its estuary, related to the lack of increased metal loadings from the Project area. The Aquatic Effects Monitoring Plan includes sediment quality sampling in Galore Creek and Scud River, and will be applied using adaptive management to respond to any future monitoring requirements or changes to sediment quality in receiving environments.

In the event of a diesel pipeline rupture, significant amounts of fuel may be released into the environment, and, if this occurred near a waterbody, significant degradation of sediment quality will occur, particularly in wetland or lakes which have minimal flows and significantly more sediment to absorb contaminants than local streams. Spills associated with streams may also degrade sediment quality, depending on where the rupture occurred.

The rupture of the concentrate pipeline along the Sphaler-Porcupine section of the access corridor will result in only minimal release of concentrate to the environment. This is because the pipeline will drain downhill to the sump system at the Porcupine. A concentrate pipeline rupture in the More Creek watershed will result in a similar effect, with concentrate being drained downhill to the filter plant.

The use of road salts as dust suppressants along the access road could lead to increased ionic concentrations in nearby waterbodies. However, these would be dissolved constituents, transported downstream and having no impact on sediment quality.

Impacts to sediment quality related to discharges at the More Creek heliport and the aerodrome are limited to spills of either fuel or de-icing fluid to the surrounding ground. The use of an impermeable apron for fuelling, and the application of the spill prevention and emergency response to manage any spills will minimize this pathway to the sediment of More Creek and local lakes and wetlands and contain spills in localized areas. No significant impact to sediment quality related to accidental chemical discharges is predicted.

Siltation

During construction of mine infrastructure, there is potential for increased total suspended solid loading to lower Galore Creek due to terrain disturbance and erosion. This is partially dependent on precipitation events relating to increases in erosion and transport of soil into waterbodies.

It is expected that there will be significant total suspended solid loads in silt settling ponds, due to the relatively high proportion of clays in the rock of Galore Creek valley. Depending on settling rates for particles, retention of water within settling ponds may be extended until water is clear enough for discharge.

Blasting will result in aerial deposition of particulates to nearby streams, but local surface waters will be diverted to settling ponds or the tailings facility in order to reduce total suspended solid to permit limits.

During construction, some increases in total suspended solid concentrations to lower Galore Creek may occur, depending on the efficacy of sediment settling ponds and precipitation rates which propagate siltation. However, these values will remain within the range of baseline conditions.

No major changes to sediment quality in the Galore or Scud rivers are anticipated from siltation during operations. This is because total suspended solids will be reduced (to a maximum of 15 mg/L based on *Metal Mining Effluent Regulations*) relative to background concentrations, which can exceed 500 mg/L during freshet.

Activities associated with the construction of the access road, pipelines and transmission line will not have significant adverse effects on sediment quality.

During construction and operation, haul road traffic will be a regular source of airborne dust to local waterbodies along the access corridor. To mitigate effects, the road will be built away from wetlands and ponds to minimize dust inputs, traffic speeds will be enforced, and water and road salts will be used as dust suppressants during dry summer periods. The implementation of diesel fuel and ore concentrate pipelines in the mine plan results in a large reduction in vehicle traffic along the access road.

During construction of the aerodrome, minor inputs of silt to the Porcupine River are expected. These will be minimized based on the location of the airstrip, and sediment/erosion control measures. The substrate of the floodplain area where the airstrip is situated is composed of gravel, cobble and sand, and natural total suspended solid concentrations are fairly high in the Porcupine River. Construction of the airstrip access road and bridge across the river will involve some disturbance of localized areas in order to place pilings. Silt curtains will act to minimize the siltation of the downstream environment. Air and ground traffic will contribute to dust being blown into waterbodies downwind, but effects to sediment quality will be negligible.

2.6.3 Issues Raised and Proponent Response

During the Application review, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team noted the effects of increased flow on changes in erosion and channel morphology downstream of the main dam had not been addressed. The Proponent responded that quantitative predictions of bedload transport rates and sediment supply in mountain watersheds are difficult and open to large uncertainties. The Proponent has committed to monitor sediment transport in Galore Creek during operations.

2.6.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following measures and commitments to mitigate potential impacts to sediment quality:

- developing and implementing Sediment and Erosion Plans and will monitor sediment transport in Galore Creek during construction and operations;
- developing detailed monitoring and management plans for areas of higher risk for erosion and sediment generation;
- regular monitoring of ditches, channels and spillways associated with site water management during the early spring and early fall periods before peak snowmelt and fall rain;
- undertaking best management practices to reduce potential downstream sediment loadings such as maximizing diversion of clean waters around areas of potential disturbance, establishing buffer zones around disturbed areas for natural filtering of surface runoff waters en route to watercourses, and intercepting sources of potential sediment-laden waters as close to source of erosion as possible and use runoff control and conveyance measures to move these waters to a receiving waterbody;
- employing environmental monitors during construction of the access road mine site facilities and transmission line;

- monitoring the receiving environment and employing adaptive management if effects are identified;
- lining the bottom of diversion channel to reduce leaching;
- keeping sewage treatment well away from waterbodies;
- capturing groundwater transport of Galore sewage effluent in tailings pond;
- applying erosion control measures and Best Management Practices;
- controlling total suspended solids at 15mg/L during operations to meet federal Metal Mining Effluent Regulations for discharge;
- lining base of diversion channel with membrane; and,
- revegetating slopes, apply water management practices and reclaim at closure.

The Proponent has committed to sediment quality monitoring and follow-up (see section 4.2.5 of this Report) to support or verify the predictions made on environmental effects.

2.6.5 Significance of Residual Effects

See also section 3.2 of this Report related to the evaluation the environmental effects of accidents and malfunctions.

Potentially serious adverse effects on sediment quality relating to catastrophic failures involving the tailings dam (breach or overspill events), pipeline ruptures, or filter plant accidents were all assigned a very low probability of occurrence. Best management practices and monitoring of structures and water quality of discharges by trained personnel will mitigate potential impacts.

Any fuel or ore concentrate spill will be assessed and clean-up will be conducted to either contain or remove contaminated materials and reduce or eliminate impacts to local sediment quality. The low likelihood of a pipeline rupture and the low magnitude of effect indicate that no significant residual adverse effects to sediment quality are predicted for this issue.

The occurrence of landslides has a higher probability of occurrence and associated risks will be managed by proper road design, monitoring and routing. This includes adequate water management and slope stabilization measures, which will reduce the potential for catastrophic erosion events. A landslide would be limited in geographic extent to a localized area and therefore residual impacts to regional sediment quality would not be significant.

Regarding scheduled activities, the discharge of tailings effluent and filter plant effluent are both judged to have negligible potential for impacts to downstream sediment quality, based on best available scientific data on predicted water quality of effluents. Finally, construction activities will require the monitoring and management of surface waters to safeguard against any increased loadings of total suspended solids to the downstream environment. Natural background total suspended solids levels are fairly high (up to 500 mg/L in lower Galore during freshet).

During construction, some increases in total suspended solids concentrations to lower Galore Creek may occur, depending on the efficacy of sediment settling ponds and precipitation rates which propagate siltation. However, these values will remain within the range of baseline conditions, and will not result in significant effects to sediment quality.

2.6.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the Project on sediment quality; and responses from the Proponent.

Based on the information in this Joint Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on sediment quality.

2.7 AQUATIC RESOURCES

2.7.1 Background

For the purpose of this Report, aquatic resources include benthic invertebrates, periphyton and phytoplankton.

Primary and secondary producers within the Galore Creek receiving environment were studied at 19 stream and river sites. Sites at 17 lakes and 19 wetlands situated along the access corridor, aerodrome and filter plant were also studied. The studies included three river, four lake and four wetland reference sites. Aquatic resources were also surveyed at sites along the Stikine River, which receives water from all the watersheds associated with project activities.

Primary producers included periphyton in streams and wetlands and phytoplankton in lakes and some wetlands. Primary productivity based on phytoplankton communities was assessed in lakes along the access corridor. Secondary producers included benthic invertebrates in streams, wetlands and lakes and zooplankton communities in lakes.

Primary Producers

Owing to the high degree of sediment scouring in the fast-flowing streams of the area, periphyton was rarely seen at stream and river sites. Genus richness among sites ranged from 10 to 47 genera, with significant variation between years related to the patchy nature of the periphyton. All major phyla were represented throughout the stream sites sampled. The reference site, Ball Creek, an upstream tributary of the Iskut River, supported mainly golden algae (Chrysophyta), whereas sites along the access corridor were dominated by green algae (Chlorophyta). Poor habitat conditions such as the lack of suitable substrates and low nutrient concentrations limit the colonization and development of periphyton at many sites in these high-gradient mountain streams.

Wetlands of lower altitude near the Iskut or Porcupine rivers were dominated by diatoms (Bacillariophyceae), whereas higher altitude wetlands of the upper More Watershed supported mainly blue-green algae (Cyanophyta). Chlorophyta and Chrysophyta were also well represented within the periphyton community of some wetlands. Genus richness ranged from 19 to 71 genera. This variability is related to environmental conditions such as water velocity and quality, sediment scour, light penetration, temperature and depth.

Phytoplankton was sampled at all lakes and at wetlands where periphyton was not readily observed or accessible. Genus richness ranged from 9 to 59 genera per site, with the highest richness in the Bob Quinn/Iskut and upper More watersheds. Diatoms dominated seven of the 27 sites sampled, including those of the lower More watershed. Blue-green algae were the most common periphyton at eight of the sites, most of which were in the Upper More watershed. Golden algae dominated seven sites, and both cryptophyte and green algae each dominated two sites. All major phytoplankton phyla were represented along the access corridor. Biomass was generally higher in the Bob Quinn/Iskut and lower More watersheds, intermediate in the Sphaler/Porcupine watershed and lowest in the upper More watershed. Phytoplankton abundance among sites ranged from 19 to 2,254 cells/mL, a variation caused by the wide range of habitats found along the access corridor. These included sedge-fens, marshes, grassy channels, abandoned beaver ponds, lakes, and rocky basins and drainage gullies.

Abundance was generally higher in the Bob Quinn/Iskut watershed but it varied greatly among sites within all watersheds. Diversity and evenness of phytoplankton communities were generally moderate to high in wetlands.

Secondary Producers

Zooplankton
The biological characteristics of zooplankton samples collected in lakes along the access corridor showed high variability. Low levels of diversity were observed at some sites, resulting from a high proportion of a single taxonomic group. Mean zooplankton density and diversity were generally higher in the Iskut watershed compared to the Sphaler/Porcupine and More watersheds. An increasing gradient of richness was observed from the upper More alpine area through the lower More to the Iskut (Bob Quinn Lake) area. This trend may reflect the increased opportunities for successful colonization, survival and reproduction during the longer open-water seasons associated with lower elevations. Evenness, a measure of relative abundance, was slightly higher in the Iskut watershed compared to the Sphaler/Porcupine and More watersheds at the family and genus level of analysis.

Overall, cyclopoid and calanoid copepods were the dominant taxonomic groups in most of the lakes along the road route. At some sites in the upper Sphaler and More watersheds the cyclopoid and calanoid copepods represented over 99% of the total organisms collected. At lakes in the lower Sphaler and Iskut regions, rotifers made up a significant (greater than 30%) proportion of the zooplankton community.

Daphnid waterfleas were the most predominant taxonomic group at one site in each of the More and Sphaler/Porcupine watersheds. Amphipods and predatory phantom midges were present in at least half of the lakes. While not as numerous as the copepods and waterfleas, the amphipods and phantom midges represented significant proportions of the secondary producer biomass due to their much larger body sizes.

Benthic Invertebrates
At most stream sites, mean total density and family-level richness of benthic invertebrates were fairly low, with the exception of one site in the upper Iskut watershed. Sphaler/Porcupine sites had the lowest density and richness overall. Over the entire study area the predominant stream benthos taxa were Diptera (true flies), Ephemeroptera (mayflies) and Plecoptera (stoneflies), with smaller numbers of Trichoptera (caddisflies) and other taxa (Nematoda, Turbellaria, Oligochaeta, Copepoda, Hydracarina, Collembola, Lepidoptera and Coleoptera). Chironomidae were the predominant dipteran taxa, comprising up to 95% of all dipterans collected and half of the overall organisms. The Ephemeroptera, Trichoptera and Plecoptera accounted for most of the other half of the total number of organisms collected from streams. Five genera were commonly observed throughout the area, accounting for over half of the total benthos observed. These included three chironomid genera (*Diamesa*, *Chaetocladius* and *Pseudosmittia*) and two mayfly genera (*Epeorus* and *Rhithrogena*).

The benthic communities in wetlands along the access corridor showed considerable variability. One or two sites in each watershed exhibited very high total benthos density, while some sites showed very low averages for all variables analyzed. Wetland benthic communities were generally dominated by oligochaete worms (mainly tubificids) and chironomids, with smaller proportions of nematode worms, crustaceans (cladocerans and ostracods) and molluscs.

2.7.2 Project Effects

Aquatic resources were selected as a valued ecosystem component because they are useful indicators of environmental quality and can be used to assess various impacts related to degraded water and/or sediment quality. Therefore, changes to aquatic resources will have potential impacts to other components of the ecosystem, most directly to fish communities and fish habitat. In addition, the federal *Metal Mining Effluent Regulations* requires that benthos surveys be used to monitor for potential aquatic impacts from metal mines.

Eight watersheds were included within the regional assessment area as follows: Galore, More, Sphaler, and Scotsimpson creeks and Scud, Iskut, Porcupine and Stikine rivers. For each watershed, the spatial extent of the assessment included the major streams and rivers and their side channels, as well as floodplains exposed during low flow periods. For watersheds along the access road, stream crossings were also included, as well as nearby wetlands and lakes. The terrestrial components of the watersheds were considered only in the case of spills on to land and how this could result in effects to aquatic systems through surface and groundwater movement.

Potential Effects and Evaluation

Habitat Loss and Alteration

Mine Site

Habitat loss and alteration within the mine area will occur due to construction of open pits and storage facilities over existing streams. Potential effects to lower Galore Creek include siltation, altered water levels and temperatures, and altered inputs of drifting benthos and organic matter. Aquatic habitat for periphyton and benthos within the Galore Creek valley will be lost.

On a local scale, habitat loss for aquatic resources represents a considerable effect. However, this habitat is not unique to the region; therefore on a larger scale the effect from mine development will not be significant. Potential indirect effects of this habitat loss in lower Galore Creek include reduced loadings of organic matter from upstream riparian zones and reduced benthic drift downstream.

Habitat loss includes most habitat along the mainstem of Galore Creek above the dam, and a significant portion of its upper tributary habitat, particularly in the West Fork area. However, during closure, much of this area will be reclaimed as lake-type habitat where the open pits and tailings facilities are situated, and stream habitat in area of the reclaimed waste rock facility. Therefore, the long term effect on aquatic habitat in upper Galore Creek watershed is a change from stream to lake-type habitat, with some permanent loss of stream habitat.

Habitat alteration within the mine area will be caused by increased levels of siltation during construction of all mine site infrastructure including the open pits, mine roads, building foundations and storage areas. Increased siltation could result in habitat alteration in terms of altered siltation patterns and increased scouring within streams. During construction and operations, the erosion of roadways in this mountainous area as well as soil compaction by heavy vehicles will provide other sources of silt to contact waters flowing into the tailings pond.

During construction of the site runoff diversion channel, temporary increases in turbidity are expected. As turbidity fluctuates widely in this region, effects on downstream aquatic habitat will be negligible to low and limited to lower Galore Creek. During operations, the diversion channel will contain natural flows, therefore no habitat alteration is related to this mine activity.

Reduction in flows from the tailings impoundment during the winter could lead to increased ice cover during winter months, as well as reduced wetted width. This would result in mortality to aquatic organisms in dried areas. Maintaining flow in the diversion channel will therefore be important in order to avoid effects to downstream habitat. Regular monitoring and clearing ice and debris from the diversion channel will ensure continuous flow in lower Galore Creek over the winter. The wetted width and area of downstream habitat are not expected to be significantly reduced, based on hydrologic and bathymetric studies of lower Galore Creek.

At peak flows during freshet, total flows of Galore Creek would increase above natural levels due to higher volumes of tailings effluent discharge. The increased flows could lead to changes in river morphology including increased scouring of the channel, increased erosion of banks, homogenization of habitat, and deeper waters where shallow riffle habitat used to exist. However, these physical alterations to the stream habitat will not cause considerable effects on periphyton or benthos communities, since these alterations will not greatly exceed baseline ranges.

Water temperatures in summer flows in lower Galore Creek are predicted to increase by a few degrees due to thermal stratification within the tailings pond. Discharge from the uppermost layer of the pond will have a peak daily temperature of 14 to °16°C, based on limnology studies in lakes of similar altitude assessed in upper More Creek in August 2005. This discharge will flow into lower Galore Creek and mix with water from the diversion channel (which averages °10°C in summer). The final temperature upon mixing is estimated to be 12 to 14°C, and will thus not be greatly increased from baseline conditions. Due to five-fold dilution, the Scud River will experience negligible increases in water temperature related to tailings effluent discharge. Therefore, no effects to aquatic biota are linked to altered water temperatures in Galore Creek or the Scud River.

During closure, the diversion channel will be breached and eastern tributaries will flow into Galore Creek through the reclaimed tailings and waste rock impoundment. Habitat within the diversion channel, colonized by periphyton and benthos post-construction, will be lost. Nutrient loading to lower Galore Creek should not be greatly affected by this major change in upstream hydrology and habitat structure, since nutrients dissolved in water will continue to flow out of the tailings impoundment. However, benthic drift and downstream loading of organic matter could be retained behind the dam, reducing downstream output.

In the unlikely event of an effluent overspill or tailings dam breach, significant effects to downstream habitat may occur due to effluent and particulate release. However, an event such as this is classified as catastrophic and beyond any best engineering practices for earth-filled hydroelectric reservoirs.

Access Corridor

Minor habitat loss and alteration will be caused by development of the 30 metre wide right of way for the access route and both diesel and ore concentrate pipelines. This includes loss of habitat at the footprints of pilings, streambanks where rip-rap is used for stabilizing banks and minimizing erosion, as well as removal of riparian vegetation and coarse woody debris and siltation during construction of stream crossings. Road traffic may also cause minor alteration from aerial deposition of dust to waterways; mitigation will include speed limits and dust suppressants.

Total area of in-stream habitat lost at fish bearing crossings is estimated to be approximately 327 square metres. Habitat will also be destroyed at 306 stream crossings where closed culverts will be installed. This represents minor loss of habitat at each crossing based on the small fraction of impacted area compared to total stream lengths. Also, a total of 0.9 hectares of riparian habitat will be lost within a wetland area of lower More Creek, due to construction of the access road. This represents only 5% of this wetland area.

The total surface area lost due to development of the access corridor is quite small relative to the area covered by each stream, and negligible when observed on a regional level. However, habitat alteration due to siltation is expected briefly during construction, and localized erosion will occur along the road over the mine life. Roadway monitoring and repair will be important in mitigating and minimizing effects, but due to the steepness of the terrain covered, it is expected that some areas will experience erosion problems. Any unavoidable alteration, disruption or destruction of fish habitat will be compensated for through development of a Fish Habitat Compensation Plan in order to meet no net-loss criteria based on the *Fisheries Act*.

Transmission line development will involve removing some riparian vegetation and trimming overheight trees, but this will result in negligible short term reductions in woody inputs and cover in streams. The transmission line right-of-way will be built along the access road, reducing disturbance to local waterbodies.

The heliport at upper West More Creek near Round Lake is not expected to involve any habitat loss or physical alteration since it will be located away from waterbodies. It may contribute small amounts of silt to localized streams through air-blown dust from air traffic. This will have a negligible effect on surrounding aquatic resources.

Slope failures could result in stream blockages, changes to sedimentation patterns in rivers, and flooding events. Appropriate protective measures (e.g. revegetation and reshaping of slopes, diversion ditches and culverts) and erosion control will be implemented along the access road to manage water and maintain slope stability. Thus, there is a low probability of significant effects on aquatic resources occurring along the access corridor due to landslides.

A rupture of either the ore concentrate or diesel pipeline could lead to effects on aquatic resources. In the case of a concentrate pipeline rupture, significant amounts of slurry could be released leading to altered physical habitat in nearby wetlands or streams. A response time of 2 to 15 minutes for concentrate spills is predicted, based on the capacity of the pressure sensor system. The probability of an effect to aquatic resources due to a pipeline rupture is quite low.

Filter Plant

Installation of the diffuser within the Iskut River will require site isolation for construction to proceed under dry conditions. Any silt-bearing water will be directed to settling ponds and/or released into terrestrial areas to filter particulates. A minor pulse of sediment loading downstream of the diffuser will occur when the area is reopened to the river. Construction of the filter plant and pipeline would cause negligible sediment loadings to surrounding wetlands, lakes and streams, and therefore no effect to aquatic resources.

Construction of the airstrip access road and bridge across the Porcupine River will involve some habitat loss and alteration of localized areas in order to place pilings. Air and ground traffic will contribute to dust being blown into waterbodies downwind but the loadings to aquatic habitats will be relatively minimal.

Direct Mortality and Sublethal Effects

Mine Site
Direct mortality of aquatic organisms may be caused by the destruction of habitat during construction activities within or near streams due to the removal of organisms in excavated substrates or by smothering of organisms with construction materials (i.e., tailings dam). Mortality may also be caused by exposure to various contaminants related to planned and accidental discharges, including effluents, metal leaching/acid rock drainage release and chemical spills.

Some mine components associated with potential lethal or sublethal effects to aquatic organisms include release of tailings effluent and diversion channel water to lower Galore Creek, discharge from the concentrate slurry filtration plant into the Iskut River, road runoff (suspended solids, dust suppressants, and released fuels), and spills from machinery or the diesel or concentrate slurry pipelines. These are all potential sources of stressors to aquatic systems in the Project area.

Access/Pipeline Corridor
Some direct mortality to aquatic resources will occur within the footprint of the access road at stream crossings (pilings, rip-rap) and along the road itself. However, the magnitude of effects to biota is quite small, based on the small area affected. Construction and operation of the access corridor may be associated with siltation, chemical spills and metal leaching/acid rock drainage, potentially resulting in lethal or sublethal effects to aquatic organisms in nearby rivers, wetlands or lakes.

Erosion along the road during construction and operations will likely cause temporary increases in turbidity in localized areas. This could lead to smothering of invertebrates including their eggs, decreased visibility which would reduce feeding efficiencies, and altered siltation patterns within streams. Recovery would be more rapid in fast flowing streams than wetlands or lakes. However, most wetlands and lakes are well away from the road route. In addition, More and Sphaler creeks and the Iskut River already have very high total suspended solids concentrations, so siltation from the road is not expected to have a significant effect. Roadway monitoring, repair and sediment control will be important in mitigating and minimizing effects.

Dust suppression using moisture-attracting salts (calcium chloride and magnesium chloride) could result in degraded water quality in streams downstream of access road crossings. Water management and erosion control where the access road approaches or crosses a waterbody will minimize the potential for salt accumulation and toxicity to aquatic life. Water quality monitoring will also be conducted to avoid potential effects at some locations. However, wildlife mitigation measures suggest minimal use of calcium chloride.

Sewage associated with construction and staging camps along the access should not lead to any significant effects to aquatic life since only a portion of nutrients from sewage discharge will travel through groundwater (depending on soil chemistry and substrate sizes) to waterbodies, where they will be quickly diluted. Effects to wetlands and lakes would be more significant, hence discharge will be positioned to avoid exposure to these more sensitive areas.

Chemical spills (fuel, de-icer fluids) along the access corridor including the camps and the West More heliport may occur. Within the mine area, haul trucks will be refuelled at specified areas with concrete pads. Risks will be mitigated by locating fuelling stations away from waterbodies, as well as implementation of the Spill Contingency Emergency Response Plan.

A landslide along the access corridor or within the Galore Creek valley could result in massive loadings of sediment to waterbodies, smothering benthos and affecting primary producers. This could also affect water clarity, where in extreme cases primary production would decline leading to effects at higher trophic levels. Other effects could include altered sedimentation patterns in rivers and flooding of habitat. However, there is a low probability of significant effects occurring along the access corridor related to landslides.

Rupture of the slurry pipeline could cause significant mortality or sublethal effects to aquatic life in wetlands or lakes directly or through trophic effects depending on species sensitivities to the metals introduced. The slurry will have a pH of 10, which also poses potential effects to many aquatic organisms accustomed to the more circum-neutral environments of the region (pH 7.5 to 8.5, with slightly lower values in some wetlands). These effects could be linked to effects on birds, fish and wildlife, which depend on primary and secondary producers for food and habitat. Metal could be stored in organic sediment and act as a contaminant source to benthic organisms including invertebrates and fish. Concentrate spills to a stream or river could also cause effects to aquatic life, but effects would be of lower magnitude and duration than those expected in wetlands, due to the flowing nature of streams.

Rupture of the diesel pipeline could also lead to toxic effects in aquatic organisms if fuel reached aquatic habitats either through surface or groundwater transport. Diesel fuel could cause significant mortality to aquatic life of streams and especially that residing in wetlands and lakes, which are more static systems and therefore would contain the contaminants for a longer period.

Filter Plant
Construction of the diffuser will cause some mortality to organisms within the development footprint. Also, this will introduce a short term increase in total suspended solid levels to the immediate downstream environment, with minimal mortality or sublethal effects to aquatic life. Any effects on algal or benthic communities will be of low magnitude and of short duration.

Some localized mortality and sublethal effects are predicted in the 7 metres stretch downstream of the diffuser due to metal uptake. Metal-sensitive taxa may be eliminated or reduced in this confined area, including increased avoidance through benthic drift. Effects would only occur during operations and no effects would extend beyond the More-Iskut confluence due to additional dilution from More Creek.

Water-sediment interactions such as precipitation and adsorption are assumed to be negligible since pH is not predicted to change, and metal-binding substrates including clays and organic matter are scarce in the Iskut as in the Scud River. Also, the relatively small size of the mixing zone indicates that this should have no significant effect to the benthic communities of the Iskut River, which contains naturally high concentrations of many metals. Also, this area would likely be recolonized by more sensitive taxa during the post-closure phase, re-establishing a benthic community similar in diversity to that present during baseline conditions.

Aerodrome
Construction activities associated with the aerodrome could cause mortality to biota. Effects will be mitigated by controlling siltation to waterbodies using best management practices and by situating the airstrip away from waterbodies to reduce aerial deposition. Uncontrolled chemical spills (fuels, de-icing fluids) could have significant effects on aquatic life in the Porcupine River and wetlands of the valley following a significant chemical spill.

Altered Productive Capacity

Mine Site
The productive capacity of aquatic habitats will decrease in certain areas due to Project development, and will have the potential to do so in other areas. Reductions in productive capacity will be related to habitat loss and alteration of habitat within the Galore Creek valley under footprints of the various mine components.

Effluent discharge could decrease productive capacity in lower Galore Creek to a moderate extent. Retention of organic material behind the tailings dam will reduce organic loadings downstream and potentially reduce productive capacity. Finally, there is a potential for slope failures to occur within the Galore Creek valley or along the access corridor, which could result in reduced productivity. However, none of these effects were rated as significant following final assessment, based on the magnitude, extent and duration of potential effects. Also, no trophic interactions or eutrophication effects were related to any of the Project activities.

Productivity may also be affected in habitat downstream of the dam due to effluent discharge, altered water levels, and the potential for siltation and reduced organic loadings from upstream.

The main area of stream habitat that is significantly altered is under the tailings pond footprint. Therefore there will be a moderate loss or alteration of stream habitat (approximately 35%) in the Galore Creek watershed. The new lentic habitat formed by the filling of the open mine pits and the tailings impoundment is expected to have significantly different benthic communities (probably chironomid-dominated) compared to those found in streams under baseline conditions. Benthic community composition will be determined largely by the different habitat of streams and lakes, which are preferred by different groups of organisms. Also, the sediment within the tailings facility will contain large volumes of tailings materials of high metal content. Benthic communities throughout the region are generally of relatively low abundance, related to the characteristics of the habitat. The communities of Galore Creek are generally typical of the region in terms of their taxonomic composition, diversity, and low productivity levels. Therefore, on a local scale, this represents a considerable change, but in terms of relative effect to the Cassiar Iskut-Stikine LRMP region, it will not affect productivity or biodiversity of algal or benthic communities.

Indirect effects of habitat loss and alteration will include minor reductions in downstream transport of organic debris and possibly benthic invertebrates (i.e., drift). It is difficult to predict the net change in organic matter loadings to lower Galore Creek to changing upstream habitat. In any case, the remaining 20 square kilometres of downstream drainage should be sufficient to support the algal and benthic communities, although some minor reductions in productive capacity could occur.

Nutrients would not be expected to decrease in concentration from this activity since they are dissolved and would continue to flow from the tailings facility downstream over the spillway in discharged effluent. Nutrients may increase slightly due to inputs related to blasting residues. Sewage will be treated in isolation of waterbodies, therefore nutrient loading from sewage will be negligible and will depend on groundwater transport. Benthic drift likewise should be sufficient to support lower Galore Creek communities, based on organisms coming from the remaining 3 kilometres lower stretch of Galore Creek as well as the hanging valley watershed tributary of lower Galore Creek. The baseline data did not indicate obvious patterns linking upstream and downstream communities; a few taxa were common to sites throughout Galore and many other watershed sites.

Only temporary and minor adverse effects to local biota are expected due to erosion from construction activities. Some reduction in productive capacity may occur in Galore Creek but recovery of the benthic community would be relatively rapid, possibly within the same season. This is because of the high flow rates, which would clear accumulated silt in the streams. Effects are predicted to be negligible in the Scud River due to a five times dilution factor, and no effects were predicted for the Stikine River.

Seasonal changes in water discharges are not expected to cause adverse effects to biological communities since water levels already fluctuate widely under natural conditions, causing periodic flooding and drying of aquatic habitat in lower Galore Creek. However, flow rates are predicted to drop significantly, and in the case of a blockage along the diversion channel, flows could drop to a point where ice formation increased in lower Galore Creek. Effects on organisms will depend on the extent and duration of freezing of the creek. Effects to the Scud River would be negligible due to the five-fold increase in flow at this point.

The transformation of Galore Creek from a turbid glacial stream into a large tailings lake may lead to a temperature increase of up to 3 or 4°C in lower Galore Creek during summer months due to stratification in the tailings pond. However, the predicted temperature increase is not expected to adversely affect algal or benthic communities downstream. A temperature increase may actually increase productivity by promoting algal growth. Possible detrimental effects of eutrophication leading to reduced dissolved oxygen concentrations in the tailings effluent are unlikely. This is because the effluent will be strongly mixed with non-contact waters upon release into the spillway and re-oxygenated in the turbulent waters of lower Galore Creek. Also, algal growth will most likely be limited by low phosphate concentrations, despite increased nitrogen from blasting residues. The water quality effect assessment demonstrated the potential for moderate effects on aquatic organisms due to ammonia and no effects related to other nutrients.

The release of tailings effluent and metal leaching/acid rock drainage-derived metals from diversion channel waters into the Galore Creek valley are predicted to have negligible to minor effects on the immediate downstream benthic community of Galore Creek, based on modelled concentrations of sulphate and metals in the water. As the existing benthic community is naturally adapted to high metal concentrations in water and sediment, changes to productive capacity are expected to be low in magnitude. Effects would be limited to the more sensitive species, possibly reducing richness slightly. Adaptation of local benthic organisms could allow a return in productivity if not diversity during the operation phase.

There are little to no effects predicted to the Scud River, and no effects to the Stikine River or its estuary from activities within the Galore Creek valley, both in terms of metal concentrations and metal loadings. Total metal concentrations in lower Galore Creek will be similar or reduced within the water column compared to baseline values. This is the product of increasing dissolved metal concentrations but decreasing total suspended solids loadings in order to comply with *Metal Mining Effluent Regulations* effluent discharge limits. Based on dilution and minor amounts of particulates settling out along the Scud River, no effect is predicted to occur 30 kilometres downstream at the confluence of Scud and Stikine rivers.

Associated total metal loadings from both effluent and natural total suspended solids particulates were shown to decrease or remain constant for Galore, Scud and Stikine sites during mine operation. Also, most effluent-derived particulates will be very fine and will be expected to travel downstream to the Stikine estuary where precipitation may occur, at a dilution rate of over 400 times. Thus, no discernable increases in metal loadings to downstream riverine or estuarine water or sediment of the Stikine system are expected, and no effects to aquatic life are predicted.

In summary, the productive capacity in lower Galore Creek may be reduced due to shifts in community structure and decreases in the density of organisms caused by physical and chemical stressors as well as changes to available habitat. No significant effects on the productive capacity of aquatic life are predicted for the Scud and Stikine rivers.

Access/Pipeline Corridor

Siltation to waterbodies along the road route will be minimized, with only temporary pulses of total suspended solids to streams during construction, and no lasting effect on water quality or aquatic resources. Habitat loss along fish-bearing crossings totals 327 m^2, representing a very insignificant area relative to the total area inhabited by aquatic biota in the hundreds of streams, rivers, lakes and wetlands along the access corridor. Additionally, there will be a total of 306 stream crossings where closed culverts will be installed. This will cause only minor habitat loss to benthos and algae at each site. Productive capacity of the streams will not be impacted because of the small proportion of impacted area at each crossing. No lake habitat will be lost, and habitat loss within wetlands will be limited to 9,000 m^2 within one wetland area in lower More Creek, representing only 5% of this wetland. This is not expected to have any significant effects on the productivity of the wetland, and will relate to only minor decreases in organic detritus provided to the wetland during flooding of the area. Any habitat loss will be compensated for in order to comply with the policy of no net-loss of productive habitat as described in the *Fisheries Act*.

Given mitigation, fuel spills, dust depositions and camp sewage will not cause any adverse affect to aquatic biota as fuelling stations will be built to contain any spills, and the West More heliport will be situated well away from local waterbodies.

Pipeline ruptures (diesel or concentrate) close to a waterbody, or landslide events due to erosion along the road could significantly reduce productive capacity within the exposed waterbody, by increasing chemical toxicity (directly or indirectly through trophic effects) or physically altering habitat (e.g., reduced water clarity, altered sediment substrate, reduced nutrient or organic inputs due to destruction of upstream riparian zone).

Given management of metal leaching/acid rock drainage along the access corridor, no significant effects related to aquatic biota are predicted.

Productive capacity of lakes and wetlands along the access corridor should remain unaffected by project activities. The road route was selected to avoid unstable terrain and sensitive aquatic habitat including streams, wetlands and lakes. Siltation effects during construction will be kept to a minimum. Silt curtains, rip-rap, and proper design of stream crossings will act to mitigate any effects to productive capacity of aquatic communities. Minor siltation of streams is expected during road construction, but this would be temporary and not bear significance to overall productive capacity of the streams.

Filter Plant
Installation of the diffuser in the bed of the Iskut River will result in a temporary increase in turbidity. Construction will be conducted under dry conditions by isolating the area and managing silt-laden waters. This is not expected to have any significant effect on productive capacity, as organisms of the region are accustomed to naturally high total suspended solids during the summer. Consideration will be given to the spawning regime of the species, which use this river, particularly Mountain Whitefish. Timing of construction will be based on appropriate timing windows.

Discharge of filter effluent could cause a localized reduction in productivity immediately downstream of the diffuser, related to reduced richness and abundance within the short mixing zone. More sensitive taxa could be replaced by metal tolerant species. Effects would only occur during operations and result in only minor toxicity to benthic organisms (density, diversity) depending on the sensitivity of the taxa present. Based on dilution rates, effects would be limited to the Iskut River between the diffuser and the More-Iskut confluence. Based on the small area affected, this will not have a significant effect on the productive capacity of the upper Iskut River. Following closure, recolonization of the mixing zone with benthos would be expected such that density and richness would be similar to other areas of the Iskut River.

Aerodrome
Construction of the aerodrome and road crossing on the Porcupine River will result in minimal siltation to the river, and habitat loss under the bridge pilings, which will be partially offset by providing habitat heterogeneity around the pilings as defined in a Fish Habitat Compensation Plan.

During operations, flight traffic could result in aerial deposition of dust to waterbodies, potentially affecting biota. To mitigate this risk, the airstrip will be situated away from the Porcupine River and nearby wetlands, thereby reducing the potential for effects.

Chemical spills could result in decreased productive capacity in the downstream Porcupine River, due to the high porosity of the floodplain substrate, which would promote rapid groundwater transport of chemicals. No effects to aquatic biota are expected in relation to chemical spills at the aerodrome facility.

2.7.3 Issues Raised and Proponent Response
During the Application review, Environment Canada commented on the number of sampling locations for benthic invertebrates and the interpretation of benthic community data. The Proponent noted that since 2005 the number of stations (composites of benthic invertebrate subsamples are taken) has been increased from three to five in the receiving environment as requested by Environment Canada.

2.7.4 Proponent Commitments and Mitigation
The Proponent has committed to undertake the following measures and commitments to mitigate potential effects on aquatic resources:

- minimizing the loss of drainage area through diversion of surface flows around mine components;
- developing and implementing an Erosion and Sediment Management Plan, including sediment ponds, silt curtains, temporary dam and monitoring;

- monitoring and managing flows in the diversion channel during the winter to maintain required minimum flows;
- undertaking water quality monitoring, settling particulates in tailings ponds;
- pacing the discharge from the tailings impoundment to mimic the natural hydrograph and time with high flows;
- reconnecting streams to Galore Creek during mine closure; monitoring along the access road;
- maintaining benthic community sampling program methodology; and,
- monitor fish health and tissue quality, including, but not limited to, analysis of the full suite of 30 metals used in the baseline studies, in Galore Creek and other potentially affected rivers as part of the Aquatic Effects Monitoring Plan pursuant to federal *Metal Mining Effluent Regulations* and the Environmental Management Act.

The Proponent has committed to aquatic effects monitoring and follow-up (see section 4.2.5 of this Report) to support or verify the predictions made on environmental effects.

2.7.5 Significance of Residual Effects

Habitat loss and alteration, direct mortality and sublethal effects, and altered productive capacity to aquatic resources will occur during construction, operation and closure phases. Residual effects (after mitigation) occur from all mine components are summarized above.

The issues that have the greatest adverse effect on aquatic resources are identified below:

- habitat loss and mortality within Galore Creek due to open mine pits and storage areas;
- habitat loss associated with the diversion of tributaries in upper Galore Creek;
- effluent discharge causing toxicity to biota in lower Galore Creek;
- slope failures along the access road causing mortality and habitat alteration; and,
- filter plant effluent discharge causing toxicity to biota in localized area downstream of diffuser in Iskut River.

The loss and alteration of the majority of aquatic habitat to benthos and algae is the single largest effect predicted from this assessment. On a local scale (within the Galore Creek watershed), this effect will be significant, as a major reduction in productivity within the drainage area will occur. However, effects focused within the Galore Creek watershed were not deemed to have far-reaching effects in terms of regional productivity or biodiversity of benthos or algae. This is because the habitat within Galore Creek is not unique to the region, nor are the aquatic organisms that reside within it. Furthermore, the habitat is of typically low productivity as seen within the other study watersheds of the area. Effects within Galore Creek will not reduce productivity within the Scud River or elsewhere. Therefore, the residual impact of the loss of this habitat was not judged to be significant.

Regarding scheduled activities, the discharge of tailings effluent and filter plant effluent are both judged to have negligible potential for effects to downstream aquatic resources, based on best available scientific data on the predicted water quality of effluents. Any effects of tailings effluent to lower Galore Creek will not extend to the Scud River, largely due to the high dilution factor at the confluence of these waterbodies.

Construction activities will require the monitoring and management of surface waters to safeguard against any increased loadings of total suspended solids to the downstream environment. Therefore, residual effects to sediment quality are related to scheduled discharges or construction activities of the Project are not expected to be significant.

Discharge of treated filter plant effluent into the Iskut River using the diffuser will minimize the area of mixing, thereby minimizing the zone in which aquatic biota may experience toxic effects. Based on the small size of the effluent plume relative to the size and flow of the Iskut River, the effects will be low in magnitude and the extent of effects will be local (less than 200m below diffuser). No effects would extend beyond the Iskut-More confluence, therefore no effects to the Stikine River are related to filter plant effluent discharge.

The potential for landslides was assessed along the access road and within the Galore Creek valley in 2005. Associated risks will be managed by proper road design, road monitoring and by choosing a route that avoids high risk zones wherever possible. This includes adequate water management and slope stabilization measures, which will reduce the potential for catastrophic erosion events. Slopes will be seeded to encourage revegetation, which will increase stability and help absorb surface runoff, reducing erosion. Any landslide would be limited in geographic extent to a localized area and therefore residual effects to aquatic resources of the region were not judged to be significant.

2.7.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities, and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the Project on aquatic resources; and responses from the Proponent.

Based on the information in this Joint Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on aquatic resources.

2.8 FISH AND FISH HABITAT

2.8.1 Background

The Project has the potential to adversely affect local populations of several species of fish and their habitats, within what is currently a relatively pristine environment. A baseline fish sampling program was carried out in 2004 and 2005 which included sampling of watersheds in the vicinity of the proposed mine area, filter plant and aerodrome, along the proposed access corridor and in the Stikine River. Streams, rivers, wetlands and lakes were surveyed for fish and fish habitat. In addition, other variables such as fish tissue metal concentration, diet composition, growth and health were surveyed at selected sites, along with genetic identification of Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*).

FILTER PLANT AND ACCESS CORRIDOR

Fish and Fish Habitat

Of the 596 stream crossings surveyed along the proposed access corridor, 327 were categorized as streams according to the Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Procedures. Of these 327 streams, 120 were sampled and 20 were found to be fish-bearing. Dolly Varden and rainbow trout (*Oncorhynchus mykiss*) dominated most fish-bearing streams. Mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*) and sculpins (*Cottus* spp.) were also collected at some sites, and coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*) and *O. tshawytscha*) are known to inhabit the Porcupine River near the crossing site.

Habitat type and quality varied widely among fish-bearing crossings. Some fish-bearing streams were clear, while others (mainly the large rivers) were turbid. Most of the cover along smaller streams was dominated by overhanging vegetation, while deep pools and boulders provided cover in larger fish-bearing streams. Among fish-bearing crossings, bankfull width ranged from 0.92 metres to over 100 metres. Gradients ranged from 0.5% to 31%.

Rearing and overwintering habitat was fair to excellent in most of the wetlands surveyed. The wetlands with the best rearing and overwintering habitat generally had deep pools or channels with abundant cover. Spawning habitat was generally poor throughout most of the wetlands. Exceptions occurred where swiftly-flowing channels passed through wetland areas, creating patches of gravel substrate. Good-quality spawning habitat was observed in a few wetlands, while habitat suitable for migration could be found in many of the wetlands surveyed. Such habitat included channels and ponds with flowing water, few obstructions and perennial flow. Poor migration habitat was found in wetlands with discontinuous or dry channels, shallow water or poorly defined channels.

The surveyed lakes range in size from 1 to 59 ha and have maximum depths of 3 to 23 metres. Most of the lakes near the road provide moderate to good habitat and have abundant cover consisting of aquatic vegetation and large woody debris. Some lakes in the alpine sections of the road (e.g., Lake 11, Round Lake and Reference Lake 5) are cold and have high turbidity from glacial sediments. These lakes have no aquatic vegetation and little cover, reducing their habitat value.

Fish habitat and communities were surveyed at five sites near the proposed filter plant discharge site on the Iskut River between July and August 2005. Additional data available for the bridge site over the Iskut River, which is located near the outfall, were also used to assess the discharge area. Throughout most of the length (30+ kilometres), the river is confined by 10 to 40 metres high rock walls, with rocky delta fans and talus slopes at the entrances of irregularly spaced tributaries. Fish habitat is primarily made up of riffles, fast glides and eddy pools. Spawning likely occurs in the main channel as well as in tributaries and side-channels. Rearing occurs in back and side-channels along the river.

Fourteen char from the Iskut River and its eastern tributaries were genetically identified in 2005. Of those, one bull trout was identified in the Iskut River downstream of the confluence with More Creek. Testing was also carried out in other project area watersheds. In the Porcupine River, 23 char were tested in 2004 and 2005. Four fish were found to have hybridized with bull trout; however, no pure bull trout were identified. A total of 52 char from the More watershed (including wetlands and lakes), 2 from the lower Scotsimpson watershed and 9 from the lower Sphaler watershed were tested in 2004 and 2005. All of those samples were positively identified as Dolly Varden.

All of the fish-bearing sites along the access corridor were located in the Iskut and Lower More watersheds, with the exception of the crossing over the Porcupine River for access to the proposed airstrip. Impassable barriers to fish migration prevent fish from moving into the upper More, Sphaler and Scotsimpson watersheds where much of the road corridor will be located; however, Dolly Varden were present in the lower reaches of all these streams.

Dolly Varden was the most common species captured along the access corridor, making up 78% of the total catch. They were the only species captured in the More watershed. Rainbow trout were present in a few streams east of the Iskut River and in the Iskut River itself. Mountain whitefish were only captured at the Iskut crossing. Sculpins were also captured at the Porcupine River crossing.

Of the 21 wetlands surveyed in 2005 along the proposed road alignment, 10 were found to contain fish. Dolly Varden was the most common fish species, occurring in 9 of the 10 fish-bearing wetlands and making up 76% of the total catch. Longnose suckers were abundant in one wetland, and threespine sticklebacks (*Gasterosteus aculeatus*) were abundant in another. Other species captured in the wetlands included rainbow trout, coho salmon, sculpins and mountain whitefish.

In only two wetlands were more than one fish species captured. In one, longnose suckers dominated the catch, Dolly Varden were common and an occasional rainbow trout was captured. At the other site, Dolly Varden and juvenile coho salmon were the most common species, while a small number of other species was also captured. Catch-per-unit-effort did not differ among wetlands, indicating that fish density was similar.

The fish community at all sites on the Iskut River near the proposed discharge location was dominated by mountain whitefish, Dolly Varden, rainbow trout and longnose sucker.

AERODROME FACILITY

Fish and Fish Habitat

The proposed aerodrome facility including the construction footprint, contains no active stream channels, but there are exposed substrates, eroding banks, wetlands, standing and flowing water nearby on the floodplain. Old river and secondary channel banks at the site are now well vegetated with sapling spruce, cottonwood and alder. The area is generally dry, with grasses and lichen covering glacial/fluvial cobble/boulder and sand substrate.

Surveys confirmed that much of the Porcupine floodplain is dry and that most flooding occurs near the northwest end, where groundwater rises to the surface and meets runoff from the southern mountain slope. The proposed location of the new aerodrome, at the southeast end of the floodplain, appears to have the least amount of surface water.

Habitat surveys established the presence of fish-bearing streams originating from the southwest valley wall and flowing northwest adjacent to the proposed aerodrome location ("PorcAir Creek"). A significant watercourse, the "Airstrip Channel," also exists in the immediate vicinity of the original airstrip. These streams are characterized by sand/gravel substrates and pool-riffle morphology. Both channels become partially dewatered during dry periods of the year, leaving isolated sections of flowing or pooled water. While less frequently flooded sections of secondary channels were also observed in the general area, including on and close to the old airstrip, these are likely devoid of water in most years.

Channel configuration appears to be variable and may be influenced by beaver activity and high flow conditions. While many dry channels were observed, floodplain morphology indicates that isolated channels may be occasionally filled from upwelling groundwater sources at different times of the year. Groundwater sources likely contribute significantly to maintenance of summer rearing habitat and potentially provide key spawning habitat for Dolly Varden.

Four species of fish were captured in Airstrip Channel. Dolly Varden were the most abundant, followed by coho salmon, sculpins and mountain whitefish. In addition to these catches, adult sockeye and coho salmon were observed at the mouth of the channel and upstream in gravel-bottom areas of the lower channel. Salmon-spawning activity was evident in the lower channel during both sockeye and coho peak spawning times in September and October, respectively. Many salmon were also captured in the Porcupine River immediately downstream of the outlets of Airstrip Channel and PorcAir Creek. More fish, mainly coho and Dolly Varden, were observed and captured farther upstream in the main river and in tributaries near the outwash lake.

Observations of salmon in the Porcupine River system show that the confluence area of Airstrip Channel, PorcAir Creek and a side-channel of the river are main salmon holding and spawning areas. The area was sampled for spawning sockeye in September 2005 and for coho in October 2005. A total of 54 sockeye and 113 coho were captured. In addition, sampling in the nearby mainstem of the Porcupine River in October 2004 yielded 7 adult coho salmon. Spawning coho and sockeye were also observed in side-channels along the north side of the river west of Scotsimpson Creek in 2004.

MINE AREA

Fish and Fish Habitat

Galore Creek is a moderate-sized, turbid, cold stream that arises from glaciers in the upper Galore Creek valley. Much of the stream is entrenched in a steep-walled canyon featuring cascades, riffles and small waterfalls. Bankfull width ranges from 4.6 to 70 m, while wetted width ranges from 3.5 to 35 metres in the summer. Cascades with gradients of 4% to 14% dominate the survey sites. Fish habitat in the Galore Creek valley is generally poor to marginal in quality due to limited cover, fast flow, high turbidity and cold temperatures. Most sites feature boulder and cobble substrate; however, some gravel can be found in small tributaries in the upper valley. In-stream cover that may be used by fish is dominated by boulders and total cover is generally limited. Some salmonid-spawning habitat is present in the lower reach of the river, mainly in side-channels near the confluence of the stream with the Scud River.

The Scud River is a large, turbid, glacial-fed river that drains into the Stikine River with a drainage area of 1,110 square kilometres. The gradient ranges from 1% to 3%, and the river morphology is dominated by glides and riffles. The bankfull width spans up to 300 metres, while the wetted width averages 122.5 metres at the surveyed locations. The substrate type varies widely across the river floodplain and features sand, gravel, cobble and boulders. In-stream cover is very low and is provided mainly by boulders and pools in the form of back- and side-channels. Salmonid-spawning habitat is present in tributaries and side-channels of the Scud River where the water is clear.

Dolly Varden were the only fish species caught in Galore Creek in 2004 and 2005 near the confluence of Galore Creek and the Scud River No fish were caught in the upper Galore Creek valley in 2004 or 2005, and no fish have ever been recorded in this area by previous researchers or by traditional users of the valley.

A chute barrier was observed approximately 1.8 kilometres upstream from the confluence of Galore Creek and the Scud River. This likely prevents migration of fish upstream.

Eight species of fish were captured in the Scud River in 2004 and 2005, including several species of Pacific salmon and bull trout. Dolly Varden was generally the most abundant. Coho were also abundant, with spawning occurring throughout the first 10 kilometres of the river. Juvenile coho were captured close to Galore Creek, in a tributary on the north side of the river. Catch per unit effort for all species in the Scud River was higher than in Galore Creek and did not differ from other watersheds in the Project area. Mean condition of Dolly Varden was lower in the Scud River than in Galore Creek but was comparable to other project area watersheds.

The Scud River was surveyed for spawning coho salmon in 2004 and 2005 and for spawning sockeye salmon in 2005 only. During the surveys in 2005, small concentrations of sockeye salmon were observed in several locations and as far as 20 kilometres upstream in the Scud River; however, the highest concentration of sockeye occurred in a tributary approximately 5 kilometres from the mouth of the Scud. This location was sampled in September 2005, and a total of 106 adult sockeye were captured. The highest concentration of coho in both years was found in the same tributary where sockeye were seen, approximately 5 kilometres upstream of the mouth of the Scud. A total of 47 adult coho were captured in 2004 at that site, while another 30 were captured in 2005. Very small numbers of adult coho were also observed as far as 10 kilometres up the river in October 2004, but not in 2005. Spawning coho and sockeye salmon have also been observed and captured during other studies up to 10 kilometres from the confluence of the Scud and Stikine rivers. Juvenile coho salmon were captured within 1 kilometre of the mouth of Galore Creek in 2005. Their presence implies that coho may spawn much further upstream than previously observed, but turbid water may have prevented accurate observations.

The concentrations of metals in muscle tissue of Dolly Varden from Galore-3 were measured and compared to Dolly Varden from More Creek and Reference-1 (a tributary of the Stikine River upstream of the Scud River) in 2004 and 2005. Concentrations of certain metals differed among sites. Whole-body muscle tissue concentrations were also analyzed in juvenile coho salmon from Scud-2 (1 kilometres downstream of the Galore Creek outflow) and Scud-4 (5 kilometres upstream of the Stikine River) in 2005. Five metals were found at higher concentrations at Scud-4 than at Scud-2.

STIKINE RIVER

Fish and Fish Habitat

The Stikine River watershed encompasses over 50,000 square kilometres, extending from its headwaters in the Spatsizi Plateau to its outlet near Wrangell, Alaska. Many of the tributaries of the Stikine are significant rivers themselves, including the Iskut, Porcupine and Scud. Within the area of the Stikine encompassed by the Project area, habitat is typical of a large river system, with moderate temperatures, turbid water and a channel punctuated with islands, side-channels and sloughs. Numerous wetland areas along the margins of the river provide important rearing and overwintering habitat for salmonids. Substrates in the river are dominated by sand, silt and gravel. Existing anthropogenic alterations to fish habitat are few; however, there are small fishing camps, cabins and docks at intervals along the river's edge. Downstream of the Canada/U.S. border, the river empties out onto a wide delta characterized by shallow water and abundant large woody debris.

The salmon fisheries of the Stikine River represent an internationally shared resource, which includes Canadian and U.S. subsistence, sport and commercial fisheries, managed in accordance with the Pacific Salmon Treaty between the United States and Canada. As a result of cooperative efforts of the Alaska Department of Fish and Game, the Pacific Salmon Commission, and the U.S. federal Subsistence Management Program, which includes four bureaus of the U.S. Department of the Interior and the U.S. Department of Agriculture Forest Service, federal subsistence salmon fisheries were established on the U.S. side of the border. A sockeye salmon fishery was initiated in 2004; Chinook and coho salmon fisheries followed in 2005. U.S. federal subsistence regulations also provide for the taking of eulachon, trout, and char. Eulachon subsistence fisheries occur on the Stikine River, but at a lower level than the salmon fisheries. While provided for in the regulations, very little subsistence taking of trout and char is thought to occur on the Stikine River.

The Stikine River has high fish species diversity. At least 10 different fish species were captured from the Stikine River in 2004 and 2005, and at least 19 different species have been documented in the river historically. Coho and sockeye salmon are the most abundant of the Pacific salmon species in the river and are known to spawn in the mainstem and in tributaries as far north as Telegraph Creek, B.C.

Mountain whitefish, Dolly Varden and coho salmon were the most abundant species captured in the Stikine River in 2004. All species were found in a variety of habitats from mainstem riffles to clear tributaries. All of the coho captured were juveniles inhabiting side channels, backwaters and small tributaries of the Stikine mainstem. In 2005, the focus was on obtaining mountain whitefish tissue samples for metals analysis, rather than information on community composition, so numbers of other species were not recorded.

Studies indicate that recreational and commercial fisheries occurring in U.S. and Canadian waters target fish species of the Stikine River, including sockeye, chinook, coho, pink and chum salmon, as well as steelhead trout, Dolly Varden, cutthroat trout and smelt. The Application reports that the U.S. fisheries management regions concerning the Stikine River and delta area include District 108 in Alaska's Southeast/Yakutat where a drift gillnet fishery, covering the areas of Frederick Sound and Wrangell, occurs, and District 106, which covers the region of the Sumner Strait and Clarence Strait. District 108 is considered one of the five traditional drift gillnet areas in southeast Alaska. The Canadian fisheries areas include a section between the

Porcupine River and the border and a section further north from the Chutine River to the Tahltan River.

Species harvested commercially in the U.S. in and around District 108 include the five species of Pacific salmon, crabs (Tanner, Dungeness and golden king), various shrimp species (northern shrimp, sidestripe shrimp, humpy shrimp and spot shrimp) and eulachon. The Application notes the drift gillnet fishery primarily targets Chinook salmon during the spring season; sockeye, pink and summer chum salmon during the summer season, coho and fall chum salmon during the fall season.

In response to concerns about the potential contamination of resident and commercially important fish, tissue metal concentrations in a number of species from the Stikine River were analyzed. Tissue metal concentrations were analyzed in mountain whitefish from two Stikine River sites in 2005. Concentrations of certain metals were correlated with fork length, and differences in concentrations were observed between sites. Tissue metal concentrations were also analyzed in Dungeness crab, Alaska bay shrimp and staghorn sculpin from the Stikine River estuary in 2004 and 2005. In both years, the crustacean species had higher metal concentrations than both the sculpins and mountain whitefish from further upstream. Concentrations were similar among years for each species.

2.8.2 Project Effects

Mine components were combined so that potential effects that affect more than one valued ecosystem component in the same way and in the same area were considered. In the Application, six "component groups" are discussed in terms of potential impacts on fishery resources:

- Mine Area – includes the open pit mine, processing plant, ore storage, operations camp, explosives storage and manufacturing facility, and borrow pits and topsoil storage. The area encompassed by this component group includes the upper Galore Creek valley upstream of the junction of East and West Fork;
- Mill Tailings and Waste Rock Facility – includes the tailings dam, seepage dam, and impoundment area. This area includes the mainstem of Galore Creek from the lowermost seepage dam to the predicted upstream extent of the waste rock facility at mine closure;
- Site Runoff and Diversion Channel – includes the proposed diversion channel, which will run along the east side of the Galore Creek valley and discharge water into Galore Creek below the lowermost seepage dam;
- Access Corridor – includes the proposed road, powerline, pipelines, and construction camps. The areas assessed under this component group include the mainstems of the Iskut River, and More, Sphaler, and Scotsimpson creeks, as well as all of the tributaries, wetlands, and lake crossings in close proximity to the access corridor;
- Porcupine aerodrome – includes the Porcupine airstrip and access road. The area assessed under this component group includes the mainstem of the Porcupine River, outwash lake, floodplain and associated wetlands; and,
- Filter Plant – includes the site of the filter plant, the effluent outfall on the Iskut River, and streams along the transportation corridor to Stewart. The area assessed under this component group includes the Iskut River downstream of the proposed discharge, streams in close proximity to the filter plant site, and waterbodies along Highway 37 where the ore concentrate will be trucked to Stewart.

Valued ecosystem components for fisheries in the Project area were identified as:

- Dolly Varden (Salvelinus malma), the most widespread fish species in the area and blue-listed in British Columbia;
- bull trout (Salvelinus confluentus), a closely related species that is blue-listed and globally threatened;
- Pacific salmon (Oncorhynchus spp.) species, especially sockeye and coho salmon, which occur in the Porcupine River;
- “other fish species”, including rainbow trout (O. mykiss), mountain whitefish (Prosopium williamsoni) , longnose sucker (Catostomus catostomus) and threespine stickleback (Gasterosteus acuteatus); and,
- the Stikine River, a culturally and economically valuable river supporting several populations of Pacific salmon as well as wildlife and human populations.

Key issues considered in the environmental assessment included:
- productive capacity of aquatic systems during all project phases;
- all creeks and rivers that may experience changes to fisheries resources, including, but not limited to the Galore Creek valley, and streams associated with the road access and slurry pipeline corridor and the filter plant site;
- habitat loss or alteration, including aquatic vegetation and sensitive areas such as spawning grounds, nursery areas, winter refuges and migration corridors;
- any rare and/or sensitive species (including fish and amphibians) and habitat and Committee on the Status of Endangered Species in Canada/*Species at Risk Act*-listed species;
- species of cultural, spiritual, or traditional use importance to First Nations (e.g. salmon);
- changes to the thermal regime of the aquatic environment;
- direct and indirect mortality (includes fishing);
- acoustic effects from blasting on fish and fish habitat in local aquatic systems along the access corridor;
- aquatic organisms and habitat;
- all creeks and rivers and associated food webs and water use potential that may be impacted by changes in water chemistry (suspended solids, nutrients, major ions, metals) due to runoff or discharges from the Project;
- mitigation and/or compensation requirements (based on DFO’s Policy for the Management of Fish Habitat and the related principle of no net loss of the productive capacity of fish habitat); and,
- physical and chemical changes to sediment quality.

The spatial boundaries for the fisheries assessment extends from Kadin Island near the mouth of the Stikine River in the south, to the Scud River, a tributary of the Stikine River, in the north, and from Highway 37 in the east to the Stikine River in the west. The Stikine, Scud, Porcupine, upper Iskut, More and Sphaler Creek watersheds were considered in this assessment. As noted above, mine components were combined so that impacts that may affect more than one valued ecosystem component in the same way and in the same area were assessed.

Potential Effects and Evaluation

Productive Capacity of Habitat

Mine Area
Habitat in the upper Galore Creek valley where the open pit mine, processing facility, borrow pits, topsoil storage and ore stockpile will be located, could be classified as fish habitat due to its ability to support the production of aquatic invertebrates that could be used as a food source further downstream in the system. However, the distance separating the mine area in upper Galore Creek from the fish-bearing reach at the mouth of the creek is so great that invertebrates produced near the mine site are not likely to drift far enough in a generation to influence fish food availability downstream.

The mine area in which productive capacity will be altered is located 10 to 14 kilometres upstream of the nearest fish-bearing reach of the streams. The streams around the mine site are not considered to be fish habitat, and the loss of productivity resulting from sedimentation, habitat loss, and toxicity in those streams will not impact any fisheries' valued ecosystem components in Galore Creek or the Scud River.

There is a small potential for the deposition of nitrates and sulphates from dust in the air to affect fish and fish habitat in Galore Creek. Concentrations of these compounds are predicted to be between 20 and 2,000 times lower than baseline concentrations, thus, effects on the productive capacity of habitat will be negligible.

Mill Tailings and Waste Rock Facility
The proposed tailings management area will include a main dam and impoundment area in upper Galore Creek. Construction of the tailings impoundment will result in a loss of aquatic habitat in Galore Creek and its tributaries directly beneath and upstream of the structure as the stream is dammed and the reservoir filled. This may adversely affect the productive capacity of the downstream reaches by cutting off the export allochthonous materials from the upper Galore Creek valley; however, the effect will be limited by the construction of a diversion channel which will funnel water from almost 70% of the watershed back into Galore Creek below the dam. Construction of temporary containment dams, access roads and sediment control dams will also result in an increase in sediment production in Galore Creek. Temporary containment dams will aid in settling out sediment before water is released downstream, while much of the construction sedimentation will be controlled and limited via sediment control and erosion plans.

During operation of the mine, tailings decant water will be discharged into Galore Creek each year during freshet. These discharges are expected to increase the concentrations of a selection of metals and nutrients in Galore Creek and the Scud River, and are therefore planned for high-flow periods when dilution from snow melt and rainwater will assist in mitigating the potential impacts of metal and nutrient toxicity.

Hazard quotients, which estimate the magnitude of proposed changes in water quality relative to baseline concentrations, were calculated for metals, anions and nutrients in the tailings water. Two contaminants, sulphate and molybdenum, had hazard quotients greater than 1. At the mouth of Galore Creek, sulphate is predicted to the have the highest hazard quotient with average concentrations up to 2.4 times higher than baseline conditions.

The Application notes that little is known about the toxicity of sulphate to aquatic life. Provincial guidelines of 100 mg SO_4^{2}/L may be overly cautious. A review of available literature found that the lowest concentration of sulphate reported to cause acute toxicity was 446 mg/L (in mayflies), while the lowest concentration to produce species-specific chronic toxicity was 775 mg/L, with water hardness affecting the overall toxicity of sulphate to aquatic organisms. Modeling of predicted worst-case scenarios at the Project has predicted maximum sulphate concentrations of less that 250 mg/L at the mouth of Galore Creek; thus, sulphate toxicity is predicted to have minimal effects on the productive capacity of Galore Creek downstream of the dam.

Predicted concentrations of molybdenum during mine operations, at less than 0.02 mg/L, are considerably lower than these levels, and will not exceed Canadian Council of Ministries of the Environment guidelines; therefore, no effects on productive capacity are expected as a result of molybdenum toxicity.

Other variables that are predicted to have high hazard quotients include fluoride, zinc, cadmium, selenium, ammonia, nitrate, and antimony; however, the hazard quotients for these variables are based on baseline concentrations that are very close to the detection limit. This introduces more uncertainty into the assessment since average baseline conditions that approach the detection limit likely include several instances of "non-detects" where concentrations during certain months were too low to be detected, and were therefore replaced with an arbitrary value of half of the detection limit. This has the effect of artificially lowering the baseline concentration and artificially inflating the hazard quotient.

While some metals are not predicted to have effects on their own, some metals have an additive, or synergistic, effect when combined in aqueous solution. The Application notes that waterborne solutions of zinc-cadmium mixtures have been found to be additive in toxicity to aquatic organisms, including freshwater fish, amphipods, marine fish, and copepods. Similarly, mixtures of copper and zinc are generally acknowledged to be more-than-additive in toxicity to a wide variety of aquatic organisms. There is a slight probability that combinations of these metals, even though they are not predicted to have significant impacts on the productive capacity of aquatic habitat on their own, may combine to affect productivity downstream of the mine; however, these effects have not been modelled.

Residues from blasting near the dam may also result in increased nitrate concentrations downstream. The Application indicates that sublethal effects of nitrate toxicity have been observed in fish species at concentrations of 6.3 mg/L. Early life stages of some invertebrates may experience increased mortality and decreased growth at very high concentrations. The effects of nitrate toxicity due to blasting will likely be negligible and short-term in nature, because blasting residues would end up in the tailings pond before being discharged.

During mine operation and post-closure, the integrity of the tailings dam will be of importance. A tailings dam failure would result in a very large pulse of water travelling downstream. The force of the water may result in the destruction or alteration of habitat for kilometres downstream of the mine, possibly as far as the Stikine River. At the mouth of the Stikine River, the pulse of water would not be as much as a yearly flood; however, when added to an ongoing flood event (such as a 5-year event), the pulse would resemble a 1-in-50 year flood. Contaminated sediment from the tailings pond would settle in the Scud River and potentially cause mortality among primary and secondary producers. However, an event such as this is classified as catastrophic.

Site Runoff and Diversion Channel
The construction of a diversion channel will allow clean water surrounding the mine site and tailings facility to be funnelled directly to Galore Creek below the tailings dam. During

construction, sedimentation could alter the productive capacity of habitat in Galore Creek. Sediment control and erosion plans will limit the severity of this effect and a lack of depositional areas in Galore Creek could result in the sediment being carried all the way to the Scud River without affecting the stream substrate. Once in the Scud River, sediment would be deposited in slower moving water and potentially affect benthic invertebrates and, by association, the fish that feed on them. The extent of this effect is predicted to be minimal and patchy because the Scud River is a large and highly variable river that frequently shifts its course through the floodplain. The Application indicates organisms living in this highly turbid environment are adapted to the variability in flow and sediment deposition; therefore, occasional incremental increases in sediment deposition arising from construction in Galore Creek will have little impact on productive capacity.

In many areas, the diversion channel will be blasted out of bedrock. This may result in the exposure of potentially acid-generating rock. The effects of acid rock drainage from exposed potentially acid generating rock in the diversion channel may have the potential to affect productive capacity of Dolly Varden and bull trout habitat in Galore Creek; however, these effects have not yet been modelled. The option to line parts of the diversion channel to prevent exposure of potentially acid generating rock will be explored as needed.

Upon completion of mining activities in the Galore Creek valley, the diversion channel will be removed, allowing tributaries to flow directly into the tailings facility. This will cut off the flow of allochthonous and autochthonous materials to downstream reaches of Galore Creek. These resources will flow into, and likely settle in the tailings and waste rock ponds. This may result in a decrease in the productive capacity of non-fish-bearing sections of Galore Creek. However, it is not predicted to have a significant impact on fish-bearing sections of the river for two reasons:

- the fish-bearing reach is far enough away from the affected reach that the remaining stream area will be sufficient to support fish populations; and,
- an undisturbed tributary to Galore Creek downstream of the dam will continue to export allochthonous materials and invertebrates to the mainstem of the stream.

The Application indicates the presence of undisturbed tributaries downstream of dams has been shown to mitigate the impact of dams on stream invertebrate communities in arid climates. In these cases, the undisturbed tributary had intermittent flow, and was located in an arid, sparsely vegetated region of Utah, U.S. Furthermore, studies of streams in southeastern Alaska near the Project area have reported that small, non-fish-bearing headwater streams export significant amounts of invertebrates and detritus to fish-bearing streams, especially where the tributaries are dominated by riparian vegetation such as red alder (*Alnus rubra*). The tributary of Galore Creek downstream of the dam is similar to other studies; therefore, the export of organic matter from this stream to Galore Creek will likely be sufficient to support the small downstream fish population.

Access Corridor and Pipelines

Clearing of riparian vegetation for road and bridge construction over short distances and can affect the productive capacity of stream habitat over moderate distances. However, removal of streamside vegetation may also increase the amount of solar radiation reaching the stream, influencing primary production and boosting the short-term productivity of the habitat. Studies of deforestation have shown that periphyton biomass increases with decreasing shade, macroinvertebrate density increases, and Dolly Varden abundance increases. Additional armouring of stream banks with rip-rap alters the substrate size and may affect composition of the invertebrate community over short distances. Replacement of streamside vegetation and additional habitat compensation can mitigate these effects.

During construction, incidental sedimentation will occur at road crossings. The effect of this impact may be temporarily elevated suspended sediment levels; however, it will not persist beyond the construction phase for each crossing. Sediment is unlikely to accumulate in most of the streams crossed due to the steep, turbulent nature of most of the streams along the access corridor. Limited sedimentation is also expected to occur from the road bed during operation; however, sediment and erosion control plans will minimize this effect on the productive capacity of streams and waterbodies.

Contamination of habitat leading to decreased productive capacity for valued ecosystem component species may occur if the proposed slurry or fuel pipelines leak or burst near fish habitat. The most likely place for this to happen would be at any road crossings where the pipeline is not buried, but rather attached to the crossing structures. The pipeline will be directionally drilled under some road crossings; however, some pipeline crossings will be entrenched using a cut-and-cover methodology and others may have the pipeline affixed to the bridge above ground. This will require site isolation and sediment control techniques to prevent sedimentation in streams. Design specifications for the pipeline will ensure that where the pipeline is not buried under the stream, it remains insulated against freezing. In the event of a pipeline breakage, automatic switches would shut off the pumps driving the materials through the pipelines. Thus, the likelihood of a breach or breakage occurring is very low and the net effect, if it should occur, would not be significant.

Productive capacity of aquatic habitat may also be impacted by catastrophic slope failures, debris torrents, and avalanches associated with the proposed access corridor and its stream crossings. Road building has been associated with increased rates of slope failure and large-scale erosion, particularly in steep, coastal watersheds. Debris torrents in streams can affect productivity in streams for hundreds of years by scouring channels to bedrock, depositing fine sediment over downstream habitat, and blocking access to upstream habitat. The significance of this potential secondary effect could be very high. To mitigate this risk, a geohazard assessment was completed in 2005. Appropriate protective measures (e.g., revegetation and reshaping of slopes, diversion ditches and culverts) and erosion control will be implemented along the access road to manage water and maintain slope stability. The likelihood of a major slope failure will therefore be low, so no compensation is planned.

Porcupine aerodrome

The proposed Porcupine aerodrome will be constructed on the valley floor and old floodplain of the Porcupine River, and will likely include storage for fuel and de-icing substances. The old floodplain area is not flooded on a regular basis; however, major flood events (e.g., one in 50 or 100 years floods) may temporarily inundate the area and create fish habitat. Streams and waterbodies on the wide floodplain support invertebrate populations that contribute to the productive capacity of the watershed.

Storage of contaminants such as fuel and de-icing substances will be of importance due to the porous nature of the floodplain. The Application indicates that sub-lethal concentrations of chemical compounds used for de-icing aircraft have also been found in fish and invertebrates living downstream of major airports. Major spills could make their way into active fish habitat relatively quickly via groundwater flows through the porous gravel substrate. Accidental discharge of these substances could potentially cause a decrease in the productive capacity of habitat for all fisheries' valued ecosystem components.

Filter Plant Effluent

Construction of the filter plant diffuser will require instream work to bury the pipe and construct the diffusers that will release treated water into the Iskut River. The productive capacity of habitat for Dolly Varden, bull trout, and other fish species could be affected by this instream work; however, proper site isolation and sediment control techniques will limit the effect and residual effects will be negligible.

Chemical contamination from the filter plant effluent may also affect productive capacity in the Iskut River immediately downstream of the effluent diffusers. The filter plant effluent is predicted to have higher than normal concentrations of copper. During annual low flow conditions, the hazard quotient for copper is predicted to be greater than one (meaning that concentrations will exceed baseline conditions) from the diffuser pipe effluent to the confluence of More Creek, 6 kilometres downstream. The maximum predicted hazard quotient during this time period is 3, indicating that copper concentrations will be 3 times higher than baseline conditions. This represents a low effect on water quality, and is not likely to have a significant impact on the productive capacity of the river.

Substantial dilution will occur at the confluence of the Iskut River and More Creek, thus, productive capacity will not be affected beyond this point. During average annual flow conditions, effects on water quality are only expected for the 100 metres stretch downstream of the diffuser. Thus, the effects of increased copper concentrations will be limited to a relatively small area. Therefore, because of the limited geographic extent of this effect and the ability of fish valued ecosystem components to avoid the zone of impact, the residual impact on fish populations is predicted to be minimal.

<u>Habitat Loss and Alteration</u>

Mine Area
The upper Galore Creek watershed where the mine facilities will be located is not considered to be fish habitat. No activities in this area are predicted to have an effect on fish habitat in downstream areas.

Mill Tailings and Waste Rock Facility
The dam associated with the tailings facility will result in a direct loss of habitat at the site upstream of the dam because of water impoundment and alterations to flow and habitat downstream. As with the mine site, the loss of habitat due to construction of the tailings dam is not predicted to have a significant effect on fisheries, valued ecosystem components due mainly to the continued transport of invertebrates and allochthonous material from small tributary streams to downstream areas via the diversion channel.

The construction and operation of the dam will also result in alterations to the discharge pattern in the stream. High flows during freshet will be even higher due to increased decants from the tailings management area, while low flows will be lower due to the impoundment of water during the winter. The Application indicates this could lead to alterations in downstream habitat such as erosion, changes in channel complexity, alterations to sedimentation patterns, increased scour and bank erosion, and altered water temperature; however, while the flow of water will decrease in Galore Creek, water levels are predicted to lower by only 5%.

Access Corridor and Pipelines
Relatively minor losses and alterations of habitat may occur at crossings along the proposed access route. These include loss of habitat around bridge piers, alteration of stream banks through the application of rip-rap, removal of riparian vegetation cover and sedimentation from

construction and use of the access road. For all areas where a harmful alteration, disruption, or destruction of fish habitat is unavoidable and unmitigable, compensation will be undertaken to achieve the Fisheries and Oceans Canada's policy of no-net-loss of productive capacity of aquatic habitat. Following mine closure, the access corridor will be decommissioned, stream crossings removed, slopes stabilized, and denuded areas revegetated to prevent erosion and slope failure.

Habitat may be altered by the introduction of fine sediments from the road surface during construction and operation of the access corridor. Incidental sediment pulses during construction may occur; however, extensive sedimentation will be avoided through the application of sediment and erosion control plans. Any short pulses of sediment are not expected to have a significant or lasting impact on stream habitat. Proper sediment control plans will also limit the introduction of sediment to streams during road operation by directing sediment-laden waters away from stream channels.

A low probability exists for significant impacts to fish habitat from slope failure and/or pipeline leakage along the access corridor. Construction of forest roads has been correlated to a greatly increased occurrence of slope failures, especially in steep, coastal areas. Slope failure could lead to a range of impacts from increased sedimentation in stream channels to debris flows that scour stream channels and deposit large debris dams in rivers. Road design has a significant influence on the likelihood of slope failure. Best management practices in road alignment, design and construction will be employed to minimize these possibilities.

Porcupine Aerodrome
The proposed Porcupine aerodrome will be constructed on the valley bottom and greater floodplain of the Porcupine River. The floodplain is not flooded on a regular basis; however, major flood events (e.g., one in 50 or 100 year floods) may temporarily inundate the area and provide temporary fish habitat. The airstrip and its associated facilities will be located away from all active stream channels and wetlands on the floodplain; therefore, habitat on the floodplain and further downstream is not expected to be impacted. A very small amount of riverine habitat will be lost within the footprints of bridge pilings on the Porcupine River. This effect will be negligible on all fisheries, valued ecosystem components due to the small area affected.

Filter Plant
Construction of the filter plant and outfall pipe may result in short-term sedimentation into fish habitat, especially in the Iskut River where the effluent will be discharged. The filter plant outfall will be buried in the substrate on the bottom of the Iskut River, and will require the work site to be isolated and dewatered while construction occurs. Minor sedimentation along the pipeline route will also be controlled during construction.

Direct and Indirect Mortality

Mine Area
The mine site is not predicted to cause mortality, either directly or indirectly, to any of the fisheries valued ecosystem components. All mine water and the potentially acid generating material will be directed to the tailings management area.

Mill Tailings and Waste Rock Facility
The release of surface water decants from the tailings and waste rock facility will likely cause an increase in the concentrations of certain metals downstream of the dam. Any potential effects on fish mortality would be most evident near the mouth of Galore Creek, and would decrease rapidly as the effluent discharge becomes diluted in the much larger Scud and Stikine rivers. Hazard quotients were calculated for a variety of dissolved and total metals, anions, and nutrients. These quotients were based on the ratio of predicted concentrations to baseline concentrations in receiving environment water. Sulphate and molybdenum emerged as contaminants of concern from these calculations; however, concentrations are predicted to have negligible effects on fisheries.

Other parameters that are predicted to have high hazard quotients include fluoride, zinc, cadmium, selenium, ammonia, nitrate, and antimony; however, the hazard quotients for these parameters are based on baseline concentrations that are very close to the detection limit. This introduces more uncertainty into the assessment since average baseline conditions that approach the detection limit likely include several instances of "non-detects" where concentrations during certain months may have been too low to be detected, and were therefore replaced with an arbitrary value of half of the detection limit. This has the effect of artificially lowering the baseline concentration and inflating the calculated hazard quotient. Thus, despite the high hazard quotients reported for these parameters, the effects of them on the mortality of fisheries, valued ecosystem components are predicted to be negligible.

Site Runoff and Diversion Channel
Construction and operation of a diversion channel to direct clean water into the lower reaches of Galore Creek is unlikely to result in increased mortality among any of the fish species living in the study area. While there is a slight potential for potentially acid generating rock to generate acidic conditions, this has not been modelled yet.

Access Corridor and Pipelines
Construction and operation of the access corridor will not cause any direct mortality to fish. However, the Application notes that erosion and sedimentation arising from construction and use of the roads could, in a worst case scenario, smother incubating eggs or aquatic invertebrates in the gravels, or cause adult salmonids to avoid previously suitable spawning beds.

Increased access has the potential to cause increased mortality of sport fish species due to increased fishing pressure; however, access control will prevent public use of the road beyond the Iskut River, and mine employees will be prohibited from sport fishing anywhere along the road.

Porcupine Aerodrome
No mortality of fish is predicted to result from the construction or operation of the Porcupine aerodrome. Perimeter ditching and berming will be used to isolate the construction and operational footprint from surface drainages. All site water during construction and operations

will be directed to the ditch system and settling ponds as needed to ensure no introductions of sediment, or other deleterious substances into fish-bearing waters.

Filter Plant
The effluent from the filter plant is not expected to cause fish mortality. Modeling of predicted metal, anion and nutrient concentrations suggests that the concentrations of most metals and nutrients in the Iskut River will be diluted by a factor of 240:1 within 1,000 metres of the diffuser. This is predicted to have a minimal effect on fisheries valued ecosystem components in the Iskut River, and would not cause fish mortality, either directly or indirectly.

<u>Sublethal Effects</u>

Mine Area
The mine site in upper Galore Creek is not expected to have any sublethal effects on any of the fisheries valued ecosystem components. The mine site is located 14 kilometres upstream of the nearest fish-bearing section of Galore Creek; therefore, tremor effects are not expected to impact any fisheries valued ecosystem components. Residues from blasting materials and any leachate arising from the explosives manufacturing facility will be disposed of in the tailings facility with other waste-water from the mine. All mine water, potentially acid generating material, and runoff from waste rock will be directed to the tailings management area and deposition of contaminants from the air will be negligible, thus there will be no effects on habitat or fish in downstream reaches of Galore Creek.

Mill Tailings and Waste Rock Facility
During operation of the mine, tailings surface water will be released to Galore Creek, primarily during freshet. These discharges are expected to increase the concentrations of some metals, anions and nutrients, especially molybdenum and sulphates in Galore Creek and the Scud River. The effects of molybdenum and sulphate will have a negligible effect on fish health and behaviour in Galore Creek and the Scud River. Modeling of possible worst-case scenarios predicted maximum sulphate concentrations of <250 mg/L at the mouth of Galore Creek. This concentration is not expected to have any toxic effect on fish in the system. Similarly, sublethal effects from molybdenum toxicity typically become evident at much higher concentrations than are expected at the Project; thus, no effects are predicted on the health or behaviour of fisheries valued ecosystem components.

As described in previous sections, other parameters are predicted to have high hazard quotients, however, these calculations are based on artificially lowered baseline conditions. These parameters are not predicted to have effects on fisheries, valued ecosystem components.

Blasting will likely be required for construction of the tailings dam and associated structures. Tremor effects from these explosions may increase stress levels or cause habitat avoidance among fish in the lower reaches of Galore Creek. These effects have a low probability of occurrence because the dam and associated structures are located at least 4 to 14 kilometres upstream of the nearest fish-bearing habitat.

Following mine closure, tailings water will be allowed to flow freely over the dam. Water quality will be required to meet post-closure criteria for metals and nutrients. Some treatment (e.g., with limestone) may be required. Modeling of post-closure concentrations will be completed before mine decommissioning in order to predict final effluent concentrations; however, no significant effects are predicted on fisheries, valued ecosystem components.

Site Runoff and Diversion Channel
Uncontrolled site runoff could produce sublethal effects among fisheries valued ecosystem components through the introduction of sediment and acid rock drainage to lower Galore Creek. The Application indicates that increased sediment levels can increase stress, or habitat avoidance behaviour among exposed fish and acid rock drainage can lower the pH of receiving water, impacting the survival and growth of fish, especially juveniles.

Access Corridor and Pipelines
Potential sublethal impacts on fisheries, valued ecosystem components arising from the proposed access corridor include habitat avoidance due to sedimentation, loss of cover, tremor effects from pile driving at bridge crossings and blasting during construction, and possible increased physiological stress.

The Application indicates that sedimentation arising from construction and erosion from active roads could potentially smother incubating eggs or aquatic invertebrates in the gravel, or cause adult salmonids to avoid previously suitable spawning beds. These effects would only affect fish at or near stream crossings and most fish would avoid the work sites during construction activities.

Loss or alteration of cover within and along streams may result in habitat avoidance, increased stress, or decreased growth among resident fish. Loss of cover from the removal of streamside vegetation will occur within the access corridor right-of-way at each stream crossing. Vegetation will be maintained wherever possible, and crossing structures themselves will provide cover following construction. Additional cover may also be provided by in-stream pilings, mitigating the effect of habitat loss resulting from the emplacement of these structures.

Tremor effects from blasting and pile driving may also increase habitat avoidance and stress. Stress resulting from the effects of pile driving and blasting along the road route will be mitigated by limiting construction to timing windows that will be set and approved by the appropriate government regulators, and by removing fish from the immediate vicinity of the construction.

Porcupine Aerodrome
Fish health and behaviour could be impacted by spills of fuel or de-icing compounds used at the proposed Porcupine aerodrome. The Application indicates that sublethal concentrations of chemical compounds used for de-icing aircraft have also been found in fish and invertebrates living downstream of major airports. The airstrip and its ancillary facilities will be located on relatively dry ground near the southeast end of the old floodplain and valley floor, such that direct spills of contaminants into streams are not anticipated. However, the floodplain is comprised of porous gravel substrates that would likely transport contaminants fairly quickly through groundwater to surrounding streams. Studies of major fuel spills have indicated that secondary production may suffer as far as 12 kilometres downstream of a spill site, and may persist for longer than a year. All fuel will be stored in bermed and lined containment facilities to prevent spills from seeping into the soil. Spill kits and spill contingency plans will minimize the effects of any small to moderate spills on the environment.

Filter Plant
The construction and operation of the filter plant and associated pipeline could result in sublethal effects on fish species in the Iskut River near the effluent diffuser. During construction of the filtrate pipeline, sedimentation could occur that might cause habitat avoidance among fish

in the Iskut River. This effect would be temporary and minor. The Iskut River is naturally turbid, and fish species living there are acclimated to such conditions.

During plant operation, minor habitat avoidance may occur in the immediate vicinity of the effluent diffuser. Copper is expected to be a metal of concern downstream of the filter plant effluent diffuser. Dilution of the effluent will reach a ratio of 240:1 within 1 kilometres during low flows, and by the time the effluent reaches the confluence with More Creek, the effect of increased copper concentrations will be negligible. Habitat avoidance may occur in this area, but is not predicted to affect fish farther away; therefore, the effect will be negligible.

Transportation of the concentrate from the filter plant to Stewart along Highway 37 also presents a few minor risks. An accidental spill of concentrate near a fish-stream could affect fish health in the immediate vicinity. These potential effects are predicted to be unlikely and minor, such that no compensation is required.

Project Effects on Dolly Varden

Dolly Varden are the most abundant and widespread fish species along the proposed access corridor and were the only species captured in the More Creek watershed during the 2004 - 2005 field program. Although much of the access corridor will be constructed through non-fish-bearing watersheds, 28 fish-bearing streams will be crossed (mainly in the lower More and Iskut watersheds). Most of these fish-bearing crossings support populations of Dolly Varden. In addition, non-fish-bearing streams throughout the access corridor eventually flow into fish-bearing waters where Dolly Varden is present. The Application indicates that Dolly Varden is usually associated with cold, clean waters; however, in the Project area, they have commonly been found in cold, turbid streams. This implies that the fish are accustomed to high sediment loads in many streams in the area. Nevertheless, proper and carefully managed sediment control and erosion prevention plans will be used to ensure that water and sediment quality is maintained especially along the access corridor.

Productive habitat at road crossings may be affected by sedimentation, slope failure, or substrate changes that result from construction. Direct loss of Dolly Varden habitat is predicted to be minimal along the proposed access corridor. Small amounts of habitat will be lost at bridge piers. This loss of habitat will be compensated for by creating additional habitat in the Project area, most likely in wetlands. Alteration and destruction of riparian vegetation will occur at most crossings, resulting in very short sections of decreased cover for fish relative to stream lengths. This effect is predicted to be temporary, since stream banks will be revegetated following bridge construction and the bridges and culverts themselves will provide cover for fish. Every effort will be made to maintain the natural vegetation along stream banks, even under bridges and arch-culverts. At any crossing where it is necessary to destroy riparian vegetation, reclamation and compensation activities will occur to replace lost habitat value.

Wetlands provide important rearing and overwintering habitat for Dolly Varden. Sediment deposition in these areas may alter invertebrate density and result in a decrease in the ability of the wetland to support fish. Productive capacity may also be altered by the building of roads over wetland habitat. Dolly Varden habitat may be impacted at one wetland site along the proposed access corridor. The proposed road traverses a wetland in the lower More Creek watershed containing channels and open water that provide excellent rearing and overwintering habitat to resident Dolly Varden. The road will avoid these important open-water areas and stream channels in this wetland will be crossed with open-bottom arch-culverts; however, the road itself will be located in riparian wetland habitat that may provide food and nutrients to fish during high-water periods. This habitat loss will be compensated for by creating additional wetland habitat.

Dolly Varden may have decreased productive capacity in Galore Creek from various aspects of the Project. Construction of the tailings facility, located approximately 3.2 kilometres upstream from the confluence of Galore Creek and the Scud River, will largely block the downstream flow of allochthonous matter from the middle and upper reaches of Galore Creek. The habitat that will be lost upstream of the tailings impoundment is of low value to Dolly Varden downstream for several reasons. It does not actively support fish populations because a canyon on lower Galore Creek acts as a velocity barrier preventing the upstream migration of fish into the reach. Streams in the upper valley support populations of invertebrates; however, it is unlikely that many of these invertebrates drift far enough to become part of the downstream food chain. Allochthonous exports of organic material may be more important than invertebrate drift, as they provide nutrients that support downstream production. The use and maintenance of a diversion channel over the mine life should direct enough of these materials to downstream reaches to support natural secondary production in fish-bearing areas. Once the diversion channel is breached after mine closure, the remaining watershed area will likely contain sufficient natural production to support the small population of Dolly Varden living at the mouth of the stream. No significant effects of reduced productive capacity are predicted for Dolly Varden living in the Scud River, which has many times the flow volume of Galore Creek.

The reduction of the hydrograph may contribute to the simplification of habitat downstream of the dam by eliminating side-channel habitats that fish depend on. The Application notes that Dolly Varden and bull trout juveniles have been found to be strongly associated with high channel complexity and in-stream cover. The construction of dams and the controlled release of larger than normal quantities of water can result in scouring of habitat at high flows, and lower water levels at low flows. Winter low flows in Galore Creek are already very low and likely limit fish access to side-channel habitat. Summer high flows that flood side-channel habitat have also been documented during baseline studies). During these extreme flow periods, fish may migrate back and forth to the Scud River, or seek refuge in less ideal habitat such as boulder substrates and small eddies. Water levels are predicted to change by approximately 5% from baseline conditions. Dolly Varden appear to be adapted to the high natural variability in flows in Galore Creek, and likely migrate into and out of the mouth of the stream as conditions become more or less favourable; thus, water level alterations to their peripheral rearing habitat are not predicted to have a significant impact on the species.

Spawning Dolly Varden have been captured near the mouth of Galore Creek during baseline studies. The Application indicates that Dolly Varden spawn in the autumn in coarse gravel substrates, and their eggs incubate throughout the winter low-flow period. During this period, they are susceptible to water level changes as this could lead to the dewatering and freezing of eggs. Winter low flows in Galore Creek will be monitored to prevent water levels from falling so low as to endanger eggs and alevins that may be deposited in the gravel of lower Galore Creek.

Dolly Varden are abundant throughout the Porcupine River floodplain, living in the mainstem of the river, in side-channels and sloughs, and in the many small tributaries arising from the valley walls. Habitat in these channels is not expected to be impacted by construction or operation of the aerodrome, as they are well removed from the preferred aerodrome site.

Dolly Varden is at risk from contaminant spills near the aerodrome. Spills of fuel or de-icing fluid could potentially affect the small streams arising from and flowing over the floodplain downstream of the airstrip. Productive capacity of these habitats may be altered by the surface or groundwater transport of contaminants to invertebrate communities; however, the likelihood of this occurring is very low. Fuel and other contaminants will be kept in tanks surrounded by lined berms designed to contain any spills. Spill kits and management plans will limit the possibility that any uncontained spill will have a serious effect on the productive capacity of habitat for Dolly Varden.

Sublethal effects arising from the tailings facility could affect Dolly Varden using the lower reaches of Galore Creek. The Application notes that no data exists detailing the specific effects of sulphate and molybdenum on char species; however, studies of Pacific salmonids indicate that they generally have a relatively high tolerance for sulphate compared to invertebrates and some other fish species.

Sedimentation and acid rock drainage could also contribute to sublethal effects on Dolly Varden near the mouth of Galore Creek. Excess sedimentation could cause habitat avoidance when concentrations are particularly high; however, sediment and acid rock drainage erosion control plans will be developed to mitigate this effect. Because acid rock drainage has not been modelled for the diversion channel, it is difficult to make meaningful predictions of impacts on specific species in the mine receiving environment. Little is known about the effects of acid rock drainage on Dolly Varden. The Application indicates that brook trout (*Salvelinus fontinalis*), a close relative of Dolly Varden, have been found to have depressed plasma sodium levels and increased plasma glucose levels in untreated acid rock drainage effluent, but not in treated acid rock drainage effluent. This had the effect of inducing severe physiological stress on the fish. For this reason, high priority will be afforded to runoff control, sediment retention, segregation and management of potentially acid generating material, and overall water balance. Ongoing monitoring of water quality both in the tailings and diversion channel will detect acid rock drainage, and contingency plans (i.e., water treatment) will be developed as necessary.

Project Effects on Bull Trout

Bull trout have not been identified in Galore Creek; however, they have been captured in the Scud River downstream of Galore. It is possible that bull trout exist in limited numbers in Galore Creek but they have not yet been genetically identified. Bull trout are differentiated from Dolly Varden mainly through genetics, as they are physically alike, with similar habitat and food requirements. If bull trout are present in lower Galore Creek, then the impact on the productive capacity of their habitat would be similar to the impacts observed on Dolly Varden, and the residual effects of these impacts are predicted to be negligible.

Bull trout, which share similar habitat and contaminant sensitivities with Dolly Varden, would likely be affected in the same manner. While bull trout are not known to inhabit lower Galore Creek, their possible presence may be inferred by the capture of a single individual in the Scud River in 2004. If they occur in the lower Galore Creek drainage, bull trout would experience similar sublethal effects as Dolly Varden as a result of the diversion channel.

Bull trout are less abundant than Dolly Varden along the proposed access corridor, and have only been captured in the Iskut River. However, it is possible that they occur, but have not yet been identified in other drainages in the Project area, including More Creek. Bull trout, like Dolly Varden, are sensitive to the effects of development on their habitat. Studies have found that bull trout abundance has been negatively correlated with increased sediment levels; thus, it will be important to maintain sediment and erosion control plans to protect bull trout habitat.

Pure bull trout have not been captured in the Porcupine River watershed; however, first-generation bull trout or Dolly Varden hybrids have, implying that there may be bull trout present. Bull trout utilize the same habitat types as Dolly Varden and, like Dolly Varden, are at a low risk of being affected by any changes in productive capacity near the proposed aerodrome. Bull trout habitat is not expected to be impacted significantly by construction or operation of the aerodrome.

Bull trout have been captured in the Iskut River downstream of the proposed road crossing. Also, bull trout and Dolly Varden hybrids have been captured in the Porcupine River downstream of the proposed bridge crossing, which suggests that pure bull trout may also exist nearby. Bull trout habitat at these two locations will primarily be affected by instream piers at bridge crossings. Habitat loss is expected to be limited to the footprints of the piers, and alterations to habitat due to the release of sediment will be minimized through the use of isolation techniques and sediment control plans. Habitat loss will be compensated for and is not predicted to have a significant effect on bull trout populations in the study area.

The Application indicates that increased densities of forest roads have been associated with decreases in bull trout populations; however, the reported losses included fish that were poached due to increased public access, cut-off from spawning grounds due to poorly designed crossings, displaced by introductions of non-native fish, and erosion and habitat degradation arising from road construction. Most of these effects will be limited by controlling public access to the road.

Bull trout are relatively scarce in the Project area and are therefore of limited interest to recreational fishers. Stream crossings over fish-bearing streams will be designed to allow unobstructed fish passage. Sedimentation will be limited through the use of detailed and properly managed sediment control plans. The effect on bull trout mortality is therefore assessed as negligible.

Project Effects on Pacific Salmon

Pacific salmon species are not found in any of the streams associated with the proposed access corridor, except the Porcupine River, where coho and sockeye salmon use the side-channels well below the bridge crossing site for spawning and rearing. No direct or indirect mortality to Pacific salmon is expected as a result of the proposed access corridor. Increased, but restricted, access to the Porcupine and Stikine rivers will not lead to increased fishing, as sport fishing will be prohibited for workers staying at the camp, and public access to the mine road will be prohibited. Pacific salmon are not expected to experience any sublethal health or behavioural effects as a result of the access corridor development because they are not present along most of the route.

Pacific salmon species, notably coho, sockeye, and Chinook, occupy streams and rivers surrounding the proposed aerodrome. Several species of Pacific salmon, especially coho and sockeye, are known to spawn in the Porcupine River and its tributaries. Coho and sockeye both spawn near the mouths of clear tributaries of the Porcupine and in the mainstem itself. One important spawning site, supporting several dozen spawners, has been observed near the northwest corner of the Porcupine floodplain. Juvenile coho are known to rear in the many side channels and tributaries on the floodplain, while juvenile sockeye likely utilize wetland and beaver dam habitat close to the mainstem of the river. These streams and spawning areas are located well away from the proposed airstrip location, such that any alterations to habitat due to aerodrome construction or operation would be minimal.

Juvenile Chinook salmon are known to inhabit larger, more turbid tributaries of the Porcupine River east of the proposed airstrip. The Porcupine River watershed may also support very limited numbers of pink and chum salmon; however, this has not been confirmed in the field. Juvenile coho, because of their association with small, clear side-channels, are probably most at risk by any decreases in productive capacity associated with the proposed aerodrome. However, the probability of a significant impact on productive capacity occurring would be very low due to the proposed spill and sediment management plans.

Pacific salmon species are present at the proposed Porcupine River bridge crossing. Habitat loss is expected to be limited to the footprint of the bridge piers at that site. Sediment releases will be minimized through the use of isolation techniques and sediment control plans. Habitat loss will be compensated for elsewhere, and is not predicted to have a significant effect on salmon populations in the study area.

The tailings impoundment and waste rock facilities are not predicted to have an affect on the habitat of any Pacific salmon species in the Project area. While coho and sockeye salmon have been observed and captured in the Scud River, most of them utilize habitat mainly in its lower reaches that is well downstream of the predicted areas of influence and are not likely to be affected The river has many times the flow volumes of Galore Creek and the salmon spawning grounds are well downstream and largely off-channel. Surface water decants will ensure that discharges generally follow the natural hydrograph, with greater decants during periods of high stream flow. This will ensure adequate dilution of tailings effluent such that organisms living in the Scud River will not be affected.

The reduction of productive capacity in Galore Creek is predicted to have no impact on Pacific salmon species. Pacific salmon health and behaviour are not expected to be impacted by the mine tailings or impoundment facility. Pacific salmon will not be affected by the diversion channel, as they are primarily found far downstream in the Scud River where any potential effects would be negligible. Juvenile coho, because of their association with small, clear side-channels, are probably most at risk to be affected by any contaminant spills that might reach streams through groundwater flow. However, the probability of a significant impact would be very low due to the proposed spill containment and management plans.

Project Effects on Other Fish Species

Other fish species living in the Scud River in the vicinity of Galore Creek include slimy sculpins and mountain whitefish. These species have never been captured in Galore Creek, instead relying on the resources of the Scud River; thus, they would not be affected by the loss of productive habitat in Galore Creek. Any mountain whitefish and slimy sculpin occurring near the mouth of Galore Creek would experience similar conditions as Dolly Varden and bull trout. Little is known about the effects of contaminants on these species; however, concentrations are not predicted to be high enough to significantly affect any fish and these species were not present at the mouth. No other fish species are expected to experience lethal effects due to the diversion channel. No other fish species are predicted to experience habitat loss or alteration as a result of the construction or operation of the tailings impoundment.

Other fish species found in streams along the proposed access corridor include rainbow trout (in streams and rivers near Bob Quinn), longnose sucker (in wetlands and rivers near Bob Quinn), mountain whitefish (mainly in the Iskut River), and slimy sculpin (possibly in streams near the Iskut River). Productive capacity of fish habitat in these streams could be affected by sedimentation from road and pipeline construction and operation. Productive capacity could also be affected at four crossings where instream piers will be required. Habitat in the immediate footprint of the piers/pilings will be lost, and construction of the piers may create minor sedimentation. Sedimentation will be limited by proper site isolation and sediment control plans, and permanently displaced habitat will be compensated for in other areas. Piers may also trap material such as bedload and large woody debris, which can then create scour. Due to the limited geographic extent of such effects, decreases in productive capacity resulting from bridge piers are predicted to be negligible.

Other fish species captured along the access corridor include mountain whitefish, rainbow trout, and slimy sculpin. These fish were captured in the Iskut and Porcupine watersheds in small numbers. Habitat loss will be limited to the footprints of bridge piers at the Iskut and Porcupine river crossings. Habitat alteration due to sediment deposition will be minimized through the use of sediment and erosion control plans and site isolation techniques, such that construction and operation of the access corridor will not result in any lasting or significant effects on fish populations. Other fish species in the Project area are also not expected to experience increased mortality as a result of construction and use of the access corridor. Sedimentation, which would be the most likely mode of increasing mortality among eggs and juveniles, will be controlled through the application of effective sediment control and erosion prevention measures.

Any sublethal effects among mountain whitefish, rainbow trout, longnose sucker, or slimy sculpin are not expected to be significant during construction or operation of the access corridor. Temporary habitat avoidance may occur during construction if sedimentation increases at construction sites or during road operations. Sedimentation will be minimized through the use of sediment and erosion control plans.

Limited sport fishing for rainbow trout already occurs in some of the small lakes along the existing portion of the access corridor near Highway 37. Construction and operation of the access corridor and associated access control points may actually decrease sport fishing in some lakes by limiting public access to these areas.

The Porcupine River watershed also supports smaller populations of mountain whitefish and slimy sculpin. Mountain whitefish were found primarily in the active mainstem channel of the river and would not likely be affected by any small changes in productivity associated with the proposed aerodrome. Slimy sculpin are found in small numbers throughout the watershed. As with other species, they are not predicted to be impacted significantly by any localized alterations to productive capacity on the floodplain. Neither species is expected to be impacted by construction or operation of the aerodrome.

Project Effects on the Stikine River

Potential effects on the Stikine River are only expected in the highly unlikely event of a tailings dam rupture. Tailings water and sediment would likely travel as far as the Stikine. This may have catastrophic effects on the productivity of the river, affecting not only fish species, but also wildlife and humans. Productive capacity would likely be altered for years as newly-exposed potentially acid-generating rock begins to leach acid, and contaminated sediment settles onto the substrate of the river. In practice, the tailings dam will be constructed to last indefinitely and become a permanent feature of the landscape.

2.8.3 Issues Raised and Proponent Response

During the Application review, the following key issues were identified by the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team:

- There is concern that there may be potential sediment effects resulting from channel re-alignment in the Porcupine River after major floods. The Proponent has designed the aerodrome to be above the active floodplain. If remedial earthworks are required, sediment and erosion control plans will be used to minimize any impacts on the Porcupine River.
- Fish sampling during low flow in Galore Creek required to confirm that the creek is non-fish bearing. Future sampling in Galore Creek is being planned for the winter of 2007 with participation by the Proponent, Fisheries and Oceans Canada, Ministry of Environment and Tahltan Central Council.

Questions on the potential for the Porcupine aerodrome site to become fish habitat were raised during the Application review. The Proponent completed floodplain mapping at the aerodrome site, which confirmed the 200-year flood event did not encroach on the proposed aerodrome site (see report entitled "Porcupine River Floodplain Declineation near the Proposed Aerodrome Facility" and listed in Appendix A).

There are potential effects of the Project on the newly identified wetland along More Creek. During the Application review, the Proponent investigated the potential to realign the road and has determined the area can be avoided.

- The effects of lowered water flow budget on the overall water quantity of the Lower Galore are a concern to Fisheries and Oceans Canada as this area is fish habitat. The Proponent has committed to monitoring the flow regime of this area, identifying the habitat usage by local species and to maintain minimum flows throughout the year.
- A conceptual fish habitat compensation for the harmful alteration, disruption or destruction associated with the Project has been developed and will be approved by Fisheries and Oceans Canada before the environmental assessment can be completed.

- More details of the design, installation and engineering aspects of the diffuser on the Iskut have been requested. More details of the use of this area of the Iskut River by Mountain whitefish have also been requested.
- Contingency plans for restoration, particularly of environmental effects, in event of catastrophic breaching of the dam was requested. The Proponent has committed to establish an ongoing initiative with the Tahltan Central Council and relevant Canadian, U.S. federal, B.C. and Alaska government agencies to assess at a conceptual level, the potential effect of a catastrophic dam failure and develop a program for remediation of those effects.

2.8.4 Proposed Commitments and Mitigation

The Proponent has committed to developing a fisheries management and fish habitat compensation plan in consultation with Fisheries and Oceans Canada, Tahltan Central Council, and Ministry of Environment. Proposed mitigation measures will include:

- sediment and erosion control plan, site isolation during construction, settling ponds and diversion;
- water treatment facility;
- spill management plan;
- contained de-icing area at aerodrome;
- all runoff will enter tailings impoundment;
- storage of concentrate away from streams; and,
- schedule discharge at high flows, monitoring.

Where mitigation is not possible (i.e., due to habitat loss), compensation plans will be developed to ensure no net loss of fish habitat. In addition, an environmental effects monitoring program will be implemented to evaluate the effectiveness of environmental protection measures and to monitor the health of aquatic ecosystems associated with the mine site.

The Proponent has committed to aquatic effects monitoring and follow-up (see section 4.2.5 of this Report) to support or verify the predictions made on environmental effects.

2.8.5 Significance of Residual Effects

For the purposes of this report fish and fish habitat issues were compiled into four categories for evaluation: productive capacity of habitat; habitat loss and alteration; direct and indirect mortality; and sublethal effects.

Residual effects (after mitigation) on fisheries valued ecosystem components are predicted to occur during the construction, operation, and decommissioning of the Galore Creek Mine as outlined above.

The residual effects identified as considerable by the Proponent include:

- increased sediment loads from slope failure causing sublethal effects on Dolly Varden, decreased productive capacity, and habitat alteration/loss;
- construction of the road causing a loss of habitat and productive capacity for Dolly Varden in a wetland along the road route; and,
- increased metal, anion, and nutrient concentrations in tailings effluent causing a decrease in productive capacity and sublethal effects on Dolly Varden and bull trout in lower Galore Creek.

Slope failure along the proposed road route was considered to have the potential to adversely affect fisheries valued ecosystem components because these events often have a significant impact on the local environment. However, effects from landslides are not predicted to extend beyond the local area of occurrence, nor are they predicted to affect entire fish populations. In addition, the probability of slope failures occurring is relatively low; therefore, the residual effects are not significant.

Loss of wetland habitat may also have a significant impact on fish populations; however, like slope failures, the geographic extent of habitat loss related to the Galore Creek Project is limited to a single wetland. Also, while the affected wetland does contain high-quality fish habitat, the quality of habitat that will be destroyed (*i.e.,* riparian willow thicket) is low in relation to the types of habitat available in the rest of the watershed. Thus, the residual effects are also predicted to be insignificant.

Effluent discharge, both intentional and unintentional, may affect the productive capacity of downstream habitat, as well as the health and behaviour of Dolly Varden and (potentially) bull trout in the lower reaches of Galore Creek. During operations, water quality will be monitored regularly to ensure that these effects do not occur as a result of regular tailings facility discharges. Accidental releases of effluent may have a larger magnitude effect and affect a larger geographic area; however, the probability of an accidental release will be so low as to render the effect insignificant.

In summary, while the construction, operation, and decommissioning of the Galore Creek Project may impact fisheries valued ecosystem components, the residual effects of these impacts are predicted to be insignificant in terms of productive capacity, habitat loss, mortality, and fish health.

All of these effects are predicted to be minor, provided appropriate sediment and erosion control plans, spill containment measures, and water quality guidelines are followed.

2.8.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the Project on fish and fish habitat; and responses from the Proponent.

Based on the information in this Joint Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working group, are satisfied that the Project is not likely to cause significant adverse environmental effects on fish and fish habitat.

2.9 WETLANDS

2.9.1 Background

Wetland quantity and quality vary spatially within the Project area due to differences in topographic features. Topographic features influence hydrology, which in turn determine the type and extent of wetlands present.

Table 5 describes wetland regions and their proximity to project components.

Table5. Characteristics of the Seven Wetland Regions within the Study Area

Mine Infrastructure	Wetland Region (WR)	Wetland Area (hectares) in Close Proximity to Development	Predominant Hydrogeomorphic Wetland Type	Example of Important Wetland Ecosystem Function
Filter Plant* and Access corridor				
	Iskut	24.4	Lacustrine	Waterfowl habitat
	East More	115.0	Fluvial	Hydrological
	Central More	74.0	Seepage slope	Hydrological
	West More	30.5	Fluvial and seepage slope	Hydrological
	Sphaler	2.5	Lacustrine	Carbon sequestration
	Porcupine	14.3	Lacustrine	Wildlife habitat
	Scotsimpson/Galore	0.0	NA**	NA
Aerodrome Facility				
	Porcupine	14.7	Fluvial	Fish habitat
Mine Site				
	Scotsimpson/Galore	16.9	Seepage slope	Hydrological

*** Located only in Iskut Wetland Region**
**** NA = not applicable. This area of the Scotsimpson/Galore Wetland Region did not contain any wetlands.**

2.9.2 Project Effects

Wetlands were selected as a valued ecosystem component because of their importance in ecosystem functions and in respect of wetland-related policy and legislation. As transition zones (ecotones), wetlands provide habitat for a wide range of organisms. Wetlands within the Project area provide habitat for aquatic and terrestrial organisms including algae, hydrophytes, invertebrates, amphibians, fish and mammals. The assessment focused on species that are dependent on wetland habitat for all or part of their life history requisites (i.e., fish, grizzly bear, moose and western toad).

Potential Effects and Evaluation

Wetland Area Loss or Altered

Access Corridor
Access corridor development will result in the direct loss of 4.4 hectares of wetlands. Two hectares of the wetland area that will be lost is dominated by sedges and provides habitat for both grizzly bears (spring forage habitat) and western toads (reproduction habitat). Sedge dominated wetlands are relatively abundant (60 hectares) within the Project area. Consequently, the direct loss of 2 hectares of this wetland type is not expected to have a significant effect on the biodiversity function of the Project area's wetlands.

The access corridor bisects two large wetland areas within the East More-Wetland Region and may restrict wildlife movement (e.g., bears and western toad) within the wetlands. Noise from corridor construction and use may also reduce the bear habitat value of the wetlands.

Fish habitat has also been identified in one of the wetlands that the access corridor bisects. Corridor development within this wetland could degrade fish habitat value by increasing sediment and contaminant loads. Degradation of fish habitat could also occur due to corridor construction and use that occurs upslope of wetland areas.

Aerodrome
Wetlands are located in close proximity to the proposed aerodrome site. These wetlands have been identified as having high grizzly bear and moose forage value. Noise and other activity at the aerodrome site may reduce the wildlife habitat function of these wetlands.

The biodiversity function of wetlands downstream of the aerodrome could be affected due to contamination caused by aerodrome construction and operation. For instance, increased sedimentation and contaminant loads to the Porcupine River from the aerodrome could reduce the fish habitat value of downstream wetlands.

Mine Area
Wetlands that will be lost (7.9 hectares) or potentially altered (6.7 hectares) within the mine site are dominated by grizzly and moose forage species. However, due to the high elevation of the area these wetlands currently have low grizzly bear and moose habitat value (see section 2.11 of this Report). Consequently, the loss or alteration of these wetlands is not anticipated to have a significant effect on the Project area's grizzly bear and moose habitat.

Mine area wetlands that will be lost or altered do currently provide western toad reproduction habitat. However, these wetlands only represent a small percent (6.5%) of the abundant wetland western toad reproduction habitat in the Project area. Consequently, the loss of western toad habitat within the mine site is not assumed to have a significant effect on the Project area's toad population.

Hydrological Function

Access Corridor
The access corridor will be built with a sufficient number of culverts so that it will not act as a barrier to down-slope water flow. Although this should ensure that the integrity of upslope wetlands are not compromised, wetlands down-slope of the corridor will be exposed, after development, to different water flow patterns. This hydrological alteration will presumably result

in the loss of some wetland areas as well as the creation of new wetland areas. Consequently, the net effect of development along the access corridor on wetland hydrological functions is presumed to be negligible.

Aerodrome
Construction of the aerodrome facility could impact the hydrology of downstream wetlands. For example, flood control measures designed to protect the aerodrome could result in altered water flow to downstream wetlands during freshet. This may in turn reduce the ability of these wetlands to buffer against downstream flooding.

Mine Area
Development in the mine area will result in the loss (7.9 hectares) and alteration (6.7 hectares) of wetlands. The water retaining function of these lost and altered wetlands will be offset by the creation of the open mine pits.

<u>Water Quality Function</u>

Access Corridor
Wetlands that will be lost along the access corridor are currently dominated by sedges. These wetlands (fens) have limited surface water flow. Due to their high organic matter content they are able to improve water quality by sorbing contaminants from the water as it percolates to depth and/or flows laterally through the subsurface.

The type of wetland that will be lost along the access corridor is common in the study area. Consequently, it is not anticipated that the access corridor will have a significant effect on the water quality function of the Project area's wetlands.

Aerodrome
The wetlands downstream of the proposed aerodrome site have high value in terms of maintaining surface water quality. This is due to the fact that they have abundant macrophyte cover. Macrophytes slow water velocity and allow sediments and other particulates to settle out of the water column. The wetland's high macrophyte cover and sediment organic matter content also provides suitable surface areas for contaminant sorption.

Altered upstream hydrology due to aerodrome development could result in higher water levels and the loss of macrophyte habitat. This would reduce the water quality function of these wetlands. Altered upstream hydrology could also result in the creation of macrophyte habitat. As macrophyte habitat loss is expected to be paired with macrophyte habitat creation the affect of aerodrome development on the Project area's water quality function is not expected to be significant.

Mine Area
The water quality function of sediment deposition function of lost wetlands (7.9 hectares) in the mine area will be offset by the creation of mine pits. These pits will have low flow through velocity, which will result in the settling out of particulate materials such as sediments.

Carbon Sequestration Function

The ability of peatlands (fens and bogs) to sequester carbon can influence the global climate. In peatlands, primary production exceeds decomposition resulting in a net removal of carbon from the atmosphere. Peatlands are efficient at sequestering carbon due to their environmental conditions.

Access Corridor
Of the wetland area that will be lost (4.4 hectares) due to access corridor development less than 2 hectares is peatland. This represents 1% of the total peatland (193 hectares) in the Project area. Therefore, it is not anticipated that the access corridor will have a significant affect on the carbon sequestration function of the Project area.

Aerodrome
Wetlands that may be potentially impacted by the aerodrome development (those located downstream) are marshes. Unlike peatland, marshes are not as valuable in terms of carbon sequestration. Consequently, the development of the aerodrome is not expected to have a significant affect on carbon sequestration within the Project area.

Mine Area
Wetlands that will be lost (7.9 hectares) or altered (6.7 hectares), due to mine area development, are peatlands and thus currently have high value in terms of their carbon sequestration function. However, the mine area peatland only represent a small percentage (8%) of the Project area's abundant (193 hectares) peatland. Consequently, it is not anticipated that the development of the mine area will have a significant affect on the carbon sequestration function of the Project area.

According to the Application, the peatland that will be directly lost due to mine area development currently stores between 2.5 and 4.2 tonnes of carbon per year. This represents less than 0.00001% of B.C.'s annual 63.5 mega tonnes of carbon emissions.

Summary
In summary, the amount of wetland area that will be directly lost due to development (12.3 hectares) represents 4% of the total wetland (293 hectares) habitat within the Project area. The reason for the low percent of wetland loss is due to the conscious effort of project designers to adhere to the first step of the federal wetland mitigation process (i.e., wetland avoidance).

The only effect of project development that is anticipated to have a significant consequence to wetland functions is the degradation of fish habitat in the More Creek area. Compensation for loss of wetland function will be implemented as fish habitat will be created.

2.9.3 Issues Raised and Proponent Response

During the Application review, the following issues were raised by government agencies and the Tahltan Resource and Environmental Assessment Team during the review:

- Clarification on the numbers of hectares of wetland lost.
  The Proponent reassessed the wetland area within the mine footprint using data related to soil types. This assessment found that the extent of the area had originally been overestimated. The new calculated value is 7.9 hectares. The wetland area within the access road was also recalculated using the most current road alignment. The amount of wetland loss due to the access road is 3.0 hectares.

- Potential effects of the access road and Porcupine airstrip on wetlands
  The Proponent will attempt to minimize changes to natural water flows. The Proponent acknowledges that the hydrology of wetlands down slope of development could be altered which in turn may result in a change in the dominant vegetation type.

2.9.4 Proponent Commitments and Mitigation

The Proponent has committed to undertake the following measures and commitments to mitigate potential effects on wetlands:

- address compensation for loss of wetland function in the fish habitat compensation plan;
- avoid wetlands where possible;
- transport of concentrate and diesel along the pipelines will reduce the amount of traffic on the road which will minimize effects on wetlands;
- reduced anthropogenic activity once mine is deactivated will allow western toads to move from wetland to wetland without the risk of anthropogenic related death;
- deactivation of road will allow western toads to more safely move from wetland to wetland without the risk of anthropogenic related death;
- reduced anthropogenic activity once corridor is deactivated will improve grizzly bear habitat (e.g., less anthropogenic noise);
- reduced anthropogenic activity once mine is deactivated will allow grizzly bears to move from wetland to wetland without the risk of anthropogenic related death;
- compensatory habitat creation; and,
- reduced sediment loading following deactivation of road.

2.9.5 Significance of Residual Effects

The amount of wetland area that will be directly lost due to development (12.3 hectares) represents 4% of the total wetland (293 hectares) habitat within the Project area. The reason for the low percent of wetland loss is due to the conscious effort of the Proponent to adhere to the first step of the federal wetland mitigation process (i.e., wetland avoidance).

The Project design has adhered to the second step of the federal wetland mitigation process and has developed strategies that when implemented will minimize the effects of development on wetland functions.

The only effect of project development that is anticipated to have a significant consequence to wetland functions is the degradation of fish habitat in the More Creek area. Here the third step of the federal wetland mitigation process (i.e., compensation for loss of wetland function) will be implemented as fish habitat will be created.

By following the recommended federal wetland mitigation process, the Project has been designed so as to help ensure that wetland functions of the area are not compromised to a significant extent. Due to the complexities of wetland ecosystems, monitoring during all project phases will be needed to determine the success of the Project design in achieving no significant loss of wetland functions.

No significant residual effects are predicted.

2.9.6 Conclusion of Effects and Mitigation

Based on the review of the Application, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplemental information; comments from the public, government agencies and Tahltan Heritage Resource and Environmental Assessment Team on the potential effects of the Project on wetland; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on wetlands.

2.10 TERRESTRIAL ECOSYSTEMS

2.10.1 Background

Information describing the terrestrial ecosystems, vegetation and soils of the Project was obtained using a combination of ecosystem mapping and field surveys. Descriptions of general landscape features, ecosystem types (including rare ecological communities), plant species (including rare plants and invasive species) and soils of the Project area are provided in this section. Rare communities and plants were identified by referring to the B.C. Conservation Data Centre and the Committee on the Status of Endangered Wildlife in Canada.

The harvesting of country foods is also addressed in this section.

<u>Regional Project Area</u>

The regional project area covers approximately 576,000 hectares and reflects the study area boundary used in the wildlife habitat assessments. It is dominated by the steep, rugged mountains of the Boundary Range and the more subdued terrain of the Tahltan Highlands. Eleven biogeoclimatic units are present and represent a combination of coastal and interior subzones (Table 6).

Snow and ice cover approximately 167,000 hectares, or 29%, of the regional project area and mature/old forest another 166,000 hectares (29%). A substantial portion, 128,000 hectares (22%), is largely unvegetated (barren) due to the relatively recent retreat of the surrounding glaciers. The remaining landscape consists of herbaceous meadows, shrub complexes, waterbodies and young forest.

Rare Elements

Three rare ecological communities were mapped with predictive ecosystem mapping. All are blue-listed, are ranked provincially as vulnerable and occur within the Coastal Western Hemlock Wet Maritime Subzone.

Two are associated with floodplain forests while the third represents a wet forest ecosystem type. In addition, a floodplain community in the Coastal Western Hemlock Wet Maritime Subzone was identified in the Interior Cedar Hemlock Wet Cold Subzone.

Table 6. Biogeoclimatic Ecosystem Classification Units Present in the Project Area

		Climatic Influence		Vegetated Status		
BEC Name	**BEC Unit**	**Coastal**	**Interior**	**Forested**	**Parkland**	**Alpine**
Coastal Western Hemlock Wet Maritime Subzone	CWHwm	□		□		
Mountain Hemlock Moist Maritime Leeward Variant	MHmm2	□		□		
Mountain Hemlock Moist Maritime Leeward Parkland Variant	MHmmp2	□			□	
Interior Cedar Hemlock Wet Cold Subzone	ICHwc		□	□		
Engelmann Spruce – Subalpine Fir Moist Cold Subzone	ESSFmc		□	□		
Engelmann Spruce – Subalpine Fir Wet Very Cold Subzone	ESSFwv		□	□		
Engelmann Spruce – Subalpine Fir Very Wet Very Cold Subzone	ESSFvv		□	□		
Engelmann Spruce – Subalpine Fir Moist Cold Parkland Subzone	ESSFmcp		□		□	
Engelmann Spruce – Subalpine Fir Wet Very Cold Parkland Subzone	ESSFwvp		□		□	
Engelmann Spruce – Subalpine Fir Very Wet Very Cold Parkland Subzone	ESSFvvp		□		□	
Alpine Tundra Zone	ATp	□	□			□

<u>Filter Plant and Access Corridor</u>

The filter plant and access corridor area covers approximately 28,000 hectares and was one of the main focal areas of the field studies. The mapped area comprised a 2 kilometres swath centred on the proposed access road alignment. The same complement of biogeoclimatic units found in the regional study area is present in this area as well; however, their distribution and extent have changed.

Almost half of the area consists of mature and old forest (13,000 hectares or 48%). Herb meadows and shrub complexes also cover a substantial portion of the area (6,500 hectares or 24%), while the remainder consists of unvegetated (barren) land, young forest and waterbodies. A number of different ecosystem units were identified through the mapping and field survey process.

Rare Elements

Six rare ecological communities were identified through a combination of terrain ecosystem mapping and field surveys. All are blue-listed, are ranked provincially as vulnerable and occur within the Coastal Western Hemlock Wet Maritime Subzone. The same Interior Cedar Hemlock

Wet Cold Subzone. floodplain community described for the regional project area was also identified along the access corridor and has been treated as a rare ecological community.

Two blue-listed rare plant species were identified along the access corridor. Sheathed cotton-grass (*Eriophorum vaginatum* ssp. *vaginatum*) and Jordal's locoweed (*Oxytropis jordallii ssp. jordallii*) were both located within the Engelmann Spruce – Subalpine Fir Wet Very Cold Parkland Subzone . Mature to old floodplain forests, which were documented throughout the area, could provide potentially suitable habitat for one species of moss (Schleicher's silk moss or *Entodon schleicheri*), but no plants were located in the field.

Invasive Plants
Three invasive plant species were documented overall: water hemlock (*Cicuta douglasii*), sheep sorrel (*Rumex acetosella*) and common horsetail (*Equisetum arvense*). Sheep sorrel was limited to one plot and water hemlock to two plots along More Creek just west of More Canyon, whereas common horsetail was more widespread.

Metal Concentrations in Plant Tissue
Several different wildlife forage species were collected along the access corridor, including salmonberry (*Rubus spectabilis*), willow (*Salix* spp.), black huckleberry (*Vaccinium membranaceum*), oval-leaved blueberry (*V. ovalifolium*), common horsetail, lady fern (*Athyrium filix-femina*) and sedge (*Carex* spp.).

Four metals (aluminum, iron, manganese and molybdenum) occasionally exceeded the recommended National Research Council cattle feed guidelines for maximum values. Aluminum and iron concentrations exceeded National Research Council guidelines (aluminum 1,000 mg/kg; iron 500 mg/kg) in common horsetail and sedge samples, while manganese exceeded the NRC guideline (2,000 mg/kg) in blueberry stems and leaves.

Molybdenum concentrations exceeded the National Research Council guideline (5 mg/kg) in several of the plant species sampled along the access corridor, including blueberry, elderberry, horsetail, salmonberry and sedges.

<u>Mine Area</u>
Four biogeoclimatic ecosystem classification units are present within the mine area although three represent most of the area. The Alpine Tundra zone and Engelmann Spruce – Subalpine Fir Wet Very Cold Subzone cover 38% (3,700 hectares) and 35% (3,300 hectares), respectively, and the Engelmann Spruce – Subalpine Fir Wet Very Cold Parkland Subzone cover 26% (2,500 hectares). The fourth biogeoclimatic unit present is the Interior Cedar Hemlock Wet Cold Subzone, which occurs at the northern extent of the mapped area and covers only 1% (105 hectares) of the area overall.

Most of the ecosystem units identified during mapping and field surveys were non-forested and represented shrub-dominated and largely unvegetated (e.g., rock, barren areas) units. Mature and old forest covers the lower slopes of the mine area.

Rare Elements
No rare ecological communities were identified on ecosystem maps or in the field within the mine area.

Invasive Plants

Common horsetail (*Equisetum arvense*) was the only invasive plant species documented in the Galore Creek valley.

Metal Concentrations in Plant Tissue
Wildlife forage species were collected from the mine area and included salmonberry, willow, elderberry (*Sambucus racemosa*), common horsetail, lady fern and graceful mountain sedge (*Carex podocarpa*).

Analysis of plant tissue samples for various metal concentrations showed that median molybdenum levels were elevated above the recommended National Research Council cattle feed guideline (5 mg/kg) in a single salmonberry sample. Similarly, maximum molybdenum concentrations also exceeded the National Research Council guideline in elderberry, common horsetail, salmonberry and sedge.

Land Suitability and Productivity
In addition to mineral exploration, current land use within the Galore Creek valley study area includes wildlife habitat and low productivity forest land. The area provides high suitability habitat for goat (winter and summer), marten (winter) and grizzly bear (spring). The climate of approximately one-third of the study area supports potentially productive forest lands (Ministry of Forests, 2005). Within this area, productivity is further reduced by avalanche activity, which prevents trees from reaching mature heights. There is no commercial forestry in this or adjacent watersheds. The rest of the area, occupied by parkland and alpine subzones, exhibits severe climatic limitations that prevent productive forest establishment.

Soil Suitability for Reclamation
Soil suitability criteria will be used as a guideline for selecting soil material for salvage prior to disturbance. Coarse-textured soils (loamy sand and sand) from the mine site, which display low available water storage capacity, are locally rated higher than normal because significant growing season moisture deficits are rare. The forest soil root zones (combined humus, A and B horizons) will be salvaged separately from the underlying parent material because of their inherently higher organic matter content. This “topsoil” material will be stored separately from the overburden and rock waste. Where these horizons have not developed (Regosolic soils) or where excess slope or irregular topography and/or shallow/irregular bedrock make separation from the underlying parent material impractical, no “topsoil” salvage will be undertaken and the “soil” material will be placed in the overburden stockpile.

Metal Concentrations in Soils
Background concentrations of a suite of metals were determined for the soils common to the Galore Creek valley. The results confirm the mineralized nature of the soils and the common occurrence of elevated concentrations of five metals (arsenic, chromium, copper, nickel and vanadium) relative to Canadian Council of Ministers of the Environment guidelines for industrial land-use. The native soils and overburden available for reclamation will naturally exhibit elevated levels of these metals.

Country Foods
There is currently little harvesting of country foods within the Project area because there is no road access; however, this is expected to change as Project development brings more people into the area.

The baseline assessment estimated the quality of country foods prior to Project development and thus is reflective of naturally occurring levels of metals. The focus of the baseline assessment was on metals, primarily because these are the only contaminants of potential concern at present.

Country foods found within the Project include caribou weed (leaves/stems) (*Artemesia spp*.), blueberry (berries) (*Vaccinium spp*.), moose (muscle tissue and organs), hoary marmot (muscle tissue), grouse (muscle tissue) (*Phasiandidae spp.*) and salmon (muscle tissue). 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 industry, but no data exists on this nascent industry.

All mammal species identified during the country foods interviews are found in the vicinity of the proposed mine site and/or access road except caribou and sheep. All bird species identified during the country foods interviews are found in the vicinity of the proposed mine site and/or access road.

Ethnographic records have identified that harvesting plants, berries, shoots and tenders for nutritional and medicinal purposes has been an important activity pursued by the Tahltan during the summer and early fall. During the summer of 2005, the identification of flora and fauna considered to be important for food, cultural or medicinal purposes was undertaken in cooperation with the Tahltan.

2.10.2 Project Effects

Terrestrial ecosystems, vegetation and soil landscapes were selected as a valued ecosystem component because ecosystems and plant species are sensitive to disturbance provide habitat for wildlife and are of conservation concern to regulatory agencies and the public.

Potential Effects and Evaluation

The main environmental effects from the Project on the terrestrial ecosystem are related to:

- continued road access that will delay recovery of impacted ecosystems and may encourage additional use and development of area. This will have an effect on ecosystems in the forested and parkland subzones;
- introduction of invasive plant species into previously undisturbed areas. The potential for invasive plant species establishment is high despite implementation of Invasive Plant Strategy and Reclamation efforts. This will have an effect on ecosystems in the forested, parkland and alpine subzones and will also affect habitat of plant species of conservation concern;
- permanent loss of terrestrial ecosystems in Galore Creek valley due to the development of the main dam and permanent flooding of the pits. Ecosystems affected include forested, parkland and alpine subzones; and,
- potential contaminants to country foods together with a possible increase in use of the area by Tahltan members.

Filter Plant and Access Corridor

Ecosystem Alteration:
The total amount of disturbance attributed to the access corridor and its various components is approximately 1,810 hectares. The largest proportion of the disturbance is associated with ecosystem degradation attributable to the powerline corridor and road right of way edge.

The majority of direct soil impacts will be within the 420 hectares are described as 'lost'. The large majority of this disturbance (388 hectares) will be linear (along the road alignment), with aerial disturbances associated with two additional features, the six hectare filter plant area and 27 hectares of borrow sites. Soil drainage, both internal and external, will be disrupted with the extensive ditch development required in sloping terrain. Soils in steep terrain may have large cuts and fills, which increases susceptibility to local hydrological disruption.

Topsoil materials, comprising the combined humus layer and the upper mineral horizons (approximately 0.3 metres thick), will be salvaged and stored along the route and in the area of the filter plant and individual borrow locations. Where possible, topsoil will be stored in close proximity to the disturbance (within the right of way at the filter plant site). This stored soil material will function under extremely altered conditions throughout the period of road operation.

Approximately 1,598 hectares are anticipated to be disturbed as a result of development of the access corridor and filter plant facility. At the local scale, this reflects approximately 7.5% of the area, while regionally it reflects less than 1%.

The largest effects (1,446 hectares or 90% of the total valued ecosystem component disturbance area) will occur in forested subzones, with the remaining 10% (153 hectares) occurring in parkland areas. The largest amount of area disturbed will occur within forested ecosystem units.

Approximately 365 hectares (23% of the total valued ecosystem component disturbance area) will be lost along the access corridor overall, with the majority attributed to the road right of way itself. The predominant vegetation is mature forest and alder-dominated shrub ecosystem units.

In the Interior Cedar Hemlock Wet Cold Subzone specifically, approximately 28 hectares (3% of local area; 1% regional) of area to be lost is associated with floodplain forest (Interior Cedar Hemlock Wet Cold Subzone 06), and is similar to a rare ecological community in the Coastal Western Hemlock Wet Maritime Subzone further to the west. Approximately 940 hectares of this ecosystem unit was mapped locally, which translates into an overall loss of 3%. Regionally, approximately 2,391 hectares of this ecosystem unit was identified, which translates to an overall loss of 1%.

Sensitive, high elevation parkland areas will lose 42 hectares overall (11% of the total area lost). Similar disturbance trends to those identified in lower-elevation areas occur in the parkland as well, with mature tree-islands and shrubby meadows being affected most. No losses occur in alpine areas as the access corridor does not pass through them.

Approximately 876 hectares (55% of the total valued ecosystem component disturbance area) will be degraded. The majority of area (793 hectares or 91% of the total area degraded) occurs in lower elevation subzones, and again is comprised largely of mature forest and alder-dominated shrub patches.

The Interior Cedar Hemlock Wet Cold Subzone ecological community of conservation concern will be affected by ecosystem degradation (approximately 46 hectares). Approximately 83 hectares (10% of the total degraded area) of higher elevation parkland will be degraded. Affected ecosystem units include mature tree-islands and willow-dominated shrub patches.

Approximately 357 hectares (22% of the total valued ecosystem component disturbance area) will exist as fragmented ecosystem patches that occur largely in between the road right-of-way and powerline corridor. Fragmented patches are largely comprised of mature forest and shrubby openings in both forested and parkland subzones.

Effects on Plant Species of Conservation Concern:
No Committee on the Status of Endangered Wildlife in Canada or *Species at Risk Act*-listed plant species were located during baseline studies, although potentially suitable habitat for one species of moss, (Schleicher's Silk Moss or *Entodon schleicheri*) was identified. This species is currently designated as data deficient under Committee on the Status of Endangered Wildlife in Canada and is not *Species at Risk Act*-listed. Two plant species, (sheathed cotton-grass or *Eriophorum vaginatum* ssp. *vaginatum* and Jordal's locoweed or *Oxytropis jordallii* ssp. *jordallii*), tracked by the B.C. Conservation Data Centre were identified in the Project area, both of which were found in the vicinity of the access corridor.

Sheathed cotton-grass was downgraded from "blue-listed" to "yellow-listed" (B.C. Conservation Data Centre, 2006), and is no longer considered to be "at risk" in B.C. Jordal's locoweed, a blue-listed species, was located to the west of Round Lake and is well beyond (greater than 200 metres away) any of the identified disturbance areas.

In the Project area, 92 rare plant species could potentially occur in high elevation areas. Major habitat associations of these species occur within the Engelmann Spruce – Subalpine Fir Wet Very Cold Parkland Subzone and Mountain Hemlock Moist Maritime Leeward Parkland Variant subzones.

Potential Introduction of Invasive Species:
The amount of disturbance associated with the construction and use of the access corridor will create conditions conducive for the potential introduction and proliferation of invasive plant species. Suitable measures will be implemented that prevent or at least severely limit the introduction of invasive plants into the area. This is especially important in areas where the access corridor crosses into more sensitive, high elevation parkland subzones that do not respond quickly to disturbance and will likely be most impacted by the introduction of highly competitive invasive plants.

<u>Aerodrome</u>
Ecosystem Alteration:
The total area expected to be disturbed by the aerodrome facility is approximately 53 hectares. More ecosystem loss will occur than degradation. Ecosystem loss is largely due to the road right of way, graded (runway) shoulder, and runway surface components. Approximately six hectares, located in between the apron, runway, and access road, will become fragmented.

Soils directly impacted by the construction of the aerodrome (airstrip and adjoining facilities) and the access road connecting the aerodrome to the main access corridor, cover approximately 27 hectares. Soil drainage and site hydrology will be impacted by development in this area.

The total amount of valued ecosystem component area disturbed is estimated to be 46 hectares and occurs only in the Coastal Western Hemlock Wet Maritime Subzone forested subzone. Disturbance trends are similar to those displayed for the total area affected. Pole/sapling forest will be disturbed most, followed next by old forest and shrubby vegetation.

Due to its proximity to the Porcupine River, a large proportion (34 hectares, or 74% of the total valued ecosystem component area disturbed) of the aerodrome facility is located within a floodplain ecosystem unit (Coastal Western Hemlock Wet Maritime Subzone) that is considered rare. Although it is mostly in a younger successional stage (pole-sapling forest), it is still of conservation interest. The total amount of disturbance expected (34 hectares) will affect approximately 5% of the total amount of Coastal Western Hemlock Wet Maritime Subzone identified.

Approximately 23 hectares will be lost due to the aerodrome facility. The largest ecosystem losses (13 hectares) will be from pole-sapling forest followed by 5 hectares of old forest and 4 hectares of shrubby vegetation. Approximately 17 of the 23 hectares lost will be from the Coastal Western Hemlock Wet Maritime Subzone rare ecological community. In the vicinity of the aerodrome facility, it exists primarily in a younger successional stage (mostly pole-sapling and shrub). The shrub stage of this particular ecosystem unit provides some of the better moose winter habitat in the area.

Approximately 17 hectares of valued ecosystem component area will be degraded. Pole-sapling and old forest structural stages will be the most affected. The pole-sapling stage of the rare Coastal Western Hemlock Wet Maritime Subzone ecological community covers approximately 11 of the 17 hectares of degraded area.

Approximately 5 hectares of valued ecosystem component area will become fragmented, and will be largely comprised of pole-sapling forest. All of the fragmented area consists of the rare Coastal Western Hemlock Wet Maritime Subzone ecological community.

Effects on Plants of Conservation Concern:
As the aerodrome facility falls completely within the Coastal Western Hemlock Wet Maritime Subzone , no subalpine or alpine areas will be affected. Therefore, no assessment of the potential to disturb rare subalpine and alpine plants and their potential habitat was conducted.

Potential Introduction of Invasive Species:
Invasive plant species can be introduced into areas via airplanes as well. The propagules of invasive plants can become lodged in airplane wheel wells and landing gear and can be subsequently deposited at any time during flight or while on the ground. Prevention and mitigation measures are similar to those implemented for managing invasive species with respect to roads and vehicles.

The location of the aerodrome is within sensitive wildlife habitat and the introduction of invasive species could lead to further degradation of the area. Preventative measures and proactive mitigation strategies will limit these impacts.

<u>Mine Area</u>
Disturbance associated with mine infrastructure is summarized in Table 15. Results are presented for each infrastructure component and the extent of disturbance expected. Individual mine components were grouped according to the level of disturbance associated with each and the future landscape conditions expected following reclamation.

Ecosystem Alteration:
The mine area is the only location where terrestrial reclamation is not feasible on certain infrastructure components (e.g. submerged tailings and portions of the pits) following closure.

Approximately 2,197 hectares is expected to be disturbed within the mine area. This area represents the full amount of disturbance, irrespective of valued ecosystem component status. Of the total area disturbed, over 75% (1,677 hectares) will be lost, of which 45% (993 hectares) has been identified as lost with no plans for terrestrial reclamation. The remaining area is reclaimable.

Approximately 1,768 hectares is anticipated to be disturbed. At the local scale, this reflects approximately 37% of the area, while at a regional scale, it reflects 2%. The largest effects (1,496 hectares or 85% of the valued ecosystem component disturbance area) will occur in forested subzones. Another 264 hectares (15%) of parkland area will be disturbed, while less than 1% (8 hectares) will be disturbed in the alpine.

Several ecosystem units in the mine area could have over 50% of their area disturbed. At a regional level, however, these effects are less important. Up to 100% of the identified moist, open meadow forest and wetland bog could be affected by mine activities. Although not specifically identified by the predictive ecosystem mapping, these particular ecosystem units are not unique to the Galore Creek valley and tend to occur as smaller complexes within larger ecosystem units elsewhere in the area. Their small extent and limited distribution makes quantification difficult.

Approximately 1,399 hectares (79% of the total valued ecosystem component area disturbed) will be lost in the mine area, of which 632 hectares (36%) is suitable for terrestrial reclamation. The largest effects occur in forested subzones, with mesic and moist (ecosystem units 01, 05, and 06) mature forests and alder-dominated shrub units (AS and AT) losing the most area. According to the larger ecosystem mapping areas (terrain ecosystem mapping and predictive ecosystem mapping), these units are fairly common.

Wetland bogs that were mapped within the Galore Creek valley fall within the mine footprint area, which could result in 100% of their area being disturbed. The effects of the Project on wetlands are discussed in detail in section 2.9 of this Report. In parkland areas, a total of 160 hectares of land will be lost, the majority of which (109 hectares) will not be suitable for future terrestrial reclamation efforts. Affected ecosystem units include herb and shrub-dominated patches, as well as mature tree-islands, all of which occur elsewhere in the area.

A small amount (6 hectares) of heather-heath and alpine meadow vegetation will be lost from alpine areas. This disturbance is associated with the pits, which are largely not reclaimable. Heather-heath vegetation is a dominant ecosystem unit in the Galore Creek valley while alpine meadows comprise a smaller component.

Degraded areas comprise 369 hectares (21%) of the total valued ecosystem component area disturbed. In forested subzones, mesic, mature forest ecosystem units (both 01 and 05) will be affected most. Alder-dominated shrub patches (AT) also occur in areas subject to potential site degradation.

In parkland areas, the largest amount of ecosystem degradation will occur in heather-heath and herbaceous ecosystem units. Mature tree-island forests and shrub-dominated ecosystems will also be affected. A negligible amount (less than 1% of the total area degraded) of ecosystem degradation will occur in alpine subzones. No ecosystem fragments are expected to occur in the mine area and no rare ecological communities are present.

Effects on Plant Species of Conservation Concern:
In the mine area, tundra (heather-heath ecosystem units), tree-islands (forest), and meadows will be subject to the most disturbance. Rocky units will also be affected but to a lesser extent. All of the habitat types potentially associated with rare alpine plant species that occupy disturbance areas have been documented outside the mine footprint area via the ecosystem map.

No rare plants were identified in the Galore Creek valley during field surveys.

Potential Introduction of Invasive Species:
The mine area will be subject to substantial land clearing and soil disturbance activities, which result in conditions conducive for the establishment of invasive plants. In addition, much of the area is already un-vegetated, and could also provide suitable conditions for the establishment of invasives that can tolerate very poor growing conditions (e.g. low soil nutrient levels and coarse textured soils).

Modes of introduction into the mine area could be from personnel (*e.g.* mud containing propagules on footwear), helicopters (e.g. propagules on skids), and dirty vehicles and machinery brought in from other locations. Limiting the establishment and spread of invasive species in the mine area will be difficult given the amount of disturbance expected, however, addressing the issue as early on as possible will likely produce better results than dealing with fully established invasives in the future.

Country Foods
The country s baseline study undertaken by the Proponent predicted no unacceptable risks to human receptors from consumption of caribou weed, blueberry, animal muscle (moose, marmot and grouse) and salmon muscle under the baseline exposure scenarios evaluated. Based on the empirical and estimated levels of metals in these foods, the amounts currently consumed are within the recommended maximum weekly intakes (RMWI).

Potential unacceptable risks to human receptors (toddlers and adults) were found for the consumption of moose organs under the baseline exposure scenario evaluated (28 servings per year). However, due to the conservativeness in the assumptions made in estimating the organ tissue concentrations, the potential risks have likely been overestimated and the RMWI underestimated. Nonetheless, elevated baseline concentrations of metals in the kidneys and livers of wildlife have been measured in various parts of Canada.

The only way to reduce the uncertainty in predicted moose tissue concentrations is to sample and analyze moose tissues from the Project area to establish actual baseline concentrations. Sampling and analysis could be conducted by in conjunction with country food harvesters. Greater certainty of baseline conditions would facilitate assessment of additional Project-related risks (if any).

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 may lead to an increase in the level of harvesting. The primary users of country foods in the Project area are the Tahltan. The development of the access road offers the potential for enhanced access to the area; however, access will be restricted to mine-related traffic. An Access Management Plan will be required as part of the Special Use Permit.

2.10.3 Issues Raised and Proponent Response

During the Application review, key issues raised by the public, government agencies, and the Tahltan Heritage Resource and Environmental Assessment Team (and associated Proponent responses) included:

- Clarification sought on ground truthing for predictive ecosystem mapping: During the Application review, the Proponent committed to provide a report expanding on the methodology used for predictive ecosystem mapping, including the incorporation of field data.

- Further information was requested on the potential effects on rare ecosystems: The Proponent clarified how effects on rare ecosystems had been assessed; noting that local and regional perspectives of these elements are unknown.

- All available soils and subsoils should be salvaged: The Proponent will develop a contingency plan before mining starts to consider this issue.

- During the Application review, Health Canada recommended that the Proponent complete an assessment of the potential for increased contamination of country foods and consult with the Tahltan to ascertain their views on the need for a follow-up impact assessment on country foods. The Proponent has committed to monitor, with Tahltan participation, surface water, soil and vegetation concentrations of selected metals throughout the period of mine development and operation and has committed to further monitoring and mitigation, as feasible, should environmental monitoring indicate concern.

2.10.4 Proponent Commitments and Mitigation

The Proponent has committed to mitigate potential effects through reclamation, with the exception for areas associated with the pits and tailings and the access corridor in the medium-term. Portions of the pits and tailings impoundment are to be submerged following mine closure and will therefore not be subject to terrestrial reclamation.

The Proponent has committed to undertake the following measures and commitments to mitigate potential effects on terrestrial ecosystems:

- salvage and stockpile topsoil for use in reclamation and protect topsoil stockpiles through revegetation and other practices as described in the Application;
- use adaptive management approaches to ensure advances in reclamation research are included in final closure planning efforts;
- conduct test plots during operations to support appropriate revegetation of reclaimed areas;
- reclaim using plants that will set the stage for natural succession and the establishment of plant communities that reflect the ecology of the area;
- ensure that dump slope angles create a stable configuration at closure;
- reclaim borrow and gravel pits to appropriate habitat when they are no longer required;
- initiate progressive reclamation where possible to control sedimentation around the mine area;
- develop a plan to control and manage invasive plant species; and,

- monitor, with Tahltan participation, surface water, soil and vegetation concentrations of selected metals throughout the period of mine development and operation. A quantitative screening level risk assessment (SLRA)for country foods will be conducted if the quality of these environmental media is shown to decrease and should a specific country food appear vulnerable, monitoring of contaminant levels in the tissues consumed, if feasible, will be undertaken. If the SLRA finds that the quality of the country foods have potentially been reduced to unacceptable levels, mitigation options will be considered and the most feasible option will be selected and implemented. In the case that fish tissue quality data obtained from monitoring undertaken indicates an increase in contamination levels, potential impacts to human health from fish consumption will be assessed.

2.10.5 Significance of Residual Effects

All of the terrestrial valued ecosystem components described in this section are expected to experience some form of ecosystem alteration, be it loss, degradation, fragmentation, or a combination of the three. The majority of impacts can be mitigated through reclamation, with the exception of areas associated with the pits and tailings, and the access corridor in the medium-term. Portions of the pits and tailings impoundment are to be submerged following mine closure and will therefore not be subject to terrestrial reclamation.

The access road will result in a permanent loss of ecosystems during the life of mine operations and is also likely to contribute to cumulative effects during this time. With the exception of these mine components, the remaining adverse effects are assumed to be negligible.

Invasive plant species are not considered a valued ecosystem component but can adversely affect by altering ecological integrity. Even with the implementation of a rigorous invasive plant strategy and reclamation program, there is still a good chance invasives will be an issue to some degree. For this reason the residual adverse effect of invasive plants on valued ecosystem components has been deemed considerable.

Overall residual adverse effects on plant species of conservation concern are considered to be negligible.

With respect to country foods, as noted above, the country food baseline study predicted no current unacceptable risks to human receptors from consumption of caribou weed, blueberry, animal muscle (moose, marmot and grouse) and salmon muscle. Based on this analysis, people may safely continue to eat these country foods. However, potential unacceptable risks to human receptors (toddlers and adults) were found for the consumption of moose organs., This is likely due to the conservative assumptions made in estimating the organ tissue concentrations, and therefore the potential risks have likely been overestimated. The development of the access road creates the potential for enhanced access to the area. However, the road will have strict access controls. As the proponent has committed to monitoring and mitigation, if needed, any likely adverse effects to human health from the consumption of contaminated country foods were not considered to be significant.

2.10.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplemental information; comments from the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment

Team, on the potential effects of the Project on terrestrial ecosystems; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO, the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on terrestrial ecosystems, vegetation and soils and country foods.

2.11 WILDLIFE AND WILDLIFE HABITAT

2.11.1 Background

Wildlife studies were conducted within the regional project area for moose (*Alces alces*), mountain goat (*Oreamnos americanus*) and grizzly bear (*Ursus arctos horribilus*). Small mammal, bat, bird and herpetile surveys were conducted within the local project area, which included the access corridor, filter plant site, mine area within the Galore Creek valley and aerodrome facility site within the Porcupine River valley (including the Porcupine River to the confluence of the Stikine River for bird surveys).

Wildlife habitat suitability mapping was carried out to assess wildlife habitat for six focal species in the study area: moose, mountain goat, grizzly bear, American marten (*Martes americanus*), hoary marmot (*Marmota caligata*) and western toad. These species were selected based on input from government agencies, the Cassiar Iskut-Stikine Land and Resource Management Plan and in consultation with the Tahltan and stakeholders.

Terrestrial ecosystem mapping (TEM) and predictive ecosystem mapping (PEM) suitability models were developed for the six focal species. In addition to these models, refined habitat models referred to as "enhanced suitability models" were created to generate more-accurate models of habitat suitability for the six focal species. The TEM and PEM products were incorporated as either a contributing component of the enhanced models (moose, goat, western toad breeding and hoary marmot) or provided the primary layer for the enhanced models (grizzly bear, western toad terrestrial and marten).

Grizzly Bears
Grizzly bears are identified as an important species in the Cassar Iskut-Stikine Land and Resource Management Plan. The lower Stikine River has been designated as a Management Zone that emphasizes the maintenance of habitat value for grizzly bear and salmon in recognition of their combined keystone role in the Iskut-Stikine ecosystem. Grizzly bears are blue-listed in British Columbia and are federally listed as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada, 2002.

A higher density of grizzly bears was detected in the coastal study area than in the interior area. Most bears were detected near salmon-spawning areas including the Porcupine, Scud, Craig, Christina and Inhini rivers. Bears were also detected at Verrett Creek and in nearby streams. Few bears were detected in upland areas away from spawning streams in the coastal area. No movement between major spawning streams was detected. Isotope analysis for coastal grizzly bears indicated that salmon was an important food source and a measurable portion of the diet, even in spring.

The density in the lower Stikine area appears to be lower than in other areas of the B.C. coast. This may be due to modest salmon runs in the Stikine drainage compared to other areas of the north coast. However, a large portion of the coastal area is rock or glacier, and removing unproductive habitat for the mapping increases the calculated density of bears.

Lower densities of grizzly bears were detected in the interior study area (relative to the coastal study area). Grizzlies were detected mostly above the treeline and particularly in the open habitat found in the north-central part of the study area. The relative density of bears may be higher in this open habitat than in other parts of the interior study area. Forested areas appeared to receive little use during late summer and early fall. Isotope analysis suggested very modest changes in the diet of interior grizzly bears from season to season. The bears in this sample derived very little of their June to September diet from meat.

Grizzly densities vary substantially in the interior areas of B.C. compared to the coastal areas, and the interior study area for the Project appears to support one of the higher densities of bears documented in the interior of the province. This high density is likely related to: the high rainfall, which generates lush vegetation; the low treeline, which maintains a large portion of the landscape in herb and shrub cover; and the presence of a large burn site (Burrage Creek burn) in the northeast corner of the area, which produces large huckleberry crops.

Early spring habitat is important as it provides the first forage for bears following winter hibernation. Both coastal and interior bears will move to lower elevation spring habitats within their respective ranges to feed after den emergence. Some of the early spring habitat identified in the study area also supports occupied moose winter range, and the availability of moose carrion from winter kills enhances the value of this habitat. In early spring (April to late May), the availability of suitable grizzly bear habitat is typically limited to lower elevations due to the deeper snow packs remaining at higher elevations until later in the season. There is very little early or late spring habitat suitable for grizzly bears within the mine area.

Late spring (late May to mid-June) grizzly bear habitat is comprised of wetlands, wet meadows and marsh and swamp areas along lower More Creek east toward the filter plant. Suitable late spring habitat also exists along the access road near the Porcupine River.

Grizzly bears prefer higher elevations during mid-July to early August. Suitable summer habitat for the coastal population of grizzly bears was found at higher elevations in the mine area, including important herbaceous avalanche paths, alder thickets and alpine sedge meadows of the Galore Creek valley, within the Porcupine River area, and along the access road in the Scotsimpson Creek area and interspersed throughout much of upper More Creek along the access road. This area is also enhanced for grizzly bear by the presence of suitable hoary marmot habitat, indicating a potential prey source. The coastal grizzly bear population is extremely dependent on the Chinook and sockeye salmon resource of the Porcupine River as a summer food source.

Salmon-spawning streams and rivers are very important to grizzly bears in the fall. The reaches identified along the Porcupine River provide a fall food source of coho and are some of the most important habitat available to the local coastal bear population. Suitable fall habitat is also found associated with Scotsimpson Creek. Within the mine area, suitable fall habitat for grizzly bears includes alder thickets and berry-producing areas. Suitable denning habitat, while not modeled, was found near the mine site but was restricted to higher elevations.

Mountain Goats

Regionally, the mountain goat resource has been identified as socially and economically important for both the traditional aboriginal and recreational harvests. Goats are also important game for commercial guide outfitting.

Higher densities of mountain goats were observed at high elevations in the Galore Creek valley, along the heights of land along Spahler Creek and the confluence of More Creek and the Iskut River. In general, the numbers and densities of goats observed were higher in summer than in winter for those blocks that were surveyed in both seasons.

Mountain goat kidding areas are associated with high elevations along Sphaler Creek and north of Round Lake. In addition, natal habitats have been identified at higher elevations along Scotsimpson Creek near the proposed mine access tunnel.

Suitable goat summer and winter habitat was found mostly above the access corridor, the entrance to More Canyon, low-elevation habitat at the access road crossing of the Iskut River and low-elevation summer habitat along Sphaler Canyon. Given the low elevation and lack of accessible escape terrain in the area of the aerodrome facility or proposed flight path along the Porcupine River, there is no suitable summer or winter habitat for mountain goats in these areas. Much of the escape terrain and resulting goat winter habitat in the Galore Creek valley is isolated and primarily associated with the lower-elevation slumps and slides of the valley. However, no goats were observed in this area during either summer or winter aerial flights. A greater amount of high-quality winter goat habitat was located along the west ridges of the mine site, and high-quality mountain goat summer habitat was identified on the north ridge of East Fork Creek. Goats were observed along this ridge during both summer and winter.

Moose

Moose are an important economic and social resource within the Stikine and Iskut watersheds. Moose harvest is recognized as important to the Tahltan Nation, resident hunters and local guide outfitters.

Moose were observed at the filter plant site (near Bob Quinn Lake on the east side of the Iskut River), along the access corridor and aerodrome (Porcupine River floodplain). All were in or slightly above areas associated with habitat identified as moose winter range. No moose were recorded along the Sphaler Creek. Moose were observed along More Creek.

Within the interior ecosystem, moose were observed at elevations of less than 500 metres and gradients greater than 40%. Snow depth did not appear to limit moose movement until elevations well above 500 metres. Recent timber harvesting has produced abundant rooted forage that appeared to be attractive to moose.

Moose aerial winter surveys were coordinated with Alaskan researchers. The lower Stikine River valley from the international border to the ocean was surveyed by Alaska Fish and Game officials concurrently with the Iskut/Stikine survey in B.C. Moose were observed along the Stikine River in Alaska.

Highly suitable moose winter habitat along the access corridor was found to be restricted to areas of the lower More Creek. The dense shrub layer provides important winter range for moose.

The Porcupine aerodrome will be developed in an area adjacent to highly suitable and occupied moose winter range. The Porcupine River is quite braided and includes small islands, channels and bars that are often associated with willow production. During winter the river freezes over, allowing moose to access this willow forage and to travel across the ice to exploit smaller patches along the river banks.

Since the mine area is located at elevations greater than 500 m, this area is not suitable for moose

Mammals

Eight species of small mammal were identified, including: northern red-backed vole (*Clethrionomys rutilus*); long-tailed vole (Microtus longicaudus littoralis); meadow vole (Microtus pennsylvanicus); Keen's mouse (Peromyscus keeni); meadow jumping mouse (Zapus hudsonicus hudsonicus);common shrew (*Sorex cinerus*); dusky shrew (Sorex monticolus); water shrew (*Sorex palustris*).

The most commonly captured species were Keen's mouse, northern red-backed vole, common shrew and dusky shrew. Two species at risk, tundra shrew (*Sorex tundrensis*) and the *alaskansis* subspecies of meadow jumping mouse were not detected. No lemmings were captured.

Small mammal abundance varied with habitat. Small mammals were relatively abundant in the herb meadows and open willow thickets of ecosystems selected by grizzly bear during summer and fall.

American Marten

The access corridor provides suitable winter habitat for marten, including mature to old growth conifer forests with a closed canopy (greater than 40%) and coarse woody debris within the understory. Highly suitable habitat was found along Sphaler Creek, from upper More Creek east to the filter plant and within the Porcupine River area in association with the forested areas bordering the floodplain. The floodplain itself and the proposed airstrip location do not provide suitable winter habitat for marten. Within the mine area, suitable winter habitat for marten was associated with the mature and intermediate forest area.

Hoary Marmot

Small areas of highly suitable habitat for hoary marmot were found on the upper slopes along Scotsimpson Creek. In addition, a small portion of highly suitable habitat was identified adjacent to Round Lake. Since the low-elevation and wet areas of the Porcupine River floodplain are unsuitable for burrows and hibernacula, the aerodrome facility area does not include suitable hoary marmot habitat. Suitable growing habitat for hoary marmot is not extensive throughout the mine area.

Bats

Inventory information for bats is lacking within the Galore Creek area and within northwestern B.C. in general. Bat inventory was conducted at 10 different locations in the local project area, including sites within the access corridor, aerodrome facility and mine area.

One bat was captured during the bat survey. However, echolocations were recorded at eight of the ten inventory locations, indicating that bats are present throughout the study area from low elevations to high elevations. At least two species of *Myotis* are likely present: little brown myotis and at least one species of long-eared myotis, probably western long-eared myotis.

Bat detections were recorded along the access corridor near Sphaler Creek and adjacent to the Porcupine River along the access route. Bats were also detected near Bob Quinn Lake and the filter plant. No bats were detected at a site west of More Creek along the access corridor. A high number of bat detections was recorded at the Galore camp wastewater storage lagoon. A low number of bat detection was recorded at the Porcupine River aerodrome site.

Waterfowl

Twenty species of waterfowl were observed within the local project area, including seven diving species, three merganser species, seven species of dabbler, two species of geese, two species of loons and trumpeter swans. One great blue heron was observed in wetlands at the confluence of the Porcupine and Stikine rivers. Surf scoters, a blue-listed species, were observed; however, breeding was not recorded for this species. These results suggest that surf scoters use lakes and rivers in the study area as stopover points for resting during migration only.

At the filter plant site and along the access corridor, nine waterfowl species were recorded using lakes and wetlands along the Devil Creek Forest Service Road and More and Sphaler creeks, including Barrow's goldeneye, common merganser, ring-necked duck, lesser scaup, mallard, blue-winged teal, green-winged teal, Canada goose and the common loon. Broods for less scaup were recorded in the lower Mess Creek area and broods for common loon were observed on a lake west of the More Creek/Iskut River confluence and on a lake along the Devil Creek Forest Service Road.

Species observed during fall migration surveys but not during breeding surveys included the American wigeon, black scoter, gadwall, great blue heron, northern pintail, northern shoveler and white-winged scoter. Migrating waterfowl were most commonly observed on lakes associated with More and Spahler creeks and Round Lake.

Species recorded during spring migrations surveys included green-winged teal, mallard, common merganser, lesser scaup, ring-necked duck, American wigeon, northern shoveler, barrows goldeneye and Canada goose. Habitats being used by these species included More Creek and its tributaries.

Results from spring and fall migration surveys indicate that the wetlands at the confluence of the Porcupine and Stikine rivers support a number of migrating waterfowl and are also used by breeding waterfowl. This indicates that these wetlands are important to waterfowl from spring through breeding and into fall.

Low numbers of Barrow's goldeneye were recorded at one of the high-elevation lakes in the Galore Creek valley; however, no broods were recorded. Based on relative numbers and species diversity of waterfowl broods observed, wetlands at the confluence of the Porcupine and Stikine rivers appear to provide important breeding habitat for waterfowl. This area supported broods for: Barrow's goldeneye, blue-winged teal, bufflehead, Canada goose, hooded merganser, mallard, red-breasted merganser, and trumpeter swan.

Trumpeter swans were observed on the Iskut and Stikine rivers, and one group was observed near the aerodrome site at Porcupine River. Trumpeter swans are blue-listed in B.C. and are identified in the Cassiar Iskut-Stikine Land and Resource Management Plan and by the Canadian Wildlife Service as a species requiring increased consideration. No wintering swans were observed along the Iskut, Craig, Stikine, Porcupine or Scud rivers, although mountain goat surveys identified trumpeter swans in open water in back channels of the Iskut River near the confluence of the Stikine River.

Harlequin Ducks
Harlequin ducks have been identified by the Canadian Wildlife Service as a focal species of riverine birds. Harlequin ducks were observed in Scotsimpson Creek. No harlequin duck pairs were observed along the More Creek section of the access corridor; however, this may have been the result of surveying too late in the season to detect pairs.

Harlequin duck brood surveys and additional pair surveys were conducted along More Creek. Results indicate that harlequin ducks successfully breed along portions of Scotsimpson Creek and tributaries into More Creek.

Marbled Murrelets
Marbled murrelets are a red-listed species in B.C. They are also listed as threatened by Committee on Status of Endangered Wildlife in Canada and on Schedule 1 of the *Species at Risk Act* (SARA). Marbled murrelets were detected toward the confluence of the Iskut and Stikine rivers. None were detected at any of the three survey locations within the Porcupine River valley. The distance from the ocean (greater than 70 kilometres) likely accounted for the lack of detections at this survey location.

Raptors
Raptors are highlighted by both the Cassiar Iskut-Stikine Land and Resource Management Plan and government agencies as requiring enhanced consideration. Stand watches and call playback surveys were conducted along the access corridor, aerodrome facility and mine area and identified the presence of bald eagle, peregrine falcon (subspecies not differentiated), gyrfalcon, golden eagle, osprey, red-tailed hawk, American kestrel, sharp-shinned hawk, merlin and rough-legged hawk.

The call playback surveys elicited no response from northern goshawk, suggesting the absence of this species in the local project area. Responses were received from red-tailed hawk, American kestrel and merlin, however, indicating their probable breeding status in the area. No short-eared owls were observed.

Golden eagle nests were observed at Sphaler Creek and along More Creek west of the canyon at the junction of More Creek and Iskut River. In both instances the nest clusters were on cliffs and were inactive during the 2005 season (i.e., no incubating adults, eggs or young were observed).

Songbirds
Surveys of breeding songbirds were conducted along the access corridor, aerodrome facility and mine areas. Focal species included: Smith's longspur (Calcarius pictus), hairy woodpecker, pine grosbecker and Le Conte sparrow (Ammodramus leconteil). Overall, 66 bird species were identified within the study area. Species richness (number of different species) was relatively consistent among biogeoclimatic zones.

Herpetiles
Three amphibians were recorded within the study area: spotted frog (*Rana pretiosa*); western toad (*Bufo boreas*), long-toed salamander (*Ambystoma macrodactylumi*). No reptilian species were recorded within the study area.

Western toad is listed as a species of special concern on Schedule 1 of the *Species at Risk Act* and was the most commonly observed and widely distributed amphibian within the study area. Observations of spotted frog were restricted to wetlands below 1,030 metres elevation. The long-toed salamander was encountered in wet riparian shrub habitats as well as zonal mature and old growth forest. Tailed frog, a species of special concern on Schedule 1 of *Species at Risk Act,* were not detected during surveys.

The access corridor includes a large amount of useable terrestrial habitat for western toad. High and moderate breeding habitats were identified throughout the access corridor; confirmed breeding habitats were found in lower More Creek and east of More Canyon. The area from lower More Creek east to the filter plant also supports multiple moderate breeding habitat areas for toads. The Porcupine River area includes useable terrestrial toad habitat. Two potentially moderate breeding habitats associated with the Porcupine River floodplain area adjacent to the aerodrome facility. One potential breeding habitat area was identified within the mine area.

2.11.2 Project Effects

The assessed wildlife valued ecosystem components included grizzly bear, mountain goat, moose, American marten, hoary marmot, bats, western toad, waterfowl, harlequin duck, raptors, songbirds and trumpeter swan. Species were selected if they met any of the following criteria:

- at risk or of conservation concern;
- highlighted in the Cassiar Iskut-Stikine Land and Resource Management Plan;
- government agencies asked for them to be considered; and,
- identified through Traditional Knowledge interviews with Tahltan Elders as being culturally and/or economically significant to the Tahltan Nation.

Given the hierarchical nature of biological systems, wildlife effects were considered at both the individual animal level (e.g., individual behaviour, physiological condition, survival) and the population level (e.g., population size, distribution, mortality rate, reproductive fitness). Effects at the population level are of greater concern than those at the individual level. However, population boundaries are not always distinct. The exact geographic population boundaries for the valued ecosystem component populations considered in this assessment are both unknown and dynamic.

The maximum effects assessment area for wildlife was delineated by the boundary of the PEM study area. The study area for ecosystem mapping was defined ecologically, based on the watershed boundaries and included approximately 5,760 square kilometres of PEM mapped area, of which 370 square kilometres was also TEM mapped. The TEM mapped areas were further divided into three sub-study areas: the access corridor (including the filter plant), aerodrome facility (including the Porcupine River area) and mine area (including the Galore Creek valley).

This area was used to quantify the direct habitat loss associated with the Project footprint relative to regional habitat availability. Spatial boundaries for other wildlife issues were effect-specific and not constrained to the above geographic boundary.

Potential Effects and Evaluation

Wildlife effects vary with respect to the amount of habitat lost and the availability, quality and wildlife use of those habitats. With the exception of the mine pits and the tailings and waste facility, which will be flooded, most of the Project footprint will be reclaimed upon mine closure.

Grizzly Bear

Terrestrial Habitat Loss
Loss of habitat will occur primarily due to the development of the mine site in the Galore Creek valley, with smaller losses in the access road, filter plant, Porcupine aerodrome and Round Lake heliport areas. The higher-elevation summer and fall habitats that will be lost are predominantly within the range of the coastal grizzly bear population. The losses associated with the access road construction and filter plant facility are predominantly within the range of the interior grizzly bear population.

The coastal and interior grizzly bear populations within the study area have differing dependence on vegetation forage for summer and fall. The coastal population was found to be nearly exclusively dependent on salmon, while interior bears rely on vegetation to build sufficient fat reserves for winter hibernation. The potential loss of these forage habitats within the Galore Creek valley is therefore likely to have a greater impact on the interior population. None of the salmon-spawning areas within the study area – along reaches of the Stikine, Porcupine and Scud watersheds – will be directly affected by the Project.

After mine closure, disturbed habitat will be reclaimed to reflect pre-disturbance values as closely as possible. The only areas of permanent habitat loss will be the mine pits and the tailings and waste facility, which will be flooded and therefore not revegetated.

The amount of suitable grizzly bear habitat that will be lost as a result of the Project represents a small portion of the total amount of habitat available for both coastal and interior populations in the study area. The carrying capacity of the habitat for grizzly bear at the landscape level is therefore unlikely to be affected either during mine operations or upon reclamation after closure. Overall, effects on grizzly bear as a result of direct habitat loss are expected to be negligible.

Wetland and River Habitat Loss
Approximately 7.2% of wetlands potentially supporting early spring and summer forage habitat for grizzly bear will be directly lost by developments within the Galore Creek valley and access road along More Creek. This wetland loss represents a small proportion (0.02%) of the total spring habitat available in the study area. Since the carrying capacity of the habitat at the landscape level is unlikely to be affected, the effects on grizzly bear as a result of this wetland habitat loss are expected to be negligible.

Disruption, Blockage and Impediments to Movement
Mine development in the Galore Creek valley is unlikely to result in the isolation of seasonal grizzly bear habitats. While the presence of physical structures such as the open pits, diversion ditches and tailings impoundment may affect the movements of individual bears, large areas of continuous suitable habitat will remain, thus providing corridors around the developments. Alternative travel routes between suitable habitats will therefore be accessible near the mine site.

During operation, mine traffic volumes along the access road will be approximately 0.6 vehicles per hour (less than 20 return trips per 24-hour period). Scientific studies have shown that bears will continue to cross roads when traffic volumes are less than 10 vehicles per hour. It is therefore considered unlikely that the access road will act as a barrier to movements of grizzly bear in the study area. The greatest threat in relation to the road is likely to be from grizzly bear/vehicle-related interactions rather than disruption or impediment to movements.

During the decommissioning and closure phase of the Project, provisions will be made to develop habitat corridors throughout the valley to ensure that grizzly bear movements are not disrupted in the long term. The access road will be reclaimed during the decommissioning and closure phase of the Project, eliminating the disruption represented by the road alignment in the long term.

The potential effects on grizzly bear movements at a landscape scale in the Galore Creek valley and along the access road are therefore expected to be negligible.

Sensory Disturbance
Grizzly bears can likely habituate to road traffic noise over time, particularly if traffic patterns are predictable and consistent. The greatest threat to grizzly bears from the access road is likely to be from vehicle-bear interactions rather than from noise disturbance.

The potential for industrial noise to disturb grizzly bears is highest in the Galore Creek valley. The valley contains large amounts of highly suitable summer grizzly bear habitat. Based on the literature, it is possible that bears using these habitats may not be displaced from the area. It is uncertain whether bears will habituate to noise in the valley. Although it may prove difficult to attribute observed responses to specific events, monitoring the grizzly bear population in the study area will form an important component of the Wildlife Mitigation and Monitoring Program and may help determine the magnitude of effects that occur in this area.

Studies have found that noise effects of explosives used for avalanche control may not affect hibernating grizzly bears directly, as dens are usually acoustically isolated when covered with snow. However, bear dens may also be associated with avalanche slopes, and so the proximity of detonations to den sites may be a concern.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
The location of the airstrip at the Porcupine aerodrome is approximately two kilometres from the nearest spawning channel. Activity and noise associated with aerodrome construction and operation within the Porcupine River valley may disturb grizzly bear feeding activities during the salmon spawning period.

Suitable grizzly bear denning habitat, while not modelled, is located near the mine site in the Galore Creek valley at elevations above the mine footprint. Denning areas were also located within the More and Sphaler creek valleys. These areas were also at higher elevations and outside the 1 kilometre access road buffer. It is therefore unlikely that disturbances related to project construction and operation or avalanche control will directly result in the destruction or disturbance of active dens.

However, the construction and operation of the Project could influence the selection of grizzly denning areas over time. Studies have found that although grizzly bears may tolerate human activity and noise during denning if the disturbance is greater than one kilometre from the den site, they will tend to avoid human activity areas, including roads and industrial activity, when selecting den sites.

Field observations suggest that denning habitat, which is typically in areas of deeper soil above the tree line, is unlikely to be limited in the study area. Bears displaced by activity within the Galore Creek valley or along the access road are therefore likely to find suitable denning habitat in other areas. However, given that all denning locations are not known with certainty, the timing of initial construction in areas above the tree line will be delayed where possible until after bears have emerged from their dens in April. The effects of Project disturbance on denning grizzly bears are therefore expected to be negligible. The potential Project-related source of indirect grizzly bear mortality is an increase in hunting pressure resulting from greater accessibility to the Project area.

Features Acting as Attractants

Camps associated with the construction and operation of the Project will be located in areas that overlap with grizzly bear habitat along the Porcupine River, within the Galore Creek valley, near Roca Camp and on-site at the filter plant. These camps may act as attractants to grizzly bears searching for food. Individual bears may become food-conditioned if rewarded (i.e, able to access food wastes), increasing the risk of negative human-bear interactions. This is of particular concern for the camps in the Galore Creek valley and at the filter plant because they will be in operation longer than those in the Porcupine River valley or the Roca Camp.

The best way to deal with the potential for negative human-bear interactions is to avoid them. The Waste Management Program identifies the Proponent's plans to mitigate, monitor and adaptively manage wildlife attractants such as camp facility wastes. Other potential management responses to food-conditioned bears include aversive conditioning programs to take advantage of bears' ability to modify their behaviours and capture and translocation to areas away from human activity. Educating workers and maintaining a policy that limits human-bear interactions will also assist in keeping the risk of encounters to a minimum and thereby have negligible effects on grizzly bear.

Spring foraging opportunities may be created for bears as lower-elevation areas of disturbance, such as staging areas and gravel pits developed in the course of access road construction along More Creek, convert to early seral-stage vegetation. The Wildlife Management Plan outlines measures to reduce vehicle-wildlife interactions, such as low speed limits, road signs in wildlife habitats, removal of carrion along the road and proper disposal of food wastes.

Direct Mortality

The probability of vehicle collisions with grizzly bears is expected to 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 areas where there is suitable grizzly bear habitat. Seasonal differences in behaviour may also make bears more vulnerable. 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.

Data on wildlife accidents collected by the Ministry of Transport show a general increasing trend in the number of wildlife accidents involving grizzly bears along Highway 37. Truck traffic on the highway could contribute to grizzly bear mortalities during the life of the mine. The possibility of bear collisions with project vehicles is a residual effect. These mortalities are unlikely to affect the overall grizzly bear population levels in the study area, and the residual effects are deemed to be negligible.

Indirect Mortality

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. Although the existing bear population appears to be sustainable considering the low mortality rates currently recorded as being caused by humans, the access road will open up an area that to date has been relatively inaccessible.

Hunting of grizzly bears is regulated by quota in B.C., and over-harvest due to hunter kills in the area is considered unlikely. Furthermore, access along the road will be restricted to mine-related vehicles and the road will be gated and radio-controlled. The road will be decommissioned upon mine closure. The Project area, including all camps and the mine site, will be designated as 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. The potential for indirect mortality of grizzly bear as a result of increased hunting pressure is therefore expected to be negligible.

Reduction in Wildlife Productivity

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 could include lower 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, thus limiting potential effects on reproduction. The probability and magnitude of effects on individuals or populations cannot realistically be predicted.

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.

Mountain Goat

Terrestrial Habitat Loss

Of the suitable habitats identified in the PEM study area for mountain goat, approximately 0.18% will be lost directly as a result of project development. Most of this loss (0.17%) is associated with lower-elevation slumps and slides within the Galore Creek valley, with only a very small amount (0.01%) resulting from access road construction. This represents a small portion of the total amount of habitat available in the PEM study area. Overall, the carrying capacity of the habitat for mountain goats at the landscape level is therefore unlikely to be affected.

No goats were identified during either summer or winter aerial surveys in the habitats that will be lost at lower elevations within the Galore Creek valley. Similarly, the habitats that will be lost along the alignment of the access road are generally at lower elevations than those habitats in which mountain goats were observed in the study area.

After mine closure, disturbed habitat will be reclaimed to reflect pre-disturbance values as closely as possible. The only areas of permanent habitat loss will be the mine pits and the tailings and waste facility, which will be flooded and therefore not re-vegetated.

Effects on mountain goat as a result of direct habitat loss are expected to be negligible.

Disruption, Blockage and Impediments to Movement

Most suitable goat habitat in the study area occurs at higher elevations within the Galore Creek valley. This habitat will not be affected by the Project. Regional observations by hunting guides suggest that some goats may travel longer distances, including across mid-sized river valleys.

The alignment of the access road generally traverses lower elevations than the areas used by mountain goats in the study area, and the low traffic volumes are unlikely to affect the movements of those individuals that do occur at low elevations throughout the year.

Reclamation of the access road during the decommissioning and closure phase of the Project will eliminate any disruption of mountain goat movement along the road alignment in the long term.

Given that most mountain goat movement is along ridge tops, the potential effects of development in the Galore Creek valley and the access road to movements of mountain goat are considered to be negligible.

Sensory Disturbance

As with grizzly bear, the greater potential for road effects on mountain goats is associated with vehicle-goat interactions.

Studies have found that mountain goats are sensitive to disturbance from human activity, including aircraft noise (particularly helicopter noise). There is potential for disturbances to mountain goat from helicopters and aircraft in the study area. The areas of greatest concern include the Galore Creek valley, along the Porcupine River valley and near Round Lake.
An aircraft approach along the Porcupine River from the west would be the least likely to affect mountain goats because no occupied habitat was identified within a linear one kilometre band on either side of this path. The proposed heliport near Round Lake should be far enough away from the occupied habitat to the west of the lake that traffic approaching from and leaving to the east would cause little disturbance to goats. Within the Galore Creek valley, specific flight paths will be planned to avoid mountain goat habitats where safely possible.

Explosives used for avalanche control could be particularly problematic given the association between mountain goat habitat and avalanche-prone alpine areas in general. Where helicopters are used to drop avalanche control charges, disturbance effects could be exacerbated by the association between the helicopter noise and the subsequent explosion. There is considerable potential that mine blasting and avalanche control will result in mountain goats shifting to new habitat ranges.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours

Activities within the Galore Creek valley during mine construction and operation may disturb mountain goats to the point that they avoid feeding in certain areas or slopes in the valley, thus limiting the habitat effectiveness of these areas over time. Activities that could result in such disturbance include helicopter operation, industrial activity and explosives use. Some disturbance may have already occurred within the valley as a result of exploration; however, the effects of this on goats in the area are unknown.

Potential effects on feeding habitats and/or behaviours of mountain goats along the access road, transmission line and pipeline corridor are likely to be greatest during the construction period and lesser during operations (generally related to traffic and avalanche control). Mountain goat use of low-elevation forest habitats that will be traversed by the access road will likely be restricted to winter and spring. Following construction, forested habitat will probably buffer the effects of disturbance along lower-elevation sections of the road.

Traffic levels along the access corridor are unlikely to be high enough to result in disturbance of goats during operation; however, the effects of disturbance from avalanche control and road blasting are deemed to be considerable. Helicopter support and traffic along the road corridor and heliport at Round Lake may also potentially disturb mountain goat natal habitats.

Despite mitigation measures proposed by the Proponent, potential disturbance of mountain goat natal habitats as a result of access road construction blasting and helicopter traffic is deemed considerable. Disturbance of mountain goat kidding habitats and/or behaviour in the Galore Creek valley is also of concern. The cumulative effects of helicopter operations, industrial activity and explosives use may result in disturbance of goats using the kidding habitats identified. The potential effects of disturbance of kidding areas could include a reduction in reproductive productivity. Mitigation of helicopter disturbance will include avoidance of occupied goat habitat and pre-determined flight paths and flight schedules.

The potential for considerable adverse effects on mountain goat natal habitat and mountain goat feeding habitat and/or behaviour within the Galore Creek valley is deemed considerable.

Features Acting as an Attractant
There is a possibility that mountain goat licks will develop along the access road as a result of changes in rock chemistry in bedrock cut areas. Another attractant may be high-quality regenerating vegetation along the roadside in high elevation areas. These attractions will increase the risk of goat-vehicle interactions.

Direct Mortality
Direct mortality from vehicle collisions is anticipated to have a negligible effect on the local population of mountain goat in the study area. 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 will likely ensure that they remain a safe distance away from transportation and development infrastructure, significantly reducing direct mortality.

Road cuts may create lick areas that attract goats; this has occurred in areas along Highway 1 in the Rocky Mountain Parks. These licks bring goats into close proximity to 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.

There is a negligible likelihood that the increased traffic from the Project on Highways 37 and 37A will increase the mortality risk to mountain goats because most of this route is located well away from suitable goat habitat. 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 data collected by the Ministry of Transport (1983 to 2002).

During the winter, mountain goats in the study area may occupy escape terrain near areas prone to avalanches, 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. 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.

Indirect Mortality
Limiting access to the mine site to all but authorized individuals will ensure there is no substantial increase in goat harvesting or disturbance from other human activity such as recreational snowmobile use. 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 available during the legal hunting season, but the valley is located a substantial distance from occupied goat range. It should be noted that fixed wing is the only type of aircraft that can legally be used to provide hunter access. The potential for indirect mortality of mountain goat as a result of increased hunting pressure is therefore expected to be negligible.

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. 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 Mitigation and Monitoring Plan. However, the potential for indirect mortality as a consequence of range shifts in the Galore Creek valley is considered considerable.

Reduction in Wildlife Productivity
Disturbance of goat habitat in the Galore Creek valley and along the access corridor, particularly in areas used for kid rearing, 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 predation.

Disturbance to goat 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.

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.

Moose

Terrestrial Habitat Loss
Of the suitable habitat identified in the PEM study area for moose, approximately 0.24% will be lost directly as a result of project development. Most of this loss will occur in association with the extreme east and west sections of the access road development.

Given that the amount of suitable winter moose habitat that will be directly lost represents only a very small portion of the total amount of winter habitat available in the study area, and given that reclamation activities will be designed to restore comparable habitat upon closure, the effects on moose as a result of direct habitat loss are expected to be negligible.

Wetland and River Habitat Loss
Wetlands along More Creek, but not in the Galore Creek valley, are expected to support moose during the growing season. Because wetland habitat is abundant throughout the study area, the direct loss of approximately 2.3% (4.4 ha) of wetland habitat along the east and central regions of More Creek is unlikely to affect the carrying capacity of the study area for moose. The effects of wetland habitat loss on moose both during mine operation and after closure will be negligible.

Disruption, Blockage and Impediments to Movement
No moose or moose sign was observed with the Galore Creek valley during any season. Therefore, no effects on moose movements are expected as a result of the developments in the valley.

Considering the relatively low traffic volumes anticipated along the access road and the protocol that will be in place for minimizing the disturbance of wildlife by road users, moose are more likely to use the access road as a movement corridor than to treat it as a barrier to movements. During winter, the ploughed access road will provide a relatively effective and energy efficient means of travel for moose, particularly when the snow pack conditions hamper movements through alternative routes. The presence of moose along the road will increase the risk of moose/vehicle-related interactions. Overall the effect of the road on moose movements during normal conditions is considered to be negligible.

However, moose could be trapped on the road by high snow banks created by ploughing during periods of heavy snowfall, or by the no-post barriers and earth berms planned for some sections through the More Creek canyon. These barriers could prevent the escape of moose travelling along the access road when vehicular traffic is also present; this poses a risk for both moose and vehicles. Therefore, with effective mitigation to prevent moose from being trapped on the access road by snowbanks and safety structures, the potential effects of disruption of moose movements are considered to be negligible.

Sensory Disturbance
Documented reactions of moose to roads are likely related to the physical presence of traffic and humans, as opposed to noise. As for grizzly bear and mountain goat, the greater potential for road effects on moose is therefore due to vehicle-moose interactions.

Aircraft noise could affect moose wintering in the Porcupine River valley due to their physiological vulnerability at this time of the year. The impacts of any type of disturbance to moose can vary depending on the particular winter conditions. During severe conditions, any added stress could result in moose mortality. However, moose have been observed on and near the Bob Quinn airstrip on a number of occasions in winter and thus appear to be able to habituate to aircraft noise.

No moose or moose sign was observed within the Galore Creek valley during any season so the effects of industrial noise on moose in this area are therefore not expected. Moose will be present around the filter plant, although the low level of noise from this site is not expected to incur adverse effects.

The only location where moose could potentially be exposed to noise associated with blasting and avalanche control is along the Porcupine River valley during winter months. The source of this potential exposure would be from Scotsimpson Creek during road and tunnel construction and as a result of avalanche control along the creek during construction and through operations. Given that the Porcupine River valley is some distance from this noise source, blasting and avalanche control noise is expected to have negligible effect on moose in the valley. Other sources of noise in the valley, such as aircraft, are likely to be of greater concern.

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

Disturbance of Feeding, Breeding and Denning Habitats
Feeding patterns and/or behaviours of moose overwintering within the Porcupine River valley may be disturbed by the construction and operation of the Porcupine aerodrome. Research indicates that moose may be less tolerant of human presence than of disturbance associated with mechanical activity.

An additional consideration is that moose may be more vulnerable to disturbance in winter, when the energetic cost of movement is higher and the body condition of animals tends to be poorer.

Monitoring of the moose population in the study area and within the Porcupine River valley will form an important component of the Wildlife Effects Monitoring Program and adaptive management in the valley. Further, protocols for aircraft operation in the vicinity of wildlife will be adhered to at all times. With implementation of mitigation, disturbance effects on moose feeding habitats and/or behaviour as a result of activities along the Porcupine River valley are expected to be negligible.

Moose are expected to be present in the Porcupine River valley year-round, including females with calves. However, the numbers of moose in the valley are highest during winter when the population is concentrated at lower elevations. The greatest potential for effects on moose in this area as a result of construction and operation of the Porcupine aerodrome will therefore be during winter. Effects on moose breeding habitat and/or behaviours within the Porcupine River Area are considered to be negligible.

Features Acting as an Attractant
The aerodrome is in an area adjacent to highly suitable and occupied moose winter range. It is anticipated that moose will be attracted to the airstrip because of low snow levels and increased availability of rooted browse. To mitigate effects, a fence will be constructed around the airstrip to keep out moose and other wildlife.

Studies have found that moose, in particular, exploit regenerating cleared areas on road verges. These types of foraging opportunities will be created in staging areas, gravel pits and other areas of disturbance associated with road and transmission line construction, particularly along the lower sections of More Creek. Moose are therefore likely to use the access road and transmission line right-of-way to access suitable habitats in the lower More Creek, particularly during winter, when the road is ploughed and the snow pack hampers movement elsewhere.

Reduction in Wildlife Productivity
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 severe winters could lead to lower birth rates. 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. 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.

Direct Mortality

Moose occupy habitats along the west and east ends of the proposed access road, presenting the risk of moose-vehicle collisions along the road.

During the winter, 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. 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 two kilometre 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 during baseline studies. The tracks may be attributable to a moose population wintering in the lower Mess Creek area. Confirmation would require further survey, but the presence of moose in this area suggests that the potential for vehicle collisions also exists along this section of the access road.

Wildlife accidents involving moose, while variable from year to year, have shown a general increasing trend along Highway 37 since the early 1990s, based on data collected by the Ministry of Transport. Truck traffic on the highway in association with the Project could contribute to moose mortalities. 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.

Indirect Mortality

Although the construction and operation of the mine access road could increase hunting pressure on moose in the study area, access will be restricted to mine-related traffic, and the road will be gated and radio-controlled. 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 potential for indirect mortality of moose as a result of increased hunting pressure is therefore expected to be negligible.

American Marten

Terrestrial Habitat Loss

Of the suitable habitat identified in the PEM study area for marten, approximately 0.7% will be lost directly as a result of project development. The Project will not result in changes to home habitat change on a landscape scale.

Reclamation at mine closure will be designed to restore habitat of comparable value to that lost during mine development and operation. The succession of reclaimed habitat to high-value old forest habitat will take many years and will not be possible in the areas that will be flooded (mine pits and the tailings and waste rock facility). To assist in minimizing impacts to individual marten, coarse woody debris will be maintained in adjacent areas where possible, such as along the access road.

In summary, while a small number of individuals may be temporarily affected by habitat loss within the development area during construction, the sustainability of the marten population in the study area will not be affected. Effects on American marten as a result of direct habitat loss are therefore expected to be negligible.

Disruption, Blockage and Impediments to Movement

The extent of the development in the Galore Creek valley may create a barrier, and some American marten habitat may be isolated.

It is generally accepted that roads with low traffic volume (less than 50 vehicles/day) do not act as an impermeable barrier to the movements of smaller mammals. Further, American marten are known to use drainage culverts to access habitats on either side of roads and will therefore likely use such culverts placed along the access road. It is expected that the access road will not act as a barrier to the movements of American marten in the study area.

During the decommissioning and closure phase of the Project, provision will be made for re-establishing habitat corridors through the valley to prevent disruption of American marten movements in the long term.

Effects on American marten movements in the Galore Creek valley and along the access road are therefore expected to be negligible.

Sensory Disturbance

No specific research has investigated the effects of road noise on marten. However, given the low volumes of traffic expected along the access road, it is expected that marten will continue to use habitats adjacent to the road and also culverts under the road. The effects of traffic noise on marten are therefore expected to be negligible.

Very little research exists on the effects of aircraft and industrial noise on small mammals, although possible effects could include impaired reproduction and increased energetic costs due to stress and/or decreased foraging efficiency. Habituation is possible but unknown. However, any potential effects will be highly localized and are considered unlikely to affect the sustainability of regional marten populations where they potentially occur.

There is no specific research on the effects of blasting and other explosive noises on small mammals. Marten prefer covered habitat in older forests and are not likely to be found near avalanche terrain in the winter. Avalanche control measures are therefore not expected to cause adverse effects on this species.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours

Potential effects of habitat loss and disruption of movement are likely to be the greatest concern for marten in the study area.

Marten denning habitats are associated with moist areas with shrubby understory and abundant coarse woody debris. Although these habitats were not mapped for marten, limitations for denning are considered unlikely given the abundance of structural stage 6 and 7 conifer forest within the study area.

The amount of direct habitat loss is not anticipated to exceed more than a small percentage of the available habitats in individual home ranges. Given the abundance of suitable marten denning habitat within the study area, the effects of disturbance to marten breeding behaviours and/or denning habitat are expected to be negligible.

Features Acting as an Attractant
Marten may be attracted to both human waste as well as small rodent populations within camp facilities. This behaviour will likely occur as the Project is developed, and may also become an issue at other camps or project facilities such as the filter plant and aircraft landing sites. The Waste Management Program identifies the Proponent's plans to mitigate, monitor and adaptively manage wildlife attractants such as camp facility wastes.

Carrion from road-killed wildlife may act as an attractant to marten along the access road. Although this will increase the risk of mortality as a result of vehicle strikes or increased predation from both mammalian and avian predators, the risk is considered low.

Reduction in Wildlife Productivity
The loss and alteration of habitat may affect the reproductive success of American marten. Studies report that environmental stress can reduce ovulation in American marten, with up to 50% of reproductive females failing to breed. Most studies use forest clearing rates of greater than 40% as an indication of environmental stress. However, much less clearing will be done for the 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.

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.

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.

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 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.

Data on vehicle strike mortality along Highway 37 collected by the Ministry of Transport between 1983 and 2002 documented only three marten. 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.

Indirect Mortality
The potential source of indirect mortality is displacement of individuals in the Galore Creek valley. Population-level effects are not anticipated, and thus effects are expected to be negligible.

Hoary Marmot

Terrestrial Habitat Loss
Of the suitable habitat identified in the PEM study area for hoary marmot, approximately 0.5% will be lost directly as a result of the Project. There is a small possibility that a marmot colony, or perhaps a few colonies, would be displaced from habitat that will be directly affected by the Project.

Reclamation at mine closure will be designed to restore habitat of comparable value to that lost during mine development and operation. The small amounts of habitat that will be lost either temporarily or permanently will not affect the sustainability of the hoary marmot population within the study area. Effects on hoary marmot as a result of direct habitat loss are therefore expected to be negligible.

Disruption, Blockage and Impediments to Movement
Most of the marmot habitat identified within the Galore Creek valley occurs at elevations above the Project components. Thus, while Project development may influence the direction of movement of some dispersing juveniles, no barriers to accessing suitable habitat are anticipated. Effects on hoary marmot movements within the Galore Creek valley are therefore expected to be negligible.

Most of the suitable habitat identified for hoary marmot is well above the alignment of the access road. The road is therefore considered unlikely to act as a barrier to the movements of marmot in the study area. Effects on hoary marmot movements along the access road are therefore expected to be negligible.

Sensory Disturbance
No specific research has investigated the effects of road, aircraft or industrial noise on marmot. However, given that most of the suitable habitats within the study area occur at a reasonable distance from proposed roads, effects to marmot as a result of noise are expected to be negligible.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
Most of the suitable habitat identified for hoary marmot in the study area is at elevations well above the alignment of the access road and the Galore Creek valley infrastructure. Only small

amounts of this habitat will be directly affected by the Project, and no indirect habitat loss as a result of habitat avoidance is expected. Given the small distances moved by foraging marmots, effects on feeding behaviours and/or habitats as a result of mine-related disturbance are expected to be negligible.

Only a very small percentage of potential denning habitats will be directly lost or disturbed as a result of development. Effects of disturbance to hoary marmot breeding behaviours and/or denning habitat are considered negligible.

Reduction in Wildlife Productivity
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 the Project. Effects on feeding behaviours or habitats as a result of disturbance from project development are expected to be negligible. Any reductions in reproductive success are therefore expected to be negligible for hoary marmot in the study area.

Direct 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 thus are difficult to measure.

Given the range in marmot densities and the small amount of habitat that will be lost in the Galore Creek valley, 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.

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.

Data on vehicle strike mortality along Highway 37 collected by the Ministry of Transport between 1983 and 2002 documented only two marmot. 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.

Indirect Mortality
The potential source of indirect mortality is displacement of individuals in the Galore Creek valley. Effects of range displacement are expected to be negligible.

Bats

Terrestrial Habitat Loss
The Project is likely to result in the loss of some habitat used by bats. The amount of old and mature seral stage habitat that will be lost represents a small proportion of the total comparable habitats available for bats in the study area.

Reclamation at mine closure will be designed to restore habitat of comparable value to that lost during mine development and operation. The succession of reclaimed habitat to high-value old forest habitat will take many years and will not be possible in the areas that will be flooded (mine pits and the tailings and waste rock facility).

However, the carrying capacity of the landscape for bats is unlikely to be affected by habitat loss given the large amount of habitat available in the study area. Effects on bats as a result of direct habitat loss are therefore expected to be negligible.

Wetland and River Habitat Loss
Wetland habitat loss within the study area is not anticipated to affect the foraging opportunities of bats within the study area, since only a small area (4%) of wetland habitat will be directly lost as a result of development. The effects of wetland habitat loss on bats both during mine operation and after closure will be negligible.

Sensory Disturbance
Lighting at the aerodrome may attract bats indirectly by aggregating insects. However, illuminating the facilities only during aircraft operations will substantially reduce this attraction. The potential for bat collisions with aircraft is expected to be nearly non-existent, and therefore the effects on bats attracted to facilities lighting are expected to be negligible.

Artificial lighting at the mine site will have an indirect effect on bat species by attracting insects, which could attract foraging bats. The net effect on bats may be positive, as long as bat mortality is not simultaneously increased due to collisions with machinery or buildings. These types of collisions are considered unlikely, however, and effects are deemed negligible. The Project development may result in indirect mortality of identified for bats through disturbance of hibernation.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
Although small amounts of the types of habitats used by foraging bats will be affected by project development, effects on the carrying capacity of the landscape are considered unlikely. There is the possibility that foraging habitats preferred by little brown myotis may be enhanced, particularly in open areas such as along the access road and at the mine site. The net effect of changes to the feeding habitats of bats is therefore expected to be neutral.

Aerially foraging bats, such as little brown myotis, typically forage during the peak times of insect abundance at dusk and dawn. The effects of noise disturbance from different noise sources in the study area are expected to be low, particularly during the foraging periods of bats occurring in the study area. Effects on the foraging behaviours of bats are therefore expected to be negligible.

Studies have found that most species of bats will usually move to alternate day roosts following disturbance events. This is not likely to cause adverse effects if disturbances are rare.

Features Acting as an Attractant
Tailings ponds, other water sources and light sources will attract insects, which in time will attract bats to this prey source. Of these, the tailings ponds present the most cause for concern to bats.

Little brown myotis is a common bat known to associate with human-made structures that often forms large nursery colonies in buildings. Buildings and crevices in the rocks produced by excavation will likely attract roosting bats. Bats roosting in buildings are a nuisance issue, and rock crevices may be a population sink for bats (i.e., requiring immigration of individuals to sustain populations), depending on the number attracted to the site.

All buildings throughout the mine site will need to be bat-hardened by, for example, meshing vents and ensuring that building siding material is bat-proof. Buildings will be incidentally monitored for bats, and adaptive management will ensure that problem areas are identified and mitigation measures are implemented, resulting in negligible effects on bats.

Construction of the access road may provide habitat alternatives that may attract roosting and foraging bats. Bats may also potentially use the tunnel from Scotsimpson Creek into Galore Creek valley as roosting habitat if the temperatures within the tunnel are suitable. This will be monitored and managed during the closure and decommissioning phase of the Project in particular.

The creation of forest-edge habitat may positively affect bats. However, intact forest habitat may also be important as a prey source and roosting habitat for bats. This is likely to be of higher importance for western long-eared myotis, the second species of bat likely present in the study area. Given the relatively small amount of habitat loss for bats associated with the Project, this balance will be easily maintained, ensuring a negligible effect on bats.

Reduction in Wildlife Productivity
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. The effects of sensory disturbance are also expected to be low, particularly during the foraging periods of the bats found in the study area. 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.

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.

Direct Mortality
The primary source of direct mortality identified for bats is incidental destruction of roosts during vegetation clearing activities during construction. 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 where the temperature would remain above freezing. Therefore, even where vegetation clearing did incidentally affect a bat roost, it is unlikely that large numbers of bats would die as a result.

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. This will assist in mitigating the potential for mortality of day-roosting bats in the study area. Mortality due to vegetation clearing is therefore expected to be negligible.

Indirect Mortality

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. Locations of wintering bats in the study area are unknown and cannot be predicted accurately. Based on the literature, little brown myotis, the most widely distributed and hardy species of bat identified in the study area, require hibernacula that remain above freezing with a humidity of 70% to 90%. Hibernacula for this species are therefore only likely to occur in the warmest parts of the study area. According to studies, there are no records of western long-eared myotis hibernating within B.C. 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.

Songbirds

Terrestrial Habitat Loss

Some direct habitat will be lost as a result of project development but it represents a small proportion of the total songbird habitat available in the study area. Some loss of the nesting territories and nesting habitat of individual birds will also occur, but this loss is not expected to affect the population-level carrying capacity of the landscape for songbirds. Effects on songbirds as a result of direct habitat loss 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.

Wetland and River Habitat Loss

Of the songbird species identified in the study area, approximately 9% rely on wetland habitats for breeding or foraging (e.g., tree swallow (*Melospiza melodia*). Of the wetland habitats identified within the study area, only a small proportion (4%) will be directly lost as a result of project development. Given that the vast majority of wetland habitats will be retained in the study area, the effects on those species of songbirds reliant on wetland habitats are expected to be negligible.

Disruption, Blockage and Impediments to Movement

The access road may act as a barrier to the movements of some songbirds. This type of barrier is generally not due to the physical blockage of the road itself but rather is related to noise and traffic disturbance. The transmission line may also act as a barrier to the movements of birds. However, a greater risk for birds is direct mortality resulting from collisions with vehicles and, in particular, the transmission line.

Bird feeding behaviour may be affected in areas with relatively high human and/or vehicular traffic, such as on or near access/haul roads and around work sites. When the presence or disturbance is constant, birds may become habituated over time, reducing the frequency and duration of disturbance events. However, the effects of disturbance are likely to be of greater concern for breeding than for feeding behaviour for songbirds in the study area. Disturbance of feeding, if it occurred, would likely be negligible.

Sensory Disturbance
The increase in traffic along Highway 37 is not expected to measurably elevate road noise beyond the current baseline conditions.

The effects of aircraft noise on songbirds are likely to be species, season and habitat specific. Studies have found that particularly vulnerable times for songbirds include the breeding season, when aircraft noise might interfere with breeding and territorial calls. However, given that air traffic will be relatively infrequent, population-level effects are likely to be negligible.

Continuous background noise (e.g., traffic noise) has the potential to mask breeding and territorial calls. Industrial noise from the Project will be continuous, at low levels and localized in the area. Disturbance effects to songbirds are expected to be negligible.

Aerodrome lighting could lead to collisions between migratory and nocturnal bird species and aircraft. It could also potentially temporarily distract nocturnally migrating birds if they are flying at low altitudes. No population-level effects are expected.

Birds most likely to be affected by artificial lighting at the mine site are migratory species and nocturnal species such as owls, although excessive light may also disrupt the diurnal pattern of species that roost at night. Migratory birds may be drawn to, or disoriented by, artificial lights, although this problem tends to be more associated with tall transmission towers and extremely bright light sources such as searchlights and lighthouses. No population-level effects on birds are expected as a result of mine facilities lighting.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
Bird feeding behaviour may be affected in areas with relatively high human and/or vehicle traffic such as the access road/haul roads and around work sites. When the presence or disturbance is constant, birds may become habituated over time, reducing the frequency and duration of effects on birds However, the effects of the disturbance are likely to be of greater concern for breeding than for feeding behaviour.

Tree-nesting songbird species with nests at or near the edge of previously interior habitats may be disturbed by natural predators and human activity. Nesting and incubation may be disrupted in specific areas with frequent aircraft activity. Disturbance events initiated in the middle of the breeding season may result in nest abandonment. However, in subsequent years, disturbance is likely to result in a shift in breeding locations away from areas exposed to disturbance. 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 effect of disturbance on songbird nesting habitats and breeding behaviours is therefore expected to be negligible.

The creation of edge habitat in areas of development may attract those species of songbird that prefer to nest and/or feed along edge habitats. Vehicle-bird interactions will therefore be a concern along edges created during access road construction.

Features Attracting as Attractants
Some species of songbird may also be attracted to human waste generated at camp facilities. The Wildlife Management Plan and Waste Management Plan identify the Proponent's plans to mitigate, monitor and adaptively manage wildlife attractants such as camp facility wastes. Implementation of mitigation will ensure effects on songbirds remain negligible.

The transmission line could act as an attractant for certain songbirds for perching and/or nesting. This could increase the risk of mortality from collisions with the transmission line or electrocution.

Reduction in Wildlife Productivity
Vegetation clearance and noise disturbance to nesting birds during the breeding season could affect 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 from sensory disturbance during the operations phase 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 as described earlier.. Where this is not possible, nesting sites will be avoided if encountered during construction. 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. During the operation, 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.

Direct Mortality
Mortality of songbird adults and eggs or young in nests could result from vegetation clearing 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, as described earlier. The effects of mortality in association with vegetation clearing are therefore expected to be negligible.

Small birds do occasionally collide with moving vehicles along roads so there is potential for mortalities along the access road. However, both traffic volumes and vehicle traveling 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.

In general, studies have found that large birds such as raptors are considered to be more at risk of collisions and electrocutions with transmission lines than smaller songbirds. However, general design features such as increasing the visibility of the line will be implemented in some locations to reduce the risk of collisions. 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.

Raptors

Terrestrial Habitat Loss
Potential habitat loss effects on raptors in the study area will likely be greatest for sharp-shinned hawk, particularly in the Galore Creek valley. However, this species along with the other raptor in the affected habitats (American kestrel, red-tailed hawk and merlin) are considered to be adaptable and to have moderate to high abilities to co-exist with development[5]. No terrestrial habitat loss is expected for other raptor species detected in the study area, including peregrine falcon, gyrfalcon, golden eagle, rough-legged hawk, bald eagle, osprey and northern harrier.

Reclamation at mine closure will be designed to restore habitat of comparable value to that lost during mine development and operation.

Sensory Disturbance
Raptor abundance and diversity along the access road alignment appear to be low. Of those species observed, both American kestrel and red-tailed hawk will readily use roads for hunting, including very busy highways (e.g., Highway 1 in the Lower Mainland). Golden eagle nests were observed within the 1 kilometres buffer zone of the access road. Golden eagles are more sensitive to disturbance, and road noise may disrupt nesting attempts in these areas.

Studies have found that eagles are fairly tolerant of non-threatening background disturbances. Further, bald eagles have only been observed incidentally along the access road alignment, and no nest sites were identified or are likely to occur in this part of the study area.

Studies investigating the effects of aircraft noise on raptors have typically focused on nesting success or behaviour. Studies suggest that the raptor nesting success and behaviour in general are not affected by low-level jet traffic. The effects of noise on breeding raptors in association with the airstrip in the Porcupine River valley are likely to be negligible.

Raptors are not abundant in the Galore Creek valley so effects of industrial noise and noise related to avalanche control is anticipated to be low.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
High numbers of bald eagles were observed feeding on spawning salmon at the confluence of the Porcupine and Stikine rivers during fall baseline surveys in 2005. Aircraft activity within the Porcupine River valley could possibly affect the feeding behaviours of bald eagles in this area.

The proposed airstrip for the Project is approximately 10 kilometres away from the concentration of eagle feeding activity along the confluence of the Stikine and Porcupine rivers. Because bald eagles typically respond more to disturbance from helicopters than from fixed-wing aircraft, low-level helicopter flights will be avoided over areas of concentrated feeding activity. Given the distance of the airstrip from identified eagle feeding areas, the anticipated effects of aircraft disturbance on raptor feeding within the Porcupine River valley will be negligible.

Two clusters of golden eagle nests were located along the access corridor in the upper Sphaler Creek and on cliffs immediately west of the More Creek/Iskut River confluence. If active nests are identified at the time of construction, road-building activities may result in the disturbance of

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[5] MWLAP. 2005. Best Management Practices for Raptor Conservation during Urban and Rural Land Development in British Columbia. B.C. Ministry of Water, Land and Air Protection Best Management Practices Series. B.C. Ministry of Water, Land and Air Protection.

nesting individuals and possibly nest failure. Disturbance to golden eagle nesting habitats is of particular concern because golden eagles and their nests are protected under the *B.C. Wildlife Act*. Responses to disturbance vary with reproductive stage. Eagles are most likely to abandon nests during the incubation period, which typically occurs sometime from April through June in B.C.

Construction of the road, transmission line and pipelines along the lower More Creek area during the breeding season could also result in the disturbance of American kestrel and red-tailed hawk nesting. Although long-term persistence of these species is not expected to be affected by human activity in the area, nesting individuals could be disturbed during the construction period.

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. In the event that nest sites identified are active, the B.C. Ministry of Environment will be consulted for further guidance, as discussed in the Wildlife Management Plan. In consideration of these mitigation measures, the potential effects of disturbance on raptor nesting habitats and/or behaviours are expected to be negligible.

Features Acting as Attractants

Golden eagle sightings were relatively common along the access road alignment during baseline studies. Golden eagles will readily forage on carrion, particularly during the winter, and may be attracted by vehicle-killed wildlife. Roadsides are also important hunting grounds for diurnal raptors identified along the access road alignment, including red-tailed hawk and American kestrel.. Raptor attraction to roadsides will expose individuals to the risk of vehicle collision. The Wildlife Management Plan will ensure that mortality along the access road is maintained as a negligible effect on raptor populations.

Osprey and red-tailed hawks may perch on and construct nests on top of the Project transmission line poles. This is most likely to occur where these species were observed during baselines studies: ospreys, in the area around Bob Quinn Lake and red-tailed hawks along lower More Creek and within the Porcupine River valley.

The Project transmission line will be designed to minimize the risk of electrocutions of perching raptors. In the Bob Quinn area, ospreys will be prevented from landing and nesting on transmission line poles by installing perch guards and cross-arms and by providing alternative nesting sites (e.g., dummy poles with platforms) where required. Implementation of mitigation will ensure that mortality from collisions and electrocution along the transmission has a negligible effect on raptor populations.

In natural habitats, peregrine falcon, gyrfalcon and rough-legged hawk nest on ledges and precipitous cliff faces. Baseline study sightings of both peregrine falcon and gyrfalcon in the study area were rare and breeding was not recorded for either species. No falcons were observed in the Galore Creek valley. Baseline studies recorded the presence of rough-legged hawks in the vicinity of the proposed mine site during the breeding season. However, the site is well outside the documented breeding range for rough-legged hawk and it is unknown if the sightings represented breeding individuals.

At the mine site, open pit walls may attract these cliff-nesting species. A pit wall monitoring program for raptor nests will therefore form part of the Wildlife and Wildlife Habitat Effects Monitoring Program to ensure potential effects are negligible.

Reduction in Wildlife Productivity

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 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.

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 Ministry of Environment will be consulted for further guidance. In order to mitigate 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. Further more, 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.

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.

Direct Mortality

The potential attraction of several raptor species to roadsides for hunting or feeding on carrion increases the risk of vehicle collisions for these species. The Wildlife Management Plan specifies that all road carrion will be removed and disposed of in suitable areas away from roads. Since both traffic volumes and vehicle traveling speeds will be relatively low compared to typical highway conditions, mortalities of raptors hunting along the access road are also expected to be low. No population-level effects from collisions with vehicles are expected, and the effects are therefore considered to be negligible.

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 with low clearances between energized components that allow 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.

Raptors could collide with the transmission line for the Project anywhere along its length. However, 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.

Nevertheless, appropriate mitigation primarily for the purpose power system reliability will be implemented,that will also lower the risk to raptors. Collisions and electrocutions can cause the lines to short out, leading to downtime while repairs are made and increased risk of fire. The visibility of the line will be increased in certain locations as studies have shown that this markedly reduces the incidence of bird strikes. Records of raptor mortalities will be kept to help identify areas of higher bird strikes and facilitate adaptive management. No population-level effects from transmission line collisions or electrocuations are expected and residual effects are therefore considered to be negligible.

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.

The baseline studies identified several species of raptor within the Porcupine River valley (red-tailed hawk, merlin, American kestrel, bald eagle, gyrfalcon and peregrine falcon), of which two species (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.

A peregrine falcon sighting in fall 2005 suggested 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.

The risk of bird-aircraft collisions from raptors as well as waterfowl is 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, monitoring and appropriate adaptive management is essential given the human safety concern associated with bird-aircraft collisions..

Waterfowl

Terrestrial Habitat Loss
The access road alignment has been designed to avoid lakes and wetlands where possible. At its closest point, the road passes approximately 100 metres from the smallest lake used by breeding lesser scaup in the study area and 550 metres from the location of a loon pair nest. Based on these recorded distances of nests from water, habitat loss from access road construction may affect a small amount of terrestrial habitat potentially used by breeding lesser scaup.

Reclamation at mine closure will be designed to restore habitat adjacent to lakes such that it is of comparable value to that lost during mine development and operation.

Effects on breeding waterfowl as a result of habitat loss along the road alignment are therefore expected to be negligible.

Wetland and River Habitat Loss
Wetlands, lakes and streams identified as being occupied by waterfowl (breeding or non-breeding) within the study area will not be directly affected by development. Changes in

hydrology may cause indirect effects from South More Creek westward to the point where the valley widens, and to a lesser extent where the road bisects areas of wetland habitat. Very few waterfowl were observed in the South More Creek area during baseline inventory, and no breeding waterfowl were recorded. The effects of wetland loss on waterfowl are therefore expected to be negligible.

Sensory Disturbance

Given the distance of the access road from habitats used by waterfowl in the study area, particularly breeding waterfowl, no effects are anticipated for waterfowl in association with traffic noise.

The potential for disturbance of waterfowl by aircraft noise is greatest along the Porcupine River valley. However, the highest abundance and diversity of waterfowl was recorded in wetlands at the confluence of the Porcupine and Stikine rivers, approximately 10 kilometres from the proposed airstrip. This area may be on the flight path of incoming or departing aircraft; however, the aircraft are expected to be high enough that noise-related disturbance to waterfowl would be minimal. While some disturbance to individuals may be possible, no population-level effects are anticipated on waterfowl occurring in the area.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours

The greatest potential for disturbance of breeding waterfowl is along the Porcupine River valley. Given the distance of breeding waterfowl from the Porcupine aerodrome, the potential for disturbance is considered negligible.

Features Acting as Attractants

Based on the future landscape scenario, the tailings impoundment and associated “beaches” may attract waterfowl including Canada geese, harlequin duck and trumpeter swan.

Reduction in Wildlife Productivity

Suitable waterfowl breeding habitat lies within one kilometre of the access road in the Bob Quinn Lake area, along More and Sphaler creeks and along the Porcupine River valley. Reproductive success of waterfowl near these locations may be affected by disturbance resulting from construction and operations activities, 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 breeding was observed in these disturbed areas during baseline surveys, the effects of the Project on breeding waterfowl in this locality are anticipated to be negligible. The lakes along More and Sphaler creeks suitable for breeding are screened from the access road by forest cover and are large enough to allow waterfowl to move away from any road-related disturbances. Effects of the Project on breeding waterfowl on these lakes are therefore anticipated to be negligible.

Despite the waterfowl abundance at confluence of the Porcupine and Stikine rivers , aircraft activity-related effects in this area are predicted to be negligible due to the 10 kilometre distance from the airstrip and the ability of waterfowl to move their broods to water bodies 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.

Direct Mortality

Waterfowl in the study area may be at risk of collision and electrocution with the transmission line, particularly in the Porcupine River valley where waterfowl abundance is relatively high. Transmission line design features will be implemented to reduce the risk of collisions and electrocutions as described in the Wildlife Management Plan. Recorded observations of waterfowl mortalities will help identify areas of higher bird strikes and allow appropriate adaptive management. No population-level effects are expected and any residual effects are considered to be negligible.

As discussed above, raptors and waterfowl are the species groups most commonly involved in strikes with aircraft. Population-level effects from airtstrikes are not expected and any residual effects are considered to be negligible.

<u>Harlequin Duck</u>

Terrestrial Habitat Loss
As the vegetation structure capable of supporting harlequin nests is well represented in the landscape, the net loss of riparian habitat will likely be low. Given the philopatric nature of nesting females, some individuals may be temporarily affected if actual nest sites are removed. At mine closure, reclamation activities will be designed to restore comparable habitat upon closure.

The carrying capacity of the landscape for harlequin duck is not expected to be affected. Effects on harlequin ducks as a result of habitat loss are therefore expected to be negligible.

Wetland and River Habitat Loss
Clearing activities associated with the construction of the access road, transmission line and pipelines along More and Scotsimpson creeks could degrade harlequin ducks river habitat.. Such degradation will be mitigated through adherence to a stream siltation management plan. Effects on harlequin duck from river habitat degradation are therefore expected to be negligible.

Sensory Disturbance
The access road approaches and crosses streams that include areas of high-quality harlequin duck habitat. Some of these reaches (e.g., Scotsimpson Creek) are known to be occupied by breeding harlequin ducks. However, traffic noise during operations will likely attenuate rapidly to below the background river noise. While harlequin ducks are likely to be sensitive to the high levels of noise anticipated during construction, the noise associated with traffic is unlikely to have any effects.

Harlequin duck breeding along Scotsimpson Creek are potentially vulnerable to noise disturbance from aircraft activity in the Porcupine River valley. However, the distance between the creek and the airstrip is likely sufficient that aircraft noise effects on individuals using the creek will be negligible.

No suitable occupied nesting habitat for harlequin ducks exists near the Round Lake heliport and helicopter noise is not expected to affect harlequin ducks.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
Disturbance of harlequin duck feeding habitat and behaviour may occur at river crossings along the access road that are adjacent to preferred foraging reaches. Studies suggest that harlequin ducks have some capacity to habituate to disturbance at feeding locations. Therefore, the

effects of disturbance on harlequin duck feeding habitats and behaviours are expected to be negligible.

Disturbance to harlequin duck breeding behaviours or nesting habitats in the study area could result from human presence and activity, noise levels and habitat degradation or loss. Disturbance could lead to abandonment of nesting attempts by harlequin ducks breeding along affected reaches and could also result in the separation of young broods, thus increasing predation risk and reducing productivity. Disturbance is of particular concern along Scotsimpson Creek as harlequin duck pairs and a nest were recorded along the creek during baseline studies.

Given the distance of breeding harlequin ducks from the Porcupine aerodrome, and the proposed mitigation measures for identified breeding reaches along the access road, the potential for disturbance on breeding behaviour and/or habitats is expected to be negligible.

Features Acting as Attractants

Based on the future landscape scenario, the tailings impoundment and associated “beaches” may attract waterfowl including Canada geese, harlequin duck and trumpeter swan.

Reduction in Wildlife Productivity

There is suitable harlequin duck nesting and brood rearing habitat along rivers and water bodies adjacent to the access corridor, including More and Scotsimpson creeks. Harlequin ducks may be disturbed during the courting and nesting season by the construction and operation of the access road along Scotsimpson Creek. Such breeding behaviour disturbance along Scotsimpson Creek or degredation of habitat quality along 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.

To mitigate potential 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 metres 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 will be addressed as part of fisheries concerns.

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 considered to be negligible and unlikely to affect the sustainability of the population.

Direct Mortality

The potential sources of direct mortality identified for harlequin duck 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 other waterfowl and raptors. With the implementation of mitigation, the potential for direct mortality of harlequin duck from these sources is expected to be negligible.

<u>Trumpeter Swan</u>

Wetland and River Habitat Loss
No direct loss of wetlands within the study areaarea occupied by trumpeter swan is expected because these wetlands are well away from the Project infrastructure. The airstrip in the Porcupine River valley, the closest infrastructure to nests, is approximately 10 kilometres from the nearest recorded trumpeter swan nest. Wetland loss is therefore not expected to affect trumpeter swan.

Sensory Disturbance
Given the distance of the access road from trumpeter swan habitat identified in the study area, the effects of road noise are expected to be non-existent.

There is potential for aircraft noise to disturb trumpeter swan nesting behaviour in the Porcupine River valley and at the confluence of the Porcupine and Stikine rivers. Because the Pacific flyway population of trumpeter swans is believed to be increasing, Project effects are likely to be restricted to the local population, and no population-level effects are expected. Therefore, the effects of disturbance on trumpeter swan nesting habitat and breeding behaviour are deemed negligible.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
Few studies have investigated the effects of disturbance on trumpeter swan breeding and behaviour. Studies have found that trumpeter swans can be very sensitive to extremely loud traffic (planes flying within 60 metres, large gravel trucks, motorbikes), boating, floatplane use, pedestrian traffic and human intrusion on a breeding lake. These disturbances may cause nest failures or cygnet loss. Aircraft noise could possibly disturb trumpeter swan nesting behaviours within the Porcupine River valley and at the confluence of the Porcupine and Stikine rivers.

Because the Pacific flyway population of trumpeter swans is believed to be increasing, Project effects are likely to be restricted to the local population, and no population-level effects are expected. Therefore, the effects of disturbance on trumpeter swan nesting habitat and breeding behaviour are deemed negligible.

Features Acting as Attractants
Based on the future landscape scenario, the tailings impoundment and associated "beaches" may attract waterfowl including Canada geese, harlequin duck and trumpeter swan.

Reduction in Wildlife Productivity
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 exhibit extreme variation in cygnet and adult survival, clutch size, nest success and fledging rates among years and flocks. It will therefore be 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 increasing, and the number of pairs potentially affected, as estimated from observations during baseline studies, is a minimum of three. Effects from the Project are therefore likely to be restricted to the local population. Overall population-level effects are therefore predicted to be negligible.

Direct Mortality
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, the potential for direct mortality of trumpeter swan from these sources is expected to be negligible.

Western Toad

Terrestrial Habitat Loss
Approximately 1,876 ha of suitable western toad habitat in the study area will be lost directly from the Project, including 1,504 ha in the mine site area and 372 ha along the access road.

The major concern associated with habitat loss is habitat fragmentation and isolation. However, the predicted loss of habitat is not expected to affect the sustainability of the population within the study area given the high proportion of terrestrial habitat that will be unaffected by the Project,. Project-related habitat change is not sufficient cause habitat isolation.

However, it can be expected that a number of individuals will be displaced as a result of construction, particularly in the Galore Creek valley where the most terrestrial habitat will be lost. Wetland habitat will also be lost in the Galore Creek valley.

Given the small amount of habitat that will be lost due to the access road, effects on western toad as a result of terrestrial habitat loss along the access road are expected to be negligible.

Wetland and River Habitat Loss
The requirements for successful breeding are open water of sufficient depth to prevent tadpoles from drying out before metamorphosing into young toads, but with sufficient shallow (i.e., less than 0.5 m depth) water to support egg laying. Within the study area a total of approximately 48 ha of wetland habitat identified were rated as having high suitability as breeding habitat for western toad and a further 224.5 ha was rated as having low to moderate suitability.

No direct loss of the highly suitable breeding habitat in the study area is expected to result from the Project. Approximately 6.5% of the habitat rated as low to moderate will be lost directly, mostly in areas within the Galore Creek valley classified as low quality breeding habitat. As mentioned previously, a greater proportion of suitable western toad terrestrial habitat will be lost in the Galore Creek valley.

The local western toad population is therefore likely to be affected by the Project. However, given the high proportion of wetland and terrestrial habitats that will not be disturbed and the wide distribution of western toad in the study area, the predicted loss of habitat in the Galore Creek valley is not likely to affect the sustainability of the local population. Impacts to western toad due to the relatively small amount of loss and alteration of wetland habitat along the access road are also unlikely to affect western toad at a population level.

Overall, effects on western toad due to habitat loss are expected to be negligible.

Disruption, Blockage and Impediments to Movement
Predicted levels of terrestrial and wetland habitat loss in the Galore Creek valley could potentially create barriers for toad movements between terrestrial and aquatic habitats in the local area. Given that habitat loss is not expected to affect the population levels of western toad in the study area, any disruption of toad movements at the population level within the Galore Creek valley is also expected to be negligible.

Western toad could potentially occupy most of the terrestrial habitats surrounding the access road. In addition, several wetlands close to the access road were identified as highly suitable breeding habitat for toads. It is possible that the road will bisect areas used by toads to travel from terrestrial to aquatic habitats and potentially create a barrier to toad movements. However, given that toads may use water-filled ruts in roads for breeding purposes, migrating toads are more likely to cross the access road than not. Disruption would therefore be the result of an increase in mortality through predation or vehicle collision, or where toads or young toads became trapped in ruts or potholes.

During the decommissioning and closure phase of the Project, reclamation activities will be designed to restore comparable habitats where possible. Given the planned mitigation measures, the effects of the access road on western toad movements are therefore expected to be negligible.

Sensory Disturbance
Few studies exist on the effects of noise on amphibians, much less on the effects of road and traffic noise specifically. Studies have found the most likely mechanism for road noise to affect western toads is interference with breeding calls. However, there is disagreement as to whether or not western toads even produce an advertisement call. Some studies suggest that western toads do not rely heavily on sound for mating. The potential for traffic noise to disturb western toads along the access road is therefore expected to be negligible.

Studies have found that amphibians can be attracted by artificial light sources to enhance foraging. With regard to western toads, the potential for increased forage is unknown, and it is unclear whether they would even be attracted to light sources at the mine facilities.

Disturbance of Feeding, Breeding and Denning Habitats or Behaviours
The greatest concerns for western toad in the study area are the potential effects of habitat loss and disruption of movements. Breeding habitats of western toad will be locally affected by development in the Galore Creek valley. However, wetland habitat loss will be minimal elsewhere in the study area. No wetlands rated as highly suitable breeding habitat for western toad will be directly affected by the Project.

Features Acting as Attractants
The proposed placement of specialized toad tunnels or amphibian culverts under the access road to facilitate movement will assist in mitigating the potential for toads or toadlet mortality from road crossing, and will maintain the effects on the population at a negligible level. Monitoring western toad mortality along the road will also form a component of the Wildlife and Wildlife Habitat Effects Monitoring Program. Western toad have been found in the tailings ponds of mines.

Reduction in Wildlife Productivity
The loss and reduction in quality of suitable breeding habitat associated with the access corridor, mine pits and tailings impoundment has the potential to reduce reproductive success for western toad. The Project will likely include permanent loss of small areas of wetland

habitat, formation of a barrier to movement and some direct mortality. 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.

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 during 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, Project effects on sustainability of the population are anticipated to be negligible.

Direct Mortality

Western toads hibernate for three to six months each year. Hibernating burrows for this species must be deep enough to prevent freezing (depths of up to 1.3 metres have been observed) and moist enough to prevent desiccation. 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 effects 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.

The proposed placement of specialized toad tunnels or amphibian culverts under the road will facilitate the movements 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.

Chemical Hazards

This section discusses chemical hazards to all wildlife species assessed and described in the previous sections.

It is possible that individual grizzly bears may ingest contaminants of potential concern in the Galore Creek valley through soil, water, vegetation and prey. The relatively large home ranges of grizzly bears and the fact that their home ranges do not substantially overlap, indicate that no population-level effects from exposure to contaminants of potential concern within the Galore Creek valley are likely.

Dust from access road traffic will contain naturally occurring concentrations of metals. 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 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. Since the concentrations are not expected to change from baseline concentrations along the road route, metals are not considered to be contaminants of potential concern for this mine component. Road salt may also be used to improve traction on the road during the winter.

Mammals that may be attracted to dust suppressants and road salts may be at risk of mortality from collisions with vehicles. However, it is unlikely that mammals will be adversely affected by ingestion of the dust suppressant or road salts. Birds are not expected to be attracted to these chemicals there no effects on birds are expected. 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 valued ecosystem components of potential concern with respect to 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. 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. Further information on this response plan is given in Accident and Malfunctions section (3.2) of this report. .

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, methyl isobutyl carbinol and lime used in mineral processing. Spills will be mitigated as per the Emergency Response and Spill Management Plan. The spill response plan includes immediate cleanup, which will minimize, if not eliminate, effects on wildlife receptors. Therefore, while small amounts of these chemicals could be released into the environment during transport, effects on the valued ecosystem components would be negligible.

Ongoing monitoring of the chemicals transported via concentrate and diesel pipelines or via trucking along the access road is not required in the absence of a spill. However, in the event of a major spill, soil, water and vegetation within the spill area will be monitored to ensure that the chemicals are cleaned up, to levels within the regulatory guidelines.

All chemicals used or stored at the filter plant will meet the requirements of the Materials Management Plan, Emergency Response and Spill Management and Waste Management Program. 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 contaminants of potential concern 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 chemicals are cleaned up, to levels within the regulatory guidelines. 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 valued ecosystem components.

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 in order to assess ongoing chemical accumulation, potential mobilization of chemicals away from the high-use areas and cleanup on mine closure.

Concentrations of metals in the effluent discharged into the Iskut River will meet regulatory requirements 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 valued ecosystem components such as bears and moose from entering the area.

Based on this evaluation, no contaminants of potential concern have been retained for the filter plant. As such, no potential concerns with respect to effects on valued ecosystem components have been identified.

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, Emergency Response and Spill Management and Waste Management Program. As such, ongoing monitoring for these chemicals is not required.

An aircraft de-icing compounds such as ethylene glycol and/or propylene glycol will be used during the winter months. 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. 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 negligible effects on the wildlife valued ecosystem components identified, provided that the Materials Management, Emergency Response and Spill Management and Waste Management Program are followed.

2.11.3 Issues Raised and Proponent Response

During the Application review, the public and government agencies provided the following comments related to wildlife and wildlife habitat:

- recommended the Proponent develop a nest survey program where project activities overlap with the migratory bird breeding season to ensure compliance with the *Migratory Birds Convention Act*;
- recommended that potential effects to marbled murrelets be considered and addressed in the nest survey program referred to in the comment above;
- where feasible to do so, recommended the use of a 100 metre buffer, rather than a 50 metre, for Harlequin Duck rivers;
- supported the use of diverters to reduce the potential for migratory birds-transmission line collisions;
- questioned why hoary marmot, western toad and American marmot were not included in summary of baseline studies;
- commented that loss of escape terrain in the mine footprint area has the potential to have a considerable effect on mountain goats;
- requested clarification of noise effects assessment for goat habitat polygons;
- noted that high value mountain goat habitat (i.e., winter and probably natal habitats) are probably over-estimated;
- noted there has not been adequate consideration of the potential effects of grizzly bear habitat loss along the access road;
- commented that further refined assessment of habitat suitability is required;
- questioned some of the assumptions related to terrestrial ecosystem and predictive ecosystem mapping; and,
- questioned whether there had been adequate planning to protect terrestrial wildlife and birds from contacting contaminated tailings materials or water.

During the pre-application stage, in response to Tahltan elders' concerns over toxic impacts on wildlife if ore concentrate were to spill into the environment, the Proponent incorporated pipelines to pump the concentrate from the process plant to Highway 37 and to supply diesel to the site in order to reduce the number of trucks on the access corridor.

During the Application review, the Tahltan Heritage Resource and Environmental Assessment Team provided the following comments:

- noted that the inventories and baseline data related to wildlife are thorough and of high quality and followed provincial standards for data collection;
- commented that it was difficult to get an overall sense of where species impacts are occurring and that some of the potential impacts on wildlife are underestimated;
- questioned some of the habitat suitability ratings and weighting of criteria in the mountain goat habitat model;
- expressed concerns that suitable high value goat habitat was overestimated, resulting in underestimation of potential impacts and residual effects and on mountain goats;
- requested the habitat mapping be separated for the coastal and interior grizzly bear population so it would be easier to determine potential effects on the two populations;
- noted there is too much reliance on using the regional context to assess potential adverse effects;
- requested references indicating that grizzly bears will habituate to aircraft over time and regarding displacement of grizzly bears;
- requested a minimum two kilometre buffer between known goat habitat and blasting activities;
- noted that potential effects on mountain goat feeding, breeding and rearing habitats may be higher if the area of winter and natal range are lower than estimated;

- noted the proposed Wildlife Mitigation and Monitoring Plan provides sufficient information on the types of mitigation measures but further discussion is required to better define how and where the mitigation measures should be applied;
- noted concern about the proximity of borrow and gravel pits to high value habitats; and,
- suggested that the province play a greater role in monitoring and managing grizzly bears and mountain goats in the area.

2.11.4 Proponent Commitments and Mitigation

In response to the comments from the Tahltan Heritage Resource and Environmental Assessment Team (THREAT), government agencies and the public, the Proponent met with the Ministry of Environment and THREAT members to discuss issues related to the Wildlife Mitigation and Monitoring Plan, concerns about the quality of the predictive ecosystem mapping, new criteria for the goat and grizzly bear habitat modeling, wildlife compensation proposals, and additional wildlife survey requirements.

In response to comments, the Proponent also prepared a separate report assessing potential cumulative effects on the interior grizzly bears. This report will be considered in the design of the Wildlife Mitigation and Monitoring Plan.

The Proponent committed to undertaking the following measures to mitigate potential effects on wildlife and wildlife habitat:

- developing and implementing a Wildlife Mitigation and Monitoring Plan;
- where reasonably possible, avoiding some construction activities during sensitive periods for wildlife and, where avoidance is not reasonably possible, minimizing adverse impacts of these activities;
- employing an adaptive management approach to deal with effects identified through monitoring;
- maintaining vegetation buffers around Project activities to increase sound attenuation;
- recording incidental observations of mountain goats during avalanche control procedures (e.g., survey flights) to increase knowledge of the locations of goats in relation to avalanche terrain;
- restricting vegetation clearing during construction and operations primarily to the winter months, and where this is not possible, nesting sites will be avoided if encountered during construction;
- reporting wildlife-vehicle and human-wildlife interactions and compiling records to help identify any locations with high levels of wildlife conflicts to ensure that the risk to grizzly bear remains negligible;
- maintaining woody debris and riparian vegetation within a 50 metre buffer of the road right of way along identified breeding reaches, where possible;
- maintaining a buffer zone of at least 30 metres between construction activities and identified breeding habitat where possible;
- make a draft monitoring plan for the transmission line available for Canadian Wildlife Service's timely review;
- contact Environment Canada if there is a requirement to scare SARA-listed species from the aerodrome;
- contact Canadian Wildlife Service if there is a requirement to move bird nests in relation to the project.
- maintaining a 100 metre buffer for Harlequin duck breeding habitat where it is feasible to do so;

- constructing snow-sheds in high-frequency avalanche locations near high-quality winter mountain goat habitat, including along Sphaler Creek, to provide visual screening for mountain goats from road disturbance;
- ploughing refuge areas along the road and including gaps at regular intervals along the no-post barriers and earth berms to provide escape routes for moose;
- avoiding vegetation clearing during the migratory bird breeding season; and,
- siting borrow and gravel pits adjacent to the access road and reclaiming them to appropriate habitat when they are no longer required.

The Proponent has committed to wildlife and wildlife habitat monitoring and follow-up (see section 4.2.4 of this Report) to support or verify the predictions made on environmental effects.

2.11.5 Significance of Residual Effects

Two wildlife values ecosystem component species, grizzly bear and mountain goat, may experience adverse residual effects from Project activities and infrastructure.

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 aircraft and helicopters 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 (discussed in the Wildlife Mitigation and Management Plan). Despite these measures, however, activity and noise associated with the aerodrome may disrupt individuals that congregate for salmon feeding in the Porcupine River valley.

The degree to which individuals will react to disturbance is extremely uncertain and difficult to predict. However, if there is extensive avoidance of salmon spawning in the Porcupine valley, then some individuals may decrease in fat reserves due to reduced intake of fish forage, resulting in decreased of winter survival and possibly lower reproductive success.

Alternatively, individuals may not be affected by disturbance within the Porcupine valley. The potential residual effects of disturbance to salmon foraging by grizzly bear as a result of Porcupine aerodrome activities are 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 Mitigation and Monitoring Plan. This will allow any potential effects to be identified and appropriate adaptive management to be implemented.

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 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.

Effects associated with mine site operations in the Galore Creek valley are larger than the effects associated with construction and maintenance of the access road. Sensory disturbances from industrial noise, blasting and avalanche control will affect both of these regions. However, noise disturbance will be greater in the Galore Creek valley than along the access road. Sensory disturbance due to noise from industrial activity, avalanche control and blasting will likely affect some mountain goats. The degree to which individuals will habituate to these sources of noise is uncertain.

The magnitude of goat responses to disturbance is extremely uncertain. The Wildlife Mitigation and Management Plan will describe a proposed series of mitigation strategies aimed at minimizing potential disturbance effects.

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 adult mortality and/or decrease juvenile survivorship. 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.

There is potential for considerable effects on mountain goats. The Wildlife Mitigation and Monitoring Plan will use baseline estimates of abundance, kid production and range to identify a monitoring plan. The efficacy of mitigation measures will be evaluated, and adaptive management will evolve to refine and improve mitigation measures in successive years.

The assessment of residual effects for mountain goat needs to consider the potential additive effect of multiple disturbances. Due to the uncertainty regarding most of the potential residual adverse effects, the Proponent has a strong commitment to ongoing monitoring, assessment and adaptive management (i.e., Wildlife Mitigation and Monitoring Plan).

2.11.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplemental information, comments from the public, government agencies and Tahltan Heritage Resource and Environmental Assessment Team on the potential effects of the Project on wildlife and wildlife habitat; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on wildlife and wildlife habitat.

2.12 ARCHAEOLOGICAL AND HERITAGE RESOURCES

2.12.1 Background

The Proponent completed an archaeological overview assessment. Prior to baseline studies starting in July 2005 no archaeological studies had been conducted or sites identified in the Project study area. .

There are two previously recorded archaeological sites within the study area. The first is a collapsed log cabin on the south side of the Iskut River, east of the mouth of McLymont Creek. It 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.

There are also several sites within the general vicinity but outside the study area.

Filter Plant and Access Corridor

Table 7 identifies archaeological sites identified during baseline studies along the proposed access corridor.

Table 7. Heritage Sites Recorded in Galore Creek Project Area

Site #	Type/Content	Location	Status
HgTs-1	lithic scatter/obsidian bifaces + debitage	Sphaler Creek 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 Creek uplands	to be affected
HgTr-1	lithic scatter/obsidian + basalt flakes	Upper More Creek valley	out of limits
TCH-T1	cabin/wood remains, stumps	Sphaler Creek uplands	to be avoided
TCH-T2	lean-to/wood poles + wire lashing	Sphaler Creek uplands	Outside Right of Way

The sites identified in Table 8 are all in the uplands within the subalpine zone; no sites were found in the lower valleys. This confirms background information that people chose the easier upland travel routes, above the thick vegetation, and probably did not spend much time in the lower valleys because of the comparatively difficult surface conditions.

The location of HgTr-1 on the upper side-slope of the More Creek valley is noteworthy in suggesting that travel routes were chosen primarily on the basis of degree of vegetation cover whereas 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 such as 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 were most likely used in early summer or fall, when animals were present, travel was relatively easy and berries were ripe.

AERODROME

At present, no archaeological sites have been recorded in the vicinity of the aerodrome facility in the Porcupine River valley. Preliminary overview assessments conducted in 2004 and 2005 indicated moderate archaeological potential for the valley terraces and low potential for the floodplain. Although parts of this valley were very likely used in the past, repeated flooding and the alternating sediment deposition/scouring action in the valley bottom would likely preclude the possibility of finding any intact archaeological remains.

MINE AREA

Archaeological overview assessments and ground reconnaissance of selected parts of the mine area in the Galore Creek valley were conducted in 2004 and 2005. No archaeological remains were found, and the potential for finding archaeological resources in this valley is considered low, largely because there are no reasonable travel connections, and the possibilities for game and plant resource exploitation are limited compared to other, more accessible areas in the vicinity. Furthermore, the valley has been heavily disturbed over several decades of exploration activities, virtually eliminating the possibility of finding intact archaeological deposits.

2.12.2 Project Effects

Archaeology was selected as a valued ecosystem component because archaeological resources are non-renewable and are considered valuable provincial resources, similar to mineral deposits, forests, fish and wildlife. Key issues include archaeological and heritage resources that may be affected by development.

The spatial boundaries for the archaeology assessment included a regional study area roughly bounded by the Stikine River on the west and north and the Iskut River on the south and east. The local 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. 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 metres wide corridor along the proposed access road route that was examined.

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.

Potential Effects and Evaluation

To avoid effects on the sites found along the access road, the Proponent undertook the following measures:

- realigned the road to avoid HgTs-1 (Sphaler Creek headwaters) and HGTs-2 (More Creek headwaters). These sites are in close proximity to the access road so care will be taken by the Proponent to avoid possible effects during construction.
- removed most of the remains from HgTs-3 (Sphaler Creek uplands), except for a few bits of plastic, glass and metal.
- Mapped, photographed and assessed TCH-T1 (Sphaler Creek uplands) by shovel testing. Moved the road so the site is now on the edge of the right of way.

No measures were taken for Site TCH-T2 (Sphaler Creek uplands). This site is a short distance outside of the road right-of-way. It is not protected under the *Heritage Conservation Act* . because of its age and no further action (beyond the detailed recording already completed) is necessary.

No measures were carried out for Site HgTr-1 (upper More Creek valley) as it is located well above the currently proposed road right of way

2.12.3 Issues Raised and Proponent Response

During the Application review, the Tahltan Heritage Resource and Environmental Assessment Team provided the following comments related to archaeological resources:

- assume that all obsidian finds are sourced to Ah-zeethzaa (Mount Edziza);
- conduct an analysis on the obsidian finds to confirm the source(s);
- research prospective obsidian routes back to Raspberry Pass (Mount Edziza) to allow a more thorough analysis of potential archaeology sites along that route;
- consider archaeological features such as rock piles or cairns, rock cliff or cave shelters in future archaeological work in the Project area as they have high Tahltan ethnographic significance;
- attempt to document the four tephra (or volcanic ash layers) markers in future excavations in the Project area;
- consider potential for ice patch archaeology in future archaeology work related to the Project; and,
- overall concern about potential cumulative effects on archaeological and heritage resources.

2.12.4 Proposed Commitments and Mitigation

The Proponent has committed to undertake the following measures related to archaeological resources:

- undertake geochemical analyses to determine the source of a representative sample of obsidian pieces;
- follow up with the Tahltan to confirm the approach for determining possible routes(s) back to Raspberry Pass (Mount Edziza) once information related to the obsidian source(s) is available;
- ensure that future archaeological work in the Project study area monitors for the presence of rock piles or cairns, rock cliff or cave shelters and includes sampling of tephra layers. Ice patch archaeology will also be considered where appropriate within the Project footprint;
- develop and implement an archaeological chance find procedure in consultation with the Tahltan Heritage Resource and Environmental Assessment Team to protect archaeological sites and artefacts;

- implement an extensive environmental training program concurrent with the initiation of construction works that will ensure that all personnel involved in exploration and development activities are aware that heritage resources are protected by law, that any archaeological, historic or human remains discovered during any such activities must be reported and that disturbance must cease until the remains are dealt with appropriately; and,
- develop protocols with the Tahltan Heritage Resource and Environmental Assessment Team and the provincial Archaeology Branch to ensure that sites are documented and protected as required.

2.12.5 Significance of Residual Effects

The residual environmental effects of the construction phase on heritage resources within the areas examined thus far are considered not significant.

Assuming that the Proponent's mitigation measures are implemented, the residual effects of the operations, decommissioning, closure and post closure phases on archaeological resources are not considered significant.

In summary, no significant adverse residual effects on archaeological and heritage resources are predicted. All documentary and archaeological evidence to date 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.

2.12.6 Conclusion of Effects and Mitigation

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplemental information; comments from the public, government agencies and Tahltan Heritage Resource and Environmental Assessment Team; on the potential effects of the Project on archaeological resources; and responses from the Proponent.

Based on the information in this Joint Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F, of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on archaeological and heritage resources.

2.13 SOCIOECONOMIC

2.13.1 Background

The communities closest to the Project are the Tahltan communities of Iskut, Telegraph Creek and Dease Lake. The nearest large communities are Terrace and Smithers to the south and southeast.

The closure of Eskay Creek mine in 2007 is anticipated to have the largest impact on local communities in the vicinity of the Project area. Approximately 98 Tahltan are employed at the mine.

Smithers and Terrace have direct air and road connections to Dease Lake, Iskut, Telegraph Creek and Stewart and provide a range of public and private sector services to northern residents and communities. Smithers has evolved as a mine service centre for northern B.C. Terrace also provides some eemine services as well as government, health, educational and other infrastructural services to northwestern B.C.

Mining
The Stikine-Iskut area is one of the richest and most actively exploited areas for mineral exploration in B.C. There is one operating mine in the area – Eskay Creek. The Golden Bear and Snip mines have recently closed. There are a number of advanced exploration and development projects which eeinclude Kutcho Creek, Mt. Klappan, Shaft Creek and Red Chris mine projects, as well as jade quarries and sand and gravel pits.

In addition to mineral resources, there is moderate to high oil and gas potential in the Telegraph Creek and Klappan areas and Shell Canada is actively drilling and investigating methane gas potential near Mt. Klappan.

Forestry
The Tahltan have held a timber harvesting licence near Bob Quinn and Devil Creek since February 1, 2002, but have not undertaken logging operations. Two independent operators are currently harvesting approximately 250 cubic metres from a burn area and standing green timber from within designated harvest areas. The Tahltan Nation Development Corporation holds the licence to log in the Iskut Boundary Timber Supply Block, with an annual allowable cut of 120,000 cubic metres. No harvesting has been done during the past three years, however, and none is planned for the foreseeable future.[6]

In 2005, Coast Mountain Hydro Corp harvested timber along its access road in the Forrest Kerr-Iskut River area. Other logging is actively carried out south of Bell II and several portable sawmills operate intermittently in Dease Lake, Iskut and Telegraph Creek, primarily for domestic consumption.

Guiding and Outfitting
There are two licenced guide outfitters within the study area. Both companies market the wilderness and the pristine character of the northwest and expressed concern that road access, even gated, would allow increased access into the tenured areas.

Trapping
There are seven trap line areas within the Project area. Three trap lines are active and three are inactive. The level of activity along the seventh line is uncertain.

Recreation and Tourism
The Cassiar Iskut-Stikine Land and Resource Management Plan created 14 new Protected Areas in the study area, with most also intended for recreational use. Extensive areas of wilderness, remote rivers, striking viewscapes and excellent conditions for backcountry recreation support a small nature-based tourism sector. The Application indicates that approximately 600 people visit Mount Edziza Park, Spatsizi Park and the Stikine and Mount Edziza Recreation Areas each year.

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[6] C. Rygaard, Timber Tenures Specialist, Dease Lake, B.C. Ministry of Forests and Range, Personal Communication, February 21, 2006.

2.13.2 Project Effects

The Project will directly and indirectly impact the study area communities. The key socio-economic valued ecosystem components were derived from, and represent, the issues identified in the baseline study and community consultation: economic development; employment opportunities; employment incomes; business opportunities; community health; education; cultural strengthening/Tahltan culture; communications and traffic.

Assessment Boundaries

The spatial boundaries included a primary impact area (Dease Lake, Iskut, Stewart and Telegraph Creek) a secondary impact area (Smithers and Terrace),a tertiary impact area (the region).

Potential Effects and Evaluation

<u>Primary Impact Area - Dease Lake, Iskut, Telegraph Creek and Stewart</u>

The Application identified the following potential positive effects from the Project on the primary impact communities:

- Some Tahltan believe the Project will encourage Tahltan people to return home to Tahltan communities and may generate a demand for housing.
- The Project may encourage economic development by providing more business opportunities in Dease Lake.
- The Project will have a positive impact on the Tahltan communities, arising from the preparation of potential employees for employment through on-the-job training, apprenticeship programs and opportunities for career advancement.
- Stewart is expected to benefit directly and indirectly from the Project through construction, transportation and port service contracts, which will create long-term demand for labour which cannot be satisfied locally.
- An influx of people to Stewart will generate demand for housing and infrastructural services. Municipal, education and health services are all presently underutilized and an increase in population will increase the efficient use of services and provide Stewart with additional tax revenue.
- The number of new residents in Stewart is likely to reduce unemployment.

The Application identified the following potential negative effects from the Project on the primary impact communities:

- Dease Lake is an unorganized community governed in accordance with the Local Services Act and local decision making is very limited. Until Dease Lake is able to respond more speedily to land development and infrastructure construction and improvements, the community may not be able to fully capitalize on potential economic development opportunities such as those provided by the Project.
- Employment effects in each of the communities are predicted to be positive until closure, when termination of employment will have an adverse effect on individuals and communities.
- Construction and operation of the access road may detract from the wilderness landscape marketed by local and regional guiding and outfitting establishments.
- While Project-related incomes will permit employees to acquire goods and services, some employees will spend their incomes inappropriately. Substance abuse and family

violence are both existing concerns within Tahltan communities and may be exacerbated for those employees who do not have the skills to manage their incomes successfully.
- Health issues such as family stress, substance abuse and occupational health and safety for employees working at the Project site.
- Increased volume of truck traffic will potentially affect residential and tourism traffic along Highway 37A in Stewart, affect access to accommodation, restaurants and other services and disturb sleep during the night. The volume of traffic may also generate hazards to recreational vehicles and other tourist traffic because of the narrow surface of Highway 37A. The type of traffic, as well as its frequency, volume and noise, may detract from the wilderness attributes promoted by local and regional tourism organizations.

Secondary Impact Area - Smithers and Terrace

Smithers and Terrace are expected to benefit from the Project due to increased employment opportunities and construction and operating contracts to provide goods and services. 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.

Tertiary Impact Area

The Gross Domestic Product (wages, salaries, benefits and profits) associated with the direct expenditures of the Project during operations ($227 million) is anticipated to be just over $46 million, and the Project will employ about 500 people. Government revenues from the Project during operation are estimated at $26 million per annum, with both the federal ($13 million per annum) and provincial ($12 million per annum) governments deriving similar revenues from personal and corporate income taxes, plus Goods and Services Tax and Provincial Sales Tax. Property taxes will also increase local government revenue by $1.5 million.

Industries supplying goods and services during operation will produce an additional $173 million in output. Their contribution to the Gross Domestic Product is estimated at $72 million and the number of people working in these supplier industries is estimated at 1,044.

Tax revenues derived from the activities of supplier industries are estimated at $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 and $16 million in Gross Domestic Product, while providing employment for approximately 265 people.

To reduce potential adverse effects of increased truck traffic in Stewart, the Proponent will support the town in facilitating the development of a Highway 37A bypass around residential and commercial districts. This support will take the form of encouraging the Ministry of Transportation to build the bypass. The location of the new road that will be created as a result of the bypass is described in the 1978 Stewart Master Plan and comprises part of the Town of Stewart's Official Community Plan.

2.13.3 Issues Raised and Proponent Response

During the Application review, the public and Ministry of Economic Development and Kitimat-Stikine Regional District provided the following comments:

- requested clarification on direct construction employment incomes and indirect employment information contained in the Application;
- recommended development along Highway 37 north be concentrated in nodes;

- noted the Iskut landfill is receiving relatively large volumes of refuse from exploration camps, construction projects and other sources and noted the Proponent may need to deliver its waste to Meziadin; and,
- holding workshops in northwest communities as the Project commences to provide information on hiring practices, employment vacancies and purchasing methods.

During the Application review, the Tahltan Heritage Resource and Environmental Assessment Team raised the following concerns related to potential socio-cultural effects:
- increase in domestic and community violence, gambling, substance abuse, suicides and accidents;
- loss of family support structures and increased family stress due to the two week work rotation;
- influx of non-aboriginal workers which will contribute to loss of language and culture;
- loss of pristine traditional land;
- increase in stress and stress-related illnesses, sexually-transmitted diseases and pregnancies;
- potential contamination of Tahltan water sources, foods and medicines;
- availability of short term, high paying jobs will discourage students from completing high school and/or continuing post-secondary education;
- increased pressure on health and social services and related infrastructure; and,
- raised concerns about the potential for cumulative socio-cultural effects due to the level of high resource activities in the northwest.

2.13.4 Proponent Commitments and Mitigation
The Proponent has committed to undertake the following measures and commitments to mitigate potential socio-economic impacts:
- build long-term relationships with the Tahltan Nation and local communities;
- report back to the Tahltan communities on how their input shaped project decisions;
- maintain ongoing communications and consultation programs with the Tahltan communities during the life of the mine;
- consult with the Tahltan Heritage Resource and Environmental Assessment Team on all draft permits and management plans, consistent with the conditions of the Participation Agreement;
- hold information sessions in Telegraph Creek, Dease Lake, Iskut, Stewart, Terrace and Smithers to provide information on project planning, business, training and employment opportunities;
- organize further discussions and/or meetings with potentially affected guide outfitter and trap line holders to discuss potential effects, mitigative measures and compensation;
- give hiring priority to Tahltan Nation people, residents of northwestern B.C. residing in a primary community, and then to Canadians willing to relocate to the area;
- develop a long-term recruitment, employment and training strategy, whose success would depend upon cooperation and commitment with the Tahltan Heritage Resource and Environmental Assessment Team and local communities and the provincial and federal governments;
- implement a hiring strategy that will include a workforce education and skill assessment, capacity survey of primary communities, mine employment orientation program, open pit mine heavy equipment training program, specific on-the-job training programs and apprenticeship programs;
- ensure that all employees receive site-specific safety and environmental awareness training;

- develop a long-term business opportunities strategy involving structuring contacts so they can be accessed by a variety of different sized local businesses;
- implement a business opportunities strategy that will require contractors to disclose their policies and practices for providing opportunities to the members of the Tahltan Nation and residents of northwestern B.C.;
- initiate a comprehensive recycling program for the Project to minimize the volume of materials going to landfills;
- work with the Kitimat-Stikine Regional District to address concerns with the use of the Iskut landfill;
- develop and implement industrial and domestic waste management strategies;
- maintain intensive receiving environment, aquatic, fisheries and wildlife monitoring programs, throughout the life of the mine and developed in cooperation with university researchers, Canadian and U.S. federal, B.C. and Alaska State and the Tahltan Central Council, to ensure water quality, aquatic, fisheries and wildlife resources are not impacted by the Project and are protected for future generations. This will include the addition of a monitoring site in a depositional environment downstream on the Stikine River in Alaska; and,
- continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project.

The Participation Agreement between the Proponent and Tahltan Nation is intended to provide benefits to the Tahltan Nation to help deal with the negative socio-economic/socio-cultural effects associated with the Project.

2.13.5 Significance of Residual Effects

Most socio-economic impacts associated with the Project are predicted to be positive. There are potential significant residual adverse effects 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 than other Tahltan communities to experience development pressures, adverse impacts may also be experience in Iskut is significant numbers of Tahltan return to the community.

Termination of employment will occur when the Project 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 dependent upon numerous factors, including further economic development in northwestern B.C. and the success of the Tahltan in generating economically sustainable alternative sources of employment, improved education levels and labour mobility. The significance of adverse employment and employment income impacts on individuals, families and communities at closure is based on the assumption that northwestern B.C. will be in much the same situation in 2030 that it is in 2006.

Family stress associated with fly-in/fly-out work schedules may be expected to continue. Through the Participation Agreement, the Proponent will support the Tahltan in developing initiatives to address some of the manifestations of stress, including money management, substance abuse support and participation in traditional activities and traditional ceremonies and events. While 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 suggests that development pressures may be focussed on Dease Lake and include land availability, services such as piped water and more local governance. Because Iskut is closer than Dease Lake to the Project, 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 related 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. The Proponent will support efforts by the Town of Stewart to relocate Highway 37A as a bypass around the community's residential and commercial districts. Nevertheless, the planning, routing, design, budgeting and construction of a bypass may be expected to consume a number of years. In the interim, truck traffic impacts on Stewart will be considerable.

2.13.6 Conclusion of Effects and Mitigation

As this Report is intended to meet the purposes of both the provincial and federal environmental assessment requirements, it contains matters relating to all potential socio-economic effects of the Project. However, when evaluating the significance of environmental effects pursuant to CEAA, the Responsible Authorities and the federal Minister of Environment will take into account environmental effects as defined in CEAA, summarized as follows:

> "Any change that the Project may cause in the environment; any effect of any change to environment caused by the Project on health and socio-economic conditions, including physical and cultural heritage; the current use of lands and resources for traditional purposes by aboriginal persons; or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; or any change to the Project that may be caused by the environment."

During the Application review, EAO, and the Technical Working Group have considered: the Application and supplemental information; comments from the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team on the potential socio-cultural/socio-economic effects of the Project; and responses from the Proponent.

Based on the information in this Report, and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F, EAO in consultation with the Technical Working Group, is satisfied that the Project will not likely result in significant adverse socio-economic effects.

2.14 VISUAL AND AESTHETIC RESOURCES

2.14.1 Background

A visibility assessment was conducted using three-dimensional viewshed and line-of-sight modeling. Input data included a digital elevation model from the B.C. Terrain Resource Inventory Mapping program and projected tree height data from provincial forest cover mapping. The digital elevation model 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 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.

2.14.2 Project Effects

Key issue related to visual and aesthetic resources is the maintenance of scenic areas and visual quality objectives.

The spatial boundaries of the visual and aesthetic resources effects assessment identifies areas that can be seen from one or more observation points or lines. For the 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.

Potential Effects and Evaluation

The line-of-sight analysis displayed 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.

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.

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.

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 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 kilometres 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.

2.14.3 Issues Raised and Proponent Response

During the Application review, the public raised concerns about potential impacts on Iskut River Hot Springs Provincial Park. The Proponent's visual impact assessment concluded that it would be unlikely that any of the Project facilities, such as the nearby filter plant, would be visible from the Park, particularly from the vicinity of the hotsprings.

2.14.4 Proponent Commitments and Mitigation

No mitigation measures are required.

2.14.5 Significance of Residual Effects

No significant residual effects on visual and aesthetic resources are predicted.

2.14.6 Conclusion of Effects and Mitigation

As this Report is intended to meet the purposes of both the provincial and federal environmental assessment requirements, it contains matters relating to potential socio-economic effects of the Project. However, when evaluating the significance of environmental effects pursuant to CEAA, the Responsible Authorities and the federal Minister of Environment will take into account "Any change that the Project may cause in the environment; any effect of any change to environment caused by the Project on health and socio-economic conditions, including physical and cultural heritage; the current use of lands and resources for traditional purposes by aboriginal persons; or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; or any change to the project that may be caused by the environment."

During the Application review, EAO, and the Technical Working Group have considered: the Application and supplemental information; comments from the public, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team, on the potential effects of the Project; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F, of this Report, EAO, in consultation with the Technical Working Group, is satisfied that the Project will not likely result in significant adverse effects on visual and aesthetic resources.

2.15 NAVIGABLE WATERS

2.15.1 Background

In Canada, a 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.

The proposed access road from Highway 37 to the mine site will cross a number of watercourses; nine of which are deemed to be navigable by Transport Canada. Other project components potentially affecting the public right to navigable waters are the road from the airstrip to the mine, the tailings dam, and the diffuser in the Iskut River. Both roads cross major watercourses i.e. Iskut and Porcupine rivers. On the access road, the majority of the watercourses are located upstream of significant gradient barriers in remote areas where recreational access is difficult and unlikely, however, recreational use will likely increase with new access to the area.

The public has limited navigation requirements at the majority of stream and river crossings along the proposed access corridor. Many of the streams and rivers are located in steep sided canyons and gullies where there is limited access for river craft. Most of the streams crossing the access corridor are small, steep, and shallow, and have no value as recreational or commercial navigable waters. However, there are some reaches along the larger streams and rivers in the study area that are either currently navigable or have the potential to be navigable.

2.15.2 Project Effects

Navigable waters were selected because the access corridor from Highway 37 and from the proposed aerodromecrosses many watercourses, some of which are potentially navigable.

The spatial boundaries for the navigable waters effects assessment include the Scud, Iskut, Porcupine and Stikine rivers, as well as Galore, More and Sphaler creeks.

Potential Effects and Evaluation

Human use of surface water within the study area as a resource or for navigation is limited. The Scud, Iskut, Porcupine and Stikine rivers are used to varying extents for navigation, but Galore, More and Sphaler creeks 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. Environmental effects of the project could result in reducing water flows or depths, thus affecting the navigability of a water body.

All bridge crossings for this Project are designed to accommodate current and potential future navigation requirements. During August 2006, the Proponent undertook consultations to investigate whether there is any unidentified recreational use of watercourses potentially affected by proposed works placed in or over watercourses. Based on these consultations, no recreational use was identified, except on the Iskut and Porcupine rivers.

At crossings where bridges will be constructed, the Project is not anticipated to incur adverse effects on the use of navigable waters given the inaccessibility of most of the region, limited current or historical use of accessible water in the region, low or no effects to water flow and depth, and the accommodating design of bridge heights over water.cause. However, there will be significant changes in flows downstream of the tailings dam on Galore Creek during construction, operation and post-closure. Discharge from the tailings dam will only occur from May to October when natural flows are at a level to allow dilution of the effluent. Given the difficulties of accessing Galore Creek and since anyone likely to navigate on Galore Creek would only do so during the lat spring to summer months, the Project is not anticipated to incur adverse environmental effects.

2.15.3 Issues raised and Proponent Response

The Tahltan Heritage Resource and Environmental Assessment Team raised the following concerns:

- Although the road crossings must be designed to address navigable water users, the design does not take into account flood events and water conveyance. The 100-year flood event for road design is not an adequate safety standard, in particular because the roads will be used to transport hazardous and toxic materials, and some of the bridges may be used for concentrate pipe and diesel pipe crossings. The mine should employ at least the 500-year event flood as the basis to design any water crossing where anything less than the 500-year event could significantly damage a road or pipe crossing. The same comment applies to culverts and other water conveyances.
- The goal of any bridge spanning a fish-supporting water body should be to set the span of the bridge sufficiently back from the water body so that no water diversion or containment (including rip-rap) is required (i.e., the bridge should be longer and/or higher, thereby avoiding contact with the footprint of the water body).

Both issues are addressed in the Aquatic Resources, Fish and Fish Habitat, Wetlands, and Accidents and Malfunctions sections of this Report.

2.15.4 Proponent Commitments and Mitigation

In the Application, the Proponent stated that further consultation with the public and local groups will determineassess whether there is any unidentified recreational use of watercourses potentially affected by the proposed works. Additional information obtained from these consultations will assist in developing appropriate measures to mitigate any identified effects.

The Proponent has committed to design all water-crossings over navigable waters and the diffuser to accommodate navigable water requirements.

2.15.5 Significance of Residual Effects

No significant residual environmental effects on navigable waters are predicted.

2.15.6 Conclusion of Effects and Mitigation

During the harmonized environmental assessment, EAO, the Responsible Authorities and the Technical Working Group have considered: the Application, comments from government agencies, Tahltan Heritage Resource and Environmental Assessment Team, and the public, on the potential effects of the Project on navigable waters; and responses from the Proponent.

Based on the information in this Report, provided that the Proponent conducts the mitigation as indicated and implements the actions described in the Summary of Commitments listed in Appendix F, EAO and the Responsible Authorities, in consultation with the Technical Working Group are satisfied that the Project is not likely to cause significant adverse environmental effects on navigable waters.

3. SPECIFIC CEAA REQUIREMENTS

3.1 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

3.1.1 Background

The assessment of the effects of the environment on the Project included identifying the environmental factors deemed to have possible consequences on the Project, the likelihood and severity of their occurrence and mitigation measures planned to minimize their impact. The following environmental conditions or events were discussed in regard to their potential to affect the Project: extreme weather events; floods; forest fires; climate change; seismic activity; volcanic activity and geohazards.

3.1.2 Project Effects

Extreme Weather Events

Extreme weather events could include droughts, storms, heat waves and cold snaps. These events could affect all project components including surrounding areas.

Drought

A significant reduction in the accumulated annual rain and snowfall would: reduce the runoff entering the tailings management structures and the open pits; increase the risk of forest fires; and decrease the dilution of mine discharge waters into the receiving environment. During droughts, there is a potential for low-level effects to aquatic receptors due to changes in water quality from filter plant effluent discharge. However, in glaciated watersheds (such as Galore or More creeks) extra meltwater from glaciers and ice fields during extreme hot, dry periods could help to maintain freshwater flows throughout the summer months. Furthermore, the decreased capacity of the receiving environment to absorb the mine discharge waters during a drought may be somewhat compensated by the decreased discharge volumes that would have to be pumped out of the tailings pond to the receiving environment. The tailings impoundment would have capacity to hold water until July in a 1 in 200 wet year, so pumping could be deferred until sufficiently high natural flows were available to accommodate the discharge.

Storms

There are a number of Project design and related measures that serve to mitigate effects from the various types of storm events that the Project may experience, including:

- monitoring of weather forecasts for advanced warning of incoming storms to allow time to secure buildings and equipment, mobilize equipment to key areas for maintenance and if necessary, shut down the mill;
- diversion channels designed with 10 metre wide integral access roads to accommodate clearing of the channels in the event of a blockage due to debris flows or avalanches. The channels will have five emergency overflow structures to direct channel flow into the waste catchment area in the event of a blockage due to debris flows or avalanches;

- on-site storage of various building supplies and power cable to facilitate timely repairs and reconstruction of mine infrastructure; and
- facility locations, road alignments and transmission line tower locations selected to avoid identified geohazard areas. Where geohazard areas cannot be avoided, mitigation measures include diversion berms, energy dissipation structures and sediment traps.

Severe Rainstorms and Thunderstorms
Galore Creek has a catchment basin of 125 square kilometres upstream of the proposed tailings impoundment. Catastrophic rainstorms could cause accumulation of several centimetres of precipitation in a 24-hour period, resulting in several million cubic metres of water being rapidly added to the catchment. Severe rainstorms and related surface runoff could trigger debris flows on the over-steepened valley walls of the mine area and access corridor. The debris flows could carry large volumes of surficial materials and woody debris for several kilometres down slope and possibly threaten the mine site and access corridor infrastructure.

Thunderstorms may be accompanied by hail, high winds and, rarely in B.C., tornadoes. Large hail events could damage building infrastructure, cause temporary blockages in the diversion channels and create unsafe working conditions. High-velocity winds could create large waves in the tailings pond and damage buildings and power lines along the access corridor. Tornadoes could damage or destroy building infrastructure, bridges and power lines and block the road along the access corridor with downed trees. Lightning could cause forest fires under dry conditions, or damage infrastructure such as buildings and power lines.

The potential impacts to the Project from severe rainstorms and thunderstorms were addressed by the Proponent through project design and related mitigation measures, including:

- designing mine site water management facilities to manage a 200-year return period 24-hour rainfall event;
- armouring small bridges and culverts and incorporating 1.5 metre clearance between the 100 and 200-year flood level for large bridges, and stationing maintenance crews and equipment at both ends of the road to allow rapid response to storm-induced problems;
- increasing pipeline burial depths in areas with high geohazard potential to protect them from debris flows and leak detection systems to warn of damage to pipes;
- planning for 4 metre deep water cover in the tailings impoundment to prevent tailings re-suspension due to wave erosion; and,
- designing water management structures and tailings dam to provide protection against waves in the tailings pond created by high-velocity winds.

Snowstorms
The Project area is subject to substantial snowfall and temperatures ranging from 20ºC to -20ºC making severe winter snow-storms probable. High levels of snowfall could impede the movement of mobile equipment on the access road and at the mine site, filter plant and aerodrome. Related problems could include reduced traction by vehicles and visibility during snowstorms. Fog could also reduce visibility at the mine site.

The potential impacts to the Project from snowstorms were addressed by the Proponent through project design and related mitigation measures, including:

- removing excess snow from roadways and active mining areas. The mine production fleet will include extra equipment, such as graders, loaders, trucks and scrapers, to clear snow;

- managing and scheduling the mining of ore stockpiles to allow milling to continue when mining is halted during extreme weather events;
- producing crushed aggregate to spread on the roads for improved traction;
- addressing storm-related visibility issues at the mine site with supplementary road lighting and global positions systems in mobile equipment and developing operating protocols to ensure safe and efficient traffic flow during periods of reduced visibility; and,
- designing power cables so they can be suspended above the snow pack on pole stands.

Temperature Extremes

<u>Extended Periods of Higher Temperatures</u>
Extended periods of higher temperatures could decrease the amount of discontinuous permafrost. However, reduction of discontinuous permafrost is not expected to pose geotechnical problems for the main Project structures because they will be located below the permafrost zone. Higher temperatures during spring freshet could result in accelerated snowmelt and resultant runoff, contributing to increased likelihood of flooding. Mitigation measures for flooding are described in section 3.1.2.2 below.

<u>Extended Periods of Colder Temperatures</u>
Extended cold spells will result in more precipitation falling as snow rather than rain, increasing the amount of snow to be managed at the mine site and along the access corridor. Increased snow pack translates into larger volumes of meltwater to be handled during spring freshet. Extended cold spells could also delay spring snowmelt and resultant runoff, thereby reducing the time period available to pump tailings pond water to the receiving environment.

Mitigation measures for higher snowfalls and icy conditions were discussed above for winter snowstorms and mitigation measures for flooding are described in the following section. Overall, cold temperatures would not be expected to pose significant challenges for equipment operation because all equipment would be designed for these conditions.

Floods
Although floods can result in substantial damage and impede project operations, large events that would pose the greatest risk to the Project occur rarely. Assuming a 20-year mine life, Table 8 identifies the probability of occurrence of an event with a given return period during the mine operating period.

To minimize the potential impacts of floods on the Project, most of the key project components were designed to accommodate at least the 100-year flood event. Major infrastructure, such as crossings over the main rivers and diversion channels in Galore Creek valley are designed for 200-year flood events. The main dam of the tailings and waste rock storage facility is designed to pass the Probable Maximum Flood safety criteria.

Table 8. Exceedence Probabilities of Flood Events with Varying Return Periods

Event	Probability for Any Single Year	Probability over 20 Year Mine Life
1 in 10 year	0.1	0.88
1 in 20 year	0.05	0.64
1 in 50 year	0.02	0.33
1 in 100 year	0.01	0.18
1 in 200 year	0.005	0.10
1 in 500 year	0.002	0.04

Access Corridor

Floods occurring along the access corridor could result in road closures due to excess water on the road surface, erosion of the road surface, damage to stream crossings, or debris blocking the road. Under the most extreme flood conditions there is the potential for drainage structure washouts (bridges, culverts and cross-drains) and pipeline ruptures (due to scouring of the access corridor down to the depth of the buried lines or stream crossing washouts).

The potential impacts to the access corridor infrastructure from flooding were addressed by the Proponent through project design and related mitigation measures, including:

- constructing the access road so that less than 5 kilometres of the road encroaches onto active floodplains;
- constructing sections of the access road located within floodplains atop a berm at least 1.2 metres in height, reducing the potential for road submergence;
- constructing all culverts and bridges to a 100-year design flood, with major bridge crossings designed to the 200-year flood;
- placing rip-rap at the inlet and outlet of the bridges and culverts to protect structures from erosion;
- incorporating at least 1.5 metres of clearance above the design flood elevation into bridge design to allow for debris passage and prevent bridge washout;
- implementing a road maintenance program. This will include regular maintenance of crossing structures (e.g., debris clearance) and repairs following flood events;
- closing the access road could during flooding events with the potential for road submergence;
- equipping the concentrate and diesel pipelines with extensive leak detection systems. Any detected leak will be followed by an emergency shutdown procedure to minimize the volume of any spill;
- locating a covered drainage tank at the low point in the pipeline between Scotsimpson and Sphaler creeks for the recovery of concentrate from the section of the pipeline west of Round Lake during a shutdown; and,
- restricting the volume spilled in the event of a rupture by installing shutoff valves along the diesel pipeline. Fuel storage tanks at the mine site will contain a two-week supply of fuel to allow continued mine operations while the pipeline leak is repaired.

Filter Plant
The filter plant location will not be vulnerable to flood risks. However, high-stream velocities and debris associated with flood events could damage the discharge diffuser at the bottom of the Iskut River channel, requiring repair or replacement of the diffuser. In the case of diffuser damage during flood events, filter plant operations may have to be shut down.

The diffuser is designed to minimize impacts from flood events. It will be located in a relatively straight, stable reach of the river. The effluent pipe from the filter plant will be buried approximately 1 metre below the channel bed, with the diffuser ports extending up to the channel. The diffuser is designed with almost no profile above the channel bed to reduce exposure of the diffuser ports to stream velocities and debris.

Aerodrome
The aerodrome will be located in the floodplain of the Porcupine River and will therefore be vulnerable to large flooding events. It will be located approximately 1.5 kilometres downstream of a glacial lake at the terminus of the Porcupine Glacier.

Recent flooding and channel instability have occurred within the vicinity of the aerodrome location. In addition, signs of previous flow pathways were observed in different locations across the valley bottom. This evidence suggests there is a potential flood hazard for the Porcupine aerodrome. Although unlikely, there is also potential for an outburst flood resulting from failure of the moraine dam or from ice blockage of the Porcupine Lake outlet. Such a failure could result in discharges in excess of the estimated 200-year flood.

To mitigate against flood hazards, a berm or protective barrier will be placed upslope of the aerodrome to minimize wave energy and debris resulting from a flood that might otherwise cause substantial damage to the facility. The final elevation of protective structures around the aerodrome will be determined based on a detailed flood risk assessment during the final design stage. In the event of flooding, aerodrome operations will be shut down until water levels recede and any necessary repairs have been made. In case of aerodrome shutdown, mine site access will be via the access road or by helicopter from the existing Bob Quinn airstrip, where aircraft will still be able to land.

Galore Creek Valley
Unmitigated flood conditions could seriously affect the rock storage tailings and waste rock storage facility within the Galore Creek valley and operation of the mine. Severe flooding could cause: flow over the spillway of the main dam; over topping of the banks of the diversion channels; increased water inflow to the tailings pond, thus increasing the amount of water to be retained by the main tailings dam and pumped from the facility; flooding within the mine site, sedimentation problems from increased amounts of suspended and bedload transport and deposition. Operations in the open pit could be affected by excessive runoff and precipitation inflows.

The potential impacts to mine infrastructure located inthe Galore Creek valley from flooding will be addressed by the Proponent through the proposed water management plan. Key aspects of this plan are summarized.

Diversion channels will be constructed to divert most surface runoff away from the open pits and waste rock storage facility. The pit diversion channels will be designed to convey the peak discharge from the 200-year, 24-hour precipitation event. If this flow were exceeded, then runoff will drain to the tailings pond. Water entering the tailings pond will ultimately be pumped out over the dam at a rate paced to mimic natural flows.

Runoff not captured by the diversion channels and precipitation falling directly into the pits will be pumped from the pits and used in plant processes or discharged to the tailings pond. A set of perimeter wells, pit wells and sump pumps will divert and remove water from the pits. If inflow to the pits were to exceed pumping capacity, then operations would be slowed or stopped until the water could be removed.

Along the main diversion channel, five emergency overflow structures will be constructed at locations of concern, such as the Bear Creek and Friendly Creek crossings. The emergency overflow structures will divert flow into the tailings pond during extremely high flow events or channel blockage. In the case of a blockage, the mine maintenance fleet will clear the diversion channel. Maintenance of diversion channels following flood events will be considered as part of the maintenance program.

The East Fork diversion structure is designed to divert fresh water from the East Fork of Galore Creek valley around the mine site and tailings and waste rock storage facility. If runoff from the East Fork spills over the structure during a flood event, then water will drain towards the East Fork aqueduct approximately two kilometres downstream. Water that reached the East Fork aqueduct will either seep through the rock drain at the base of the aqueduct or be pumped into the tailings and rock storage waste facility.

The tailings dam spillway was designed to convey the probable maximum flood without overtopping the dam. Under normal operating conditions, a minimum 4 metre water cover over the tailings solids will be maintained and all discharges from the dam will be controlled by pumping. The dam spillway will only be used under emergency conditions. On closure, the dam will operate with free overspill from the spillway, which will be designed to allow passage of the probable maximum flood without overtopping the dam.

Forest Fires

The frequency and size of forest fires varies with annual weather, natural disturbance type (which reflects climate) and suppression effort. The forest ecosystems of the Project area described by the Proponent are not considered to be fire dominated.

The primary effects of a fire in the mine site area would be a loss of infrastructure (process plant, mill, accommodations buildings) and operating delays. Operating delays could result from workers helping to contain the fire and unsafe working conditions due to smoke. A fire would also have secondary effects related to the loss of surface vegetation cover in the local catchment area. This would result in increased runoff with high levels of total dissolved solids reporting to the tailings management structures, and possibly greater difficulty in achieving the tailings pond effluent discharge criteria.

The damage or loss of bridges along the access corridor caused by a fire could restrict road access to the mine site from one half of a day to up to two weeks, depending on the size of the crossing and the severity of the fire.

A fire in any of the other project areas (e.g. filter plant, aerodrome, etc.) could cause damage or loss of infrastructure. A fire at the aerodrome could prevent planes from landing and result in temporary closure of the facility.

The potential impacts to the Project from forest fires were addressed by the Proponent through Project design and related mitigation measures, including:

- developing a safety plan describing appropriate procedures and protocols to effectively deal with hazards including hazard evaluation, appropriate control procedures and protocols, personal protective equipment to be used, air and water monitoring protocols and specifications, confined space entry procedures and detailed fire-fighting procedures;
- evacuating and gathering all personnel not involved in containing a fire from work areas or camps and at muster stations which will be clearly identified around the Project area;
- locating water pumps and fire-fighting equipment strategically around the mine site;
- removing vegetation (i.e. fuel for fire) around mine infrastructure;
- incorporating steel sub-structures into bridge design, leaving only the wooden decks vulnerable to fire;
- suspending aerodrome operations until the fire is under control and any repairs required to make the facility operational are complete;
- ensuring backup generators at the mine site and the filter plant have enough power capacity to operate essential equipment around the sites in case of transmission line loss;
- Storing a spare transmission line conductor on site to expedite repairs;
- constructing diesel and concentrate pipelines of welded steel and buried along most of the access route; and,
- diverting any natural increased runoff high in total suspended solids around the tailings and waste facility. If high total suspended solid levels are observed in the tailings pond, then measures will be employed to settle out the total suspended solids before discharge to the receiving environment.

Climate Change

The Proponent provided an overview of observed global, provincial and regional climate trends. In northwestern B.C., average annual temperatures and precipitation and average snow pack depth have decreased.

Using general circulation models, the Proponent developed future climate trend predictions for the Galore Creek study area. Although uncertainty with climate predictions is very high, the modeling indicated an overall trend towards warmer annual mean temperatures and increased annual precipitation. When the modelled predictions were applied to a watershed hydrologic model, the results indicated an expected overall increase in annual runoff (proportionately more in winter and early spring). The Proponent also noted that the magnitude and frequency of extreme storm events are expected to increase.

The Proponent noted that the design of water management systems based on current climate conditions should be sufficient to handle most changes in mean conditions as a result of climate change. Of greater concern is the impact of climate variability and increased frequency and magnitude of extreme events but there is currently no reliable method to estimate these climate change induced impacts. Most water management structures and operations have been designed to the 200-year event; this provides a relatively high degree of protection. Additionally, adaptive management throughout the operational period of the Project will allow project components and operations to be adjusted as required in response to observed climate changes and improved climate projections resulting from continued climate change research.

The sensitivity of project components to various climate parameters likely to be affected by climate change is listed in Table 9 and discussed below.

Table 9. Climate Change Sensitivity of Project Components

	Mean Temperature	Annual Precipitation	Magnitude and Frequency of Extreme Events	Lake Levels and Streamflow
Diversion Channels	N	N	Y	Y
Open Pits	N	Y	N	N
Access Corridor	Y	Y	Y	Y
Tailings Facility	Y	Y	Y	Y
Daily Operations	N	N	Y	N
Waste Management	Y	Y	Y	Y

Note: Y - yes, N - no

Diversion Channels
All diversion channels will be affected by changes in both temperature and precipitation, as these variables strongly influence the surface runoff that the channels will be required to convey. However, because the diversion channels have been designed to convey the 200-year flood event without overtopping, it is expected they will only be sensitive to increased magnitude and frequency of extreme events (i.e., increases in annual precipitation or mean temperature will have minimal effect). In the event the channels overtop, water will be released to the tailings pond rather than directly to the environment.

Pits
During mine operations, higher annual precipitation and temperature levels could increase the amount of groundwater seepage and precipitation that flows into the pits, which would increase pit de-watering costs. Upon closure, the pits would fill up faster because of the warmer and wetter climate, which would have no negative consequences on the environment or the public.

Access Corridor
Changes to temperature and precipitation as a result of climate change would affect the amount of precipitation and snowfall on the access road, potentially increasing the costs for maintaining the road and keeping it open year-round. Related impacts to bridges and culverts used as stream crossings along the access corridor would be minimized by their design for the 100 to 200-year flood, depending on the size of the crossing.

Tailings and Waste Management
Water management within the tailings and waste rock storage facility is a key component of the Project and would be sensitive to changes in the water balance as a result of climate change. A wetter environment would make greater volumes of freshwater available for dilution but would also increase the costs of pumping water out of the facility. In addition, the dam may need to be raised to accommodate the additional water and reduce the risk of overtopping.

Within the receiving environment downstream of the tailings dam, a wetter climate would increase the dilution capability provided by outflow from the diversion channel, the drainage area within Galore Creek downstream of the tailings facility and the Scud River. However, if late summer low flows in project area streams decrease with climate change, dilution capacity of the receiving environment during the late summer would be reduced. This reduced dilution capacity would be compensated to a degree by an increase in the length of the ice-free season, which would allow water from the tailings facility to be pumped over a longer period of the year. Upon closure, the tailings dam would have a free-overflow spillway designed to minimize the possibility of dam overtopping.

Mine Operations
The likely increase in frequency and magnitude of extreme weather events as a result of climate change could result in more operational days being lost to extreme weather.

There is a high degree of uncertainty associated with climate change predictions. During the lifetime of the mine, local and regional meteorological and hydrological conditions will be monitored. As the impacts of climate change on local weather conditions and stream flows become more apparent, there will be opportunities to review infrastructure design criteria and to consider changes to the main dam raise schedule. Continuous climate and hydrological monitoring throughout the mine life will provide an improved estimate of the climate in the closure phase, which will be taken into account in closure planning. Additionally, climate change projections should improve as the field of climate change research grows and builds on existing knowledge, data and technology.

Seismic Activity
The Project site is located in a moderately high seismic zone. Based on review of the national seismic hazard maps produced by the Geological Survey of Canada, the Proponent determined that the maximum credible earthquake peak ground-acceleration will likely be between 0.2 to 0.3 g. Return-period hazard values for the Galore Creek area are summarized in Table 10.

Table 10. Galore Creek Seismic Hazard

Return Period of Seismic Event (years)	Peak Horizontal Ground Acceleration (g)
100	0.054
200	0.074
475	0.097
1,000	0.121
2,475	0.17
10,000*	0.25

*** Extrapolated value.**

The peak horizontal ground acceleration value of 0.25g for the 1:10,000 year earthquake was defined as the maximum credible earthquake for Galore Creek as part of a probabilistic seismic assessment carried out for the Project during pre-feasibility design. To enhance the probabilistic seismic assessment, a deterministic seismic hazard evaluation was also carried out.

It was determined that all of the Project components could potentially be affected by a seismic event, but that the tailings management structures would be the most impacted. Based on the Canadian Dam Association Guidelines (1999), the downstream consequences of the failure of a tailings dam in the Galore Creek valley are categorized as very high because of potential socio-economic, financial and environmental losses. The rating is the same for all stages of the life of the tailings dam: construction, operations and closure.

Given the very high consequence rating, the main tailings dam and seepage recovery dams were designed for the maximum credible earthquake with a minimum factor of safety of 1.5 under steady-state seepage and maximum impoundment water level conditions. The waste dump slopes will be designed to resist earthquake forces as well by allowing for deformations without catastrophic failures. All final outer slopes will be designed to withstand the maximum credible earthquake without allowing catastrophic failure. In addition to design factors, all structures would be thoroughly inspected after any seismic event to assess the stability.

Volcanic Activity
There is a recent history of volcanism surrounding the Project area, which is situated within the northern Cordilleran volcanic province, one of the largest Neogene volcanic provinces in western North America.

Volcanoes present a number of generic hazards, although they are hard to predict because every volcano behaves differently. Hazards normally associated with eruptions include fragmental rocks from erupting lava and surrounding rock, widespread ash fall, pyroclastic flows, debris avalanches, landslides, pyroclastic surges and lahars. Some of the effects from these hazards include the damming, filling and flooding of drainages by volcanic material, volcanic ash falling on aircraft and loss of life and local habitat from pyroclastic flows.

The most likely potential impact on the Project from volcanic activity would be an ash cloud affecting air quality, visibility and aircraft access. The ash and debris would pose health concerns for workers at the mine site and increase the levels of suspended solids in the tailings pond and diversion channels. However, because volcanoes are difficult to predict, effects from lava spews and flows or destructive debris flows could be widespread throughout the Project area.

The diversion channels would be monitored and cleaned regularly to reduce the risk of blockage from ash and debris fallout from an eruption. Road maintenance crews would be available to clear debris from the access road. An additional minimum 1.5 metres of clearance was included in stream crossing designs to allow for debris clearance. Settling ponds would be used to help settle out the suspended solids to acceptable limits. In the event of an ash cloud, individual worker exposure would be limited and face masks or other respiratory devices would be used.

Geohazards
Evidence of recent and historic landslides and snow avalanches is found at every scale throughout the Project area and the effects on various project components are described-below.

The primary effects of geohazards on project components would be damage or loss of infrastructure.

<u>Filter Plant and Access Corridor</u>
Geohazards identified along the access corridor include snow avalanches, rockfalls, rock slides, debris slides and slumps in surficial material, debris flows and deep-seated slope-sagging features (sackungen). In gullied terrain, multiple slide paths often converge to form one larger path descending to a colluvial fan or cone. Table 11 summarizes the lengths of the access road potentially affected by geohazards prior to mitigation.

Table 11. Total Access Route Lengths Potentially Subject to Landslide and Snow Avalanche Hazards

Hazard Type	Sum of Hazard Segment Lengths (kilometres)	Percent of Total Road Length (%)
Debris Avalanches	1.6	1.2
Debris Floods	8.9	6.9
Debris Flows	4.4	3.4
Rock Avalanches	0.8	0.6
Rockfalls	13.8	10.7
Snow Avalanches	22.9	17.8
Total	**52.4**	**40.6**

Extensive design and operational measures will be implemented by the Proponent to mitigate these hazards. Mitigation includes relocating the alignment, constructing diversion berms, using explosives to manage avalanches, armouring of bridge abutments and deep burial of pipelines. The mitigation measures are expected to limit road closures lasting three days or longer to about once every three years on average. The likelihood of a pipeline rupture as a result of geohazards or snow avalanches can be mitigated to about 1% per year.

MINE SITE

The Project will be located in a steep valley with heavy snowfalls. Many of the mine facilities will be established in areas that will require design and operational considerations to mitigate avalanche and landslide hazards.

<u>Pits</u>

The eastern half of the proposed Central pit lies within terrain partially covered with thick till and glaciolacustrine and glaciofluvial material. While the natural landslide hazard is considered to be low in this area, pit development will require the removal of thick deposits that could result in instability during or after excavation.

At the northwest end of the Central pit area, steep rock slopes are subject to sporadic shallow rockfall, but the slopes will be significantly modified or removed during pit construction. The western part of the pit is intersected by Middle Creek, which is subject to debris flows with the potential to run out to the western boundary of the pit.

The proposed Southwest pit will be below steep rock slopes subject to frequent shallow rockfall. Approximately 200 metres of the western footprint lies within the rockfall runout zone. The north and west sides of the proposed North Junction pit are located in highly fractured, gullied volcanic rock potentially subject to low-magnitude rockfall and debris flows. The West Fork pit is located at the toe of the West Fork Glacier. The pit footprint lies in an area with relatively gentle slopes and is subject to very low landslide hazard. The furthest runout zone of two avalanche paths extends into the southwest margin of the West Fork pit. Snow avalanche return periods at this location are estimated at approximately 30 years (Class 4 magnitude). The Middle Creek pit extends across Middle Creek, which is subject to debris flows with the potential to run out into the pit. Because this pit is immediately upslope of the Central pit, geohazard issues and mitigation are similar to those for the western side of the Central Pit. The north side of Middle Creek pit is also subject to low magnitude (Class 2) snow avalanches with an approximately 10-year return period.

Main Tailings Dam

Rock slopes extending 100 metres above Galore Creek are densely jointed volcanic rock subject to shallow rockfall. Once constructed, the tailings dam would cover these rock slopes. Slopes above the northeast side of the tailings dam are heavily forested, moderately steep (15° to 30°) and overlain by shallow glacial till and colluvium. These slopes are considered to have very low landslide and snow avalanche hazard.

Bear Creek enters Galore Creek on the southeast edge of the proposed tailings dam. This creek is potentially subject to debris flows above approximately 550 metre elevation and to debris floods in its lower reaches. Debris flow and debris flood events are considered to have very low likelihood of damaging the tailings dam, but could represent a safety hazard during dam construction.

The northwest side of the main tailings dam is potentially subject to debris flows in a gully extending to 1,200 metre elevation on the west side of More Creek.

Tailings and Waste Facility (Middle Galore Creek)

Middle Galore Creek is defined as the portion of the Galore Creek valley between the main tailings dam and the confluence of the east and west forks of the creek. Upper slopes on the west side of the middle of Galore Creek are subject to rockfall and debris flows. There are several channels from one to four kilometres south of the proposed tailings dam where debris flows could run out within the west side of the proposed waste rock storage area. Debris flow events occurring in this area are considered to be of very low hazard to the main tailings dam. The design of water diversion channels or roads in this area will have to accommodate potential channel blockage and flow avulsion, or allow for partial blockage followed by the removal of deposited material.

Upper slopes on the east side of Middle Galore Creek are subject to sporadic rockfall and to debris flows and debris floods in upper Friendly and Bear creeks. Debris flow hazards will need to be considered in the design of bridge crossings or drainage channels at Friendly and Bear creeks.

The potential for snow avalanche-generated waves in the main tailings facility was investigated. The investigation demonstrated that in the event of a very large and rare (1 in 100 frequency) snow avalanche at a critical location on the tailings facility during the early years of mine operations, snow avalanche-generated waves are unlikely to reach the dam crest.

East Fork Dam (East Fork Galore Creek)
East Fork Galore Creek valley is characterized by a gentle valley bottom bounded by steep, gullied rock slopes. A debris flow gully on the south side of the valley has the potential to run out into the valley below the diversion structure. Debris flows from this gully originate in a small (~1.5 square kilometre) watershed containing a cirque glacier that has retreated to the uppermost basin area. Extremely large amounts of sediment are available for debris flow transport. It is estimated that the 100-year debris flow at this site could reach 10,000 to 100,000 cubic metres, which could inundate an area of about 0.1 square kilometres at the confluence with East Fork Galore Creek. Low-frequency debris flows could also cause short-lived blockages of Galore Creek.

Two recent (probably within the last 10 years) rock-slides and one older (probably several hundred years old) rock avalanche deposit were mapped in East Fork Galore Creek.

Several extensive rock slides are found on both sides of the valley. Glacial scour has oversteepened the lower slopes in this area, and joint sets daylight at numerous locations, promoting rock slope instability with potential failure volumes up to several tens of thousands of cubic metres.

The north side of East Fork Galore Creek contains steep, partially forested rock slopes dissected by several gullies subject to debris flows and shallow rockfall. One debris flow fan runs out 800 metres along the valley bottom west of the two glacier toes. Debris flows large enough to reach east Fork Galore Creek, with return periods exceeding 20 years, can be expected to occur.

Potential Hazards in Upper East Fork Galore
The Proponent identified one location in upper East Fork Galore (Copper Canyon area) where active slope sagging is occurring above a glacially debuttressed rock slope. Sackungen (slope-sagging) features extend for 370 metres parallel to the valley slope and show evidence of fresh displacement along tension cracks. Slope-sagging features above glacially undercut rockslopes are commonly associated with rock slides and rock avalanches in B.C. Should failure occur, the Proponent has outlined a preliminary rock avalanche runout zone below the sagging slope. The runout zone has not been modeled and could extend farther down the valley if wet snow covers the glacier at the time of a rock avalanche occurrence.

Impact of Glacial Retreat on Upper Galore and Sphaler Creeks
The Proponent conducted a preliminary assessment of the potential effects of future glacial retreat on geohazard activity in upper Galore and upper Sphaler creeks, based on retreat rates calculated from historic air photographs (since 1947), modified to include predictions of future climatic change.

The Proponent postulated that future glacial retreat in these areas could affect the following geomorphic processes within the Galore and Sphaler Creek drainages:

- an increase in landslide activity along glacial margins in the Galore Creek East Fork glacier as well as the upper Sphaler Creek Glacier, in unstable areas that are newly exposed or debuttressed by glacial retreat;
- an increase in the steepness of hydrographs on Galore and Sphaler creeks, due to reduction of the glacier buffer effect on stream flow; and,
- an increase in sediment transport rates in Galore and Sphaler creeks, due to mobilization of unconsolidated glacial debris in the glacier forefield.

3.1.3 Issues Raised and Proponent Response

During the Application review, government agencies and the Tahltan Heritage Resource and Environmental Assessment Team raised issues with respect to the potential effects of the environment (namely geohazards and seismic activity and climate change) on the Project. These issues, and associated Proponent responses, are described below:

- Concern was raised with respect to the potential for the tailings dam and impoundment to be affected by snow avalanches and other debris/rockfall hazards or by a surge wave in the tailings impoundment.

  The Proponent noted that the design and construction of the tailings dam would be in accordance with the Canadian Dam Association Safety Guidelines (1999) to withstand a 1 in 10,000 year earthquake (using probabilistic methods) or the Maximum Credible Earthquake (using deterministic methods). Both derivations were developed and the more conservative ground acceleration of 0.25g was used as the basis of the design. The design also considered the effect of avalanche-induced wave and the ability for the spillway to pass a Probable Maximum Flood.

  During operations, the operations and maintenance manual would describe avalanche management along the downstream face of the dam. The Proponent will also continuously measure the water levels in the impoundment and thus will be able to monitor the effects of avalanches and debris flows.

- The potential impacts to the integrity of the concentrate and diesel pipelines resulting from geohazards.

  The Proponent indicated that it will vary the depth of pipeline burial to allow for the appropriate level of protection from identified geohazards at any given location. Any aerial pipeline crossings will be designed to reduce the risk of pipeline rupture in the event of a bridge failure.

- The unknown risk that climate change poses to the Project, including the potential effects of climatic warming on the overall risk of geohazards to the Project, and the implications to the recurrence of ice dams in Porcupine Lake.

  The Proponent indicated that it had mapped all areas with the potential to affect the Project and included a consideration of the potential impacts of glacial retreat. The Proponent's commitment to monitor geohazards will detect new hazards that may develop over time due to climatic change. With respect to ice dams on Porcupine Lake and the potential for outburst floods affecting the aerodrome, the Proponent acknowledged that the potential effects of climate change would be difficult to predict. However, the Proponent committed to undertake a Flood Risk Assessment during the final design for the Porcupine aerodrome which would include an assessment of risk from mass flow events originating in Sphaler Creek, rainfall and snowmelt flooding from Porcupine River and ice dam flooding from Porcupine Lake. The potential impact of climate change will be included in the flood risk assessment.

- The potential for a catastrophic failure of the tailings and waste rock impoundment dam and possibility of severe, largely unmitigable impacts on the Stikine River system, including the salmon that are such a central part of the Tahltan culture and way of life. Particularly concerned with potential effects of the external environment in the post-closure period. Given enough time, there will be a good chance that some aspect of the external environment (e.g., floods, earthquakes, avalanches) will result in damage to structures that may result in significant environmental effects. There needs to be mechanisms in place to minimize the significant effects when they happen.

The Proponent has committed to a number on initiatives as outlined below to address the possibility of a catastrophic dam failure during operations and post closure.

3.1.4 Proponent Commitments and Mitigation

The Proponent has identified a number of measures as summarized above to reduce or eliminate the potential effects of the environment on the Project. A detailed outline of commitments that address the effects of the environment on the Project is outlined in Appendix F. Key commitments are summarized below:

- designing main diversion channel to 200-year flood event and other diversion structures around the mine to 100-year flood event;
- constructing all culverts and bridges to a 100-year design flood, with major bridge crossings designed to the 200-year flood;
- incorporating at least 1.5 metres of clearance above the design flood elevation into bridge design to allow for debris passage and prevent bridge washout;
- monitoring water levels in Porcupine River and design a flood protection barrier adjacent to the Porcupine aerodrome and undertaking a flood risk assessment during the final design for the Porcupine aerodrome which will include consideration of potential impacts of climate change;
- monitoring pertinent glaciers to predict effects on mine safety and water management and will conduct glacier mass balance monitoring starting in 2007 with a monitoring plan to be developed and reviewed by relevant agencies and the Tahltan Central Council;
- constructing the tailings dam to Canadian Dam Association guidelines (1999) to withstand a 1 in 10,000 year earthquake and an avalanche-induced wave and to safely pass a probable maximum flood;
- establishing an ongoing initiative with the Tahltan Central Council and relevant Canadian and U.S. federal and B.C. and Alaska state government agencies to assess, at a conceptual level, the potential effects of a catastrophic dam failure and develop a program for remediation of those effects;
- developing a long-term maintenance and mitigation strategy for the dam and spillway for both operations and closure, including inspections annually and after significant events such as floods and earthquakes, and dam safety inspections, following Canadian Dam Association guidelines, every five years;
- monitoring geohazards at the mine site and along the access road pursuant to permitting requirements. Will bury the pipeline except where it crosses streams on bridge structures, with deeper burial in areas assessed as having geohazard potential; and,
- developing and implement an Operations and Maintenance manual that will include avalanche management and monitoring and mitigation for rock falls and debris flows for the mine site and access corridor.

The Proponent has committed to climatic change and glacier monitoring and follow-up (see section 4.2.1) to support or verify the predictions made on environmental effects.

3.1.5 Significance of Residual Effects

The mitigation measures and commitments outlined by the Proponent will reduce the possible effects of the environment on the Project and consequential environmental effects. It is recognized that an unlikely yet catastrophic event such as an earthquake would likely have high consequences because of potential socio-economic, financial and environmental losses. However, the proponent has committed to establish an ongoing initiative with the Tahltan Central Council and relevant Canadian and U.S. federal and B.C. and Alaska state government agencies to assess, at a conceptual level, the potential effects of a catastrophic dam failure and develop a program for remediation of those effects.

3.1.6 Conclusions of Effects and Mitigation

During Application review EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of the environment on the Project; and responses from the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the effects of the environment on the Project is not likely to cause significant adverse environmental effects.

3.2 ENVIRONMENTAL EFFECTS OF ACCIDENTS AND MALFUNCTIONS

3.2.1 Background

Pursuant to the CEAA, consideration of the environmental effects of any potential project-related accidents or malfunctions is required. The Proponent used a risk assessment approach to meet this requirement, and has committed to develop an Accidents and Malfunctions Management Plan as part of its ongoing risk management program. This plan would be incorporated into the overall Environmental Management System for the Project.

3.2.2 Project Effects

In the Application and supplemental information submitted by the Proponent, the risk of several potential accidents and malfunctions to affect the environment was discussed, including:

- dam failure at tailings facility or sedimentation pond;
- slope failure of pit wall or waste rock dump;
- water treatment failure at filter plant;
- major fuel spill; and
- chemical and hazardous substance releases and spills.

An evaluation of project effects are found by valued ecosystem component in Part B of this Report and should be refered to for additional detail on possible environmental effects arising from accidents and malfunctions.

Dam Failure at Tailings Facility or Sedimentation Pond

The main dam is designed as a water-retaining earth-filled structure using best available technology standards. The dam is designed to pass the Probable Maximum Flood, which would be a 1:10,000 year earthquake event. The Probable Maximum Flood involving the estimation of Probable Maximum Precipitation on to the catchment under the worst meteorological conditions likely to occur followed by an estimation of the runoff that would result from such storm. The Proponent conducted a dam break analysis to evaluate potential environmental effects downstream in the Scud River and down the Stikine River to the mouth at Wrangell, Alaska.

Flows from a breach travelling from the dam to the mouth of the Stikine River would be in the range of 3,000 m^3/s; this flow less than a 1-year return period flood; however, if the breach flow occurs during an ongoing 5-year flood event, then the resultant flood would resemble a 50-year flood. The modeling also predicted that flows would reach the mouth of the Stikine River in roughly 34 to 42 hours and would subside back to normal flow in 24 to 48 hours.

The analysis predicted that three distinct failure modes could lead to a significant, irreversible impact on downstream habitat. However, these modes (breach following (1) rupture due to earthquake, (2) karst collapse beneath dam, or (3) sliding block on weak plane of soil or linear interface) are rated as “not likely”.

The analysis also predicted that four failure modes would lead to a catastrophic impact on downstream habitat. However, these modes (breach following (1) seepage causing piping and removing dam material, (2) seepage raising pore pressures and causing deep instability, (3) seismic deformation of core/dam, or (4) liquefaction of tails applying horizontal thrust to dam) are also rated as “not likely”.

In the case of a dam failure at the tailings facility or to a lesser extent the sedimentation pond, large volumes of total suspended solids and metal-enriched effluent would likely be released downstream in Galore Creek and Scud River. Dam failure would result in major adverse environmental effects, including: the destruction or alteration of habitat; degradation of water quality, sediment quality and wetlands; reduction in the productive capacity of aquatic habitat; and the triggering of debris flows that may scour stream channels and deposit large debris dams in rivers.

A dam failure may have catastrophic effects on the productivity of the river, affecting not only fish species, but also wildlife and humans. Productive capacity would likely be altered for years as newly-exposed potentially acid-generating rock begins to leach acid, and contaminated sediment settles onto the substrate of the river. Resulting downstream changes to surface water quantity and quality could alter the environmental conditions for aquatic and terrestrial life. Aquatic life such as periphyton, macrophytes, benthic invertebrates and fish could be affected. This effect could be expected to extend quite far down the Scud River, and, depending on particulate settling rates and season, could impact sediment and water quality, and other components of the ecosystem, such as fish communities and fish habitat of the Stikine River. Effects would be more serious and longer lasting in Galore Creek and Scud River than in the Stikine River.

However, the probability of such an event is very low and will be minimized through effective dam design (to withstand the probable maximum flood and maximum credible earthquake event) and through a program of regular surveillance and long term maintenance of the dam to ensure safety.

Slope Failure of Pit Wall or Waste Rock Dump

The Proponent determined that the environmental effects of slope failure of a pit wall or waste rock dump would have minimal or negligible environmental effects. The pit and waste rock dumps will all be located upstream of the main tailings impoundment facility. The dam will ensure that any temporary environmental effects, principally the increase in total suspended solids, can be contained within the project footprint.

Failures would have safety implications but monitoring would provide advance warning of the generally progressive types of failures in these facilitites. The likelihood of adverse economic implications of a pit wall or waste rock dump failure encourages diligence to avoid or minimize such events.

An extensive pit wall monitoring program will be implemented to provide an early warning system and to minimize worker injuries from such a failure. The details of the pit wall monitoring program will be provided in the Proponent's *Mines Act* permit application.

The Proponent also determined that a waste rock dump failure in the Galore Creek valley would have minimal or negligible effects because all of the dumps would be located within disturbed areas. Waste rock dumps will be monitored during operations and a waste rock stability monitoring program will be developed and included in the *Mines Act* permit application.

Water Treatment Failure at Filter Plant

A failure of the water treatment system at the filter plant could result in release of water into the Iskut River that failed to meet federal and/or provincial water quality requirements. Accidental releases of effluent may have a larger magnitude effect and affect a larger geographic area than controlled discharges. Such an event could result in various environmental effects, including: the degradation of water quality, sediment quality and wetlands; effects to riparian vegetation and wildlife; and a reduction in the productive capacity of aquatic habitat.

Specifically, there is a potential for:

- riparian vegetation and wildlife to uptake metals and other chemicals downstream of the diffuser.;
- associated food webs and water use effects from changes in water chemistry;
- reduced productive capacity of downstream habitat, as well as the health and behaviour of fish species; and
- toxicity to biota downstream of the diffuser

The Proponent developed a number of operational measures to mitigate this risk. The various components and stages of the water treatment plant will be monitored on a continuous basis. Acceptable equipment redundancy will also be installed in the plant to respond to equipment failure. A large standby tank has been included in the final feasibility plan to temporarily store water that does not meet discharge criteria during operation. If a non-compliance situation develops, the flow in the concentrate slurry pipeline would be stopped. If necessary, the process plant in Galore Creek valley could also be shut down until the non-compliance problem was remedied. Given monitoring and mitigation measures, the probability of an accidental failure is very low.

The Proponent developed a number of operational measures to mitigate this risk. The various components of the water treatment plant will be monitored on a continuous basis. Acceptable equipment redundancy will also be installed in the plant to respond to equipment failure. A large standby tank has been included in the final feasibility plan to temporarily store water that does not meet discharge criteria during operation.

Major Fuel Spill

A spill of concentrate slurry or diesel fuel would result in the introduction of a deleterious substance into soil, groundwater or and/or surface water systems. Such an event may result in various environmental effects, including:the degradation of surface and ground water quality, sediment quality and wetlands. Secondary production may suffer as far as 12 km downstream of the spill site, and effects may persist for longer than a year.

Rupture of the slurry pipeline could cause mortality or sublethal effects to aquatic life in wetlands or lakes directly or through trophic effects depending on species sensitivities to the metals introduced. These effects could be linked to effects on birds, fish and wildlife which depend on primary and secondary producers for food and habitat. Metal could be stored in organic sediment and act as a contaminant source to benthic organisms including invertebrates and fish. Concentrate spills to a stream or river could also cause effects to aquatic life, but effects would be of lower magnitude and duration than those expected in wetlands, due to the flowing nature of streams.

Rupture of the diesel pipeline could also lead to toxic effects in aquatic organisms if fuel reached aquatic habitats either through surface or groundwater transport. Diesel fuel could cause mortality to aquatic life of streams and especially that residing in wetlands and lakes which are more static systems and therefore would contain the contaminants for a longer period.

Pipeline ruptures (diesel or concentrate) close to a waterbody, could reduce productive capacity within the exposed waterbody, by increasing chemical toxicity (directly or indirectly through trophic effects) or physically altering habitat.

Efforts to reduce the risk of spills include the incorporation of the pipelines in project design rather than truck transport, and the development of pipeline management systems that involve a comprehensive program of inspections, monitoring and maintenance to ensure pipeline integrity. Contingency plans, including spill response and clean-up plans, will minimize the environmental consequences of spills

Mitigation to reduce the risk of a rupture includes:
- pipelines will be buried underground to avoid damage from avalanches, rockfalls and landslides;
- the pipelines will be insulated and physically supported when above ground at major stream and river crossings;
- the diesel pipeline will have several emergency shut-off valves built in at regular intervals along its length;
- the ore concentrate pipeline will have pressure sensors that will inform personnel immediately in the case of a rupture; and
- a sump tank at Porcupine River at the low point between the tunnel and upper Sphaler watershed will be designed to contain all concentrate within the pipe in the case of a rupture in this portion of the pipeline.

Potentially serious adverse environmental effects relating to pipeline ruptures was assigned a very low probability of occurrence. Best management practices and monitoring of structures and water quality of discharges by trained personnel will mitigate potential impacts.

Chemical and Hazardous Substances Releases and Spills

The construction and subsequent operation of the Project would require the use of a number of chemical or hazardous materials and dangerous goods that pose a hazard to human health or the environment if improperly handled. Localized fuel (diesel) and chemical (process and filter plant chemicals, de-icing fluids, explosives salts) spills can be expected to occur over the life of the mine. The spills will most likely be at the storage and re-fuelling sites. The release of these substances may result in various environmental effects, including the degradation of surface and ground water quality, sediment quality and wetlands.

Uncontrolled chemical spills (fuels, de-icing fluids) could have effects on aquatic life and wetlands following a large chemical spill. Chemical spills could result in decreased aquatic productive capacity downstream of spill sites or through groundwater transport. Repeated small spills at high-use areas could affect soils and potentially vegetation and wildlife. Regular spills of aircraft de-icing fluids may lead to the accumulation of sublethal concentrations of the associated chemical compounds in fish and invertebrates living downstream of the aerodrome. Chemicals transported by truck (gasoline, lubricants and flocculants and reagents such as potassium amyl xanthate, methyl isobutyl carbinol and lime) along the access road could be released into the environment in the event of a motor vehicle accident.

Mitigation to reduce the risk of spills include:
- fueling stations will be built to contain any spills;
- fueling stations, the airstrip and the West More heliport will be situated well away from local waterbodies;
- manage spills to minimize pathway to creeks, rivers and local lakes and wetlands (Spill Contingency and Emergency Response Plan);
- collection and recycling of used de-icing fluid; and
- monitor high-use areas for ongoing chemical accumulation, potential mobilization of chemicals away from the high-use areas and cleanup on mine closure; and

The Proponent has committed to adopt best management practices for hazardous materials, including the development of a Hazardous Materials Management Plan for the storage, handling and use of the product from arrival on site to final disposal at a licensed off-site facility.

Given the monitoring and mitigation measures proposed, the risk of chemical or hazardous spills to the ground or waterways is minimized and the probability of significant environmental effects is low.

3.2.3 Issues Raised and Proponent Response

During the review of the Application, government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public provided comments on issues related to accidents and malfunctions. The majority of concern centred on the tailings dam and the need to ensure its integrity over the long-term. Other issues included the potential for spills and tunnel safety.

Canadian, and U.S. federal, B.C. and Alaska State government agencies, the Tahltan Heritage and Resource Environmental Assessment Team and the public commented on potential downstream effects of a catastrophic dam failure. The Proponent has committed to establish an ongoing initiative with the Tahltan and relevant Canadian, U.S. federal, B.C. and Alaska State agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects.

Natural Resources Canada sought further information about the geological conditions of the tailings dam foundations. In response, the Proponent prepared a report entitled "Galore Creek – Tailings Dam Geologic Conditions Update" (November 14, 2006), which summarized the results of field investigations undertaken in the summer of 2006. This report provided further information on the location and nature of karst in the vicinity of the dam, and concluded that the karst present would not affect either its stability or permeability.

Canadian and U.S. federal, B.C. and Alaska State government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public raised concerns about long-term (i.e. post-closure) maintenance and monitoring of the tailings dam and spillway. The Proponent committed to developing a long-term maintenance and mitigation strategy for the dam and spillway and to maintaining a small fleet of earth-moving equipment near the dam after closure to support maintenance and repair functions.

The Technical Working Group raised concerns with respect to managing the risk of potential spills of hazardous substances into the environment. With respect to the pipelines, in September 2006 the Proponent submitted a supplemental report entitled "Overland Pipelines Detailed Feasibility Study" which provided further information on pipeline design and leak detection systems. The Proponent made a number of commitments related to minimizing the risk of pipeline failure (refer to the Summary of Commitments in Appendix F) and also indicated that it would be submitting comprehensive information on pipeline monitoring and security as part of the permitting process under the *Pipeline Act.*

With respect to concerns with tunnel safety, in November 2006, the Proponent submitted a supplemental report entitled "Revised Tunnel Alignment and Related Geotechnical Investigations" which proposed a new alignment for the southern portal in order to address previously identified geotechnical risk. The Proponent also committed to undertaking probe drilling ahead of tunnel excavation in order to obtain information on rock geotechnical properties to determine appropriate ground support methods and predict water inflows.

3.2.4 Proponent Commitments and Mitigation

The Proponent has identified a number of measures as summarized above and in other sections of this Report to reduce or eliminate the potential effects of accidents and malfunctions. A detailed outline of commitments that address the effects of accidents and malfunctions is outlined in Appendix F.

3.2.5 Significance of Residual Effects

The mitigation measures and commitments outlined by the proponent will reduce the possible environmental effects of accidents and malfunctions. As described in the effects of the environment on the Project section above, it is recognized that a catastrophic event may have high potential socio-economic, financial and environmental consequences. However, potentially serious adverse environmental effects relating to catastrophic failures involving the tailings dam (breach or overspill events), pipeline ruptures, or filter plant accidents were all assigned a very low probability of occurrence.

3.2.6 Conclusions of Effects and Mitigation

During Application review EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential effects of accidents and malfunctions and responses by the Proponent.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied the Project is not likely to cause significant adverse environmental effects associated with accidents and malfunctions.

3.3 CAPACITY OF RENEWABLE RESOURCES

3.3.1 Background

Under CEAA, the environmental assessment needs to include a consideration of the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.

Development of the Project may affect renewable resources including soils, vegetation, water, and aquatic and terrestrial species. This could affect the capacity of these resources to support future and present uses such as forestry, fishing, hunting, trapping and traditional land use activities.

The overall environmental effects assessment methodology was used to address sustainability. The criteria used to describe potential effects included “resilience” and “duration”, which together assessed the ability of a renewable resource to regenerate to baseline conditions, and the length of time that this regeneration would take. The sustainability of terrestrial ecosystems was assessed by analyzing ecosystem fragmentation and regeneration potential. The sustainability of aquatic resources and fish and wildlife populations was assessed by considering how the Project may affect carrying capacity, population persistence, and productivity.

3.3.2 Project Effects

Terrestrial Ecosystems

<u>Vegetation Resources</u>

Currently, forested and parkland ecosystems within the Project area function to provide a range of values for traditional use, wildlife habitat and possibly forestry. The primary end land use for the area is wildlife habitat supported by a functioning, though low-productivity, forest.

Within the Galore Creek valley, the potential for forestry use is limited by low productivity due to the extreme climate and the remoteness of the site. Mature, low-productivity forest stands do, however, exist in the valley. The replacement of this forest and its habitat and potential fibre resource values were recognized. Even though there will be a net loss of terrestrial habitat in the Galore Creek valley, an objective of the mine reclamation plan for a portion of the reclaimed lands would be restoration of forest productivity equivalent to that of the pre-disturbance levels.

Development of the access road will involve clearing of all vegetation along the road corridor (386 hectares of right-of-way and approximately 80,000 cubic metres of timber). While development of the access road would temporarily remove the affected area from timber production, this represents a relatively small amount of land within the regional forest land base. Further, the effects would be temporary since at closure; the access road would be deactivated, allowing regeneration of terrestrial ecosystems.

The Project would also affect renewable terrestrial resources through the permanent loss of terrestrial habitat in the Galore Creek valley due to facilities that will be remained flooded post-closure. This would not however, affect the sustainability or integrity of those ecosystems within the Stikine region, or the capacity to support country foods or wildlife populations during project operations or the post-closure period.

<u>Wildlife Resources</u>

A significant adverse environmental effect on wildlife and wildlife habitat is defined as an effect that would alter the terrestrial habitats within the Project area physically, chemically, or biologically, in quality or extent, in such a way as to cause a change or decline in the ecological function of that habitat, or a change or decline in the distribution or abundance of an animal population (as represented by the indicator species) that is dependent upon that habitat, such that natural recruitment would not re-establish the population to its original level within one generation.

The Proponent described the potential impacts to wildlife and wildlife habitat from the Project and proposed various means to avoid or mitigate those impacts. For example, the potential disturbance to ecosystems and wildlife along the selected access road will be minimized by the use of pipelines instead of truck haulage for the transportation of concentrate slurry and diesel fuel between the mine site and the filter plant. Further, the Proponent proposed a range of specific mitigation measures and management practices to avoid or reduce wildlife-related impacts including: access restrictions; no-hunting policy; wildlife right-of-way policy; no-feeding policy; waste management restrictions; avoidance of sensitive wildlife areas and periods; wildlife exclusion measures; wildlife habitat management; and an employee education program. Added to this was a commitment to continue with an ongoing wildlife monitoring and adaptive management program.

It is anticipated that given the proposed combination of general management practices, mitigation measures and an adaptive management approach to ongoing wildlife management, the potential adverse environmental effects of the Project on wildlife and wildlife habitat would not be significant. Consequently, the Project is not likely to cause significant adverse environmental effects on the capacity of wildlife resources to meet the needs of the present and those of the future, specifically, First Nation and non-First Nation hunters and trappers.

Aquatic Ecosystems

Water Resources
Surface water quality is an indicator of environmental health because it is linked to other key ecosystem components such as fish and fish habitat, aquatic resources, soil, vegetation and wildlife. As well, potential project-related impacts on surface water quality have international transboundary implications because the Stikine River flows into Alaska.

An important consideration for the Project was the potential for acid rock drainage (ARD) and metal leaching (ML). To prevent acid rock drainage/metal leaching, the waste rock and tailings impoundment has been designed to keep tailings and potentially reactive waste rock submerged within the Galore Creek valley. Having a single impoundment within the same valley as the mine site will minimize the total project footprint and confine water management issues to a single watershed.

The Proponent developed a series of extensive mitigation measures in order to address potential project-related water quality impacts. An overall Water Management Plan was developed and included in the Application. A number of related plans that are important for the protection of water resources were also developed, including: Tailings and Waste Management Plan, metal leaching/acid rock drainage Prediction and Prevention Management Plan; Access Corridor Preliminary acid rock drainage Management Plan, Erosion Control and Sediment Management Plan, Spill Contingency and Emergency Response Plan.

Since significant adverse environmental effects on water resources are not anticipated, the project is not likely to cause significant adverse environmental effects on the capacity of the freshwater resource to meet the needs of the present and those of the future.

Fisheries Resources
A significant adverse environmental effect on fish and fish habitat is defined as an effect that would alter valued habitat physically, chemically and/or biologically to the extent that instream habitat productivity would not recover through mitigation or compensation within three years and/or the riparian functions would not recover within five years of the alteration.

The Proponent described the potential impacts to fish and fish habitat from the Project and proposed various means to avoid or mitigate those impacts. The potential impacts of the Project on fish and fish habitat include: smothering of important gravel and cobble substrates due to sedimentation; contamination of watercourses offrom spills of hazardous substances; loss or alteration of fish habitat; alteration of water and/or sediment quality;, and alteration to the productive capacity of fish habitat.

The potential for these impacts was reduced through engineering and mine design. For example, the preferred access route was selected to avoid sensitive wetland and other habitats along the Iskut and Stikine valleys. The Proponent developed a Fish and Fish Habitat

Management Plan, which proposed a variety of mitigation strategies meant to avoid or reduce adverse effects where habitat avoidance is not possible. In addition, where mitigation would not be possible (i.e., due to habitat loss), the Proponent committed to developing compensation plans to ensure no net loss of fish habitat. A conceptual Fish Habitat Compensation Plan was included in the Application. Finally, an Environmental Effects Monitoring Program will be implemented to evaluate the effectiveness of the environmental protection measures and to monitor the health of aquatic ecosystems associated with the mine development.

While the construction, operation, and decommissioning of the Project may impact fisheries valued ecosystem components, the residual effects of these impacts are predicted to be insignificant in terms of productive capacity, habitat loss, mortality, and fish health. In light of mitigation and compensation measures and the commitment to implement an ongoing monitoring and follow-up program, it is anticipated that the Project would not have significant adverse effects on fish and fish habitat. Consequently, the Project is not likely to cause significant adverse environmental effects on the capacity of the freshwater fisheries resource to meet the needs of the present and those of the future.

3.3.3 Issues Raised and Proponent Response

No issues were raised by the public, government agencies or the Tahltan Heritage Resource and Environmental Assessment Team specific to the capacity of renewable resources, however, issues raised in other sections of this Report relate to the conclusions presented here. Additional review as it relates to renewable resources for First Nations will be undertaken.

3.3.4 Conclusion

During Application review EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public on the potential capacity of renewable resources.

Based on the information in this Report and provided that the Proponent implements the actions described in the Summary of Commitments listed in Appendix F of this Report, EAO and the Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the Project is not likely to cause significant adverse environmental effects on the capacity of renewable resources to meet the needs of the present and those of the future.

3.4 CUMULATIVE EFFECTS ASSESSMENT

3.4.1 Background

Section 16(1) of CEAA requires any screening or comprehensive study to include consideration of "any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out". Cumulative environmental effects are changes to the biophysical environment or socio-economic setting (only from a biophysical change) caused by an activity in association with other, past, present and future human activities.

Cumulative effects assessment (CEA) is done to ensure the incremental effects resulting from the combined influences of various actions are considered. These combined effects may be significant even though the effects of each action, when individually assessed, are considered insignificant. CEA includes effects that are likely to result from the Project in combination with other projects or activities that have been or will likely be present in a reasonable temporal or spatial scale.

Section 9 of the Application assessed potential cumulative environmental effects based on the requirements of the Terms of Reference and the guidelines described in the 1999 CEAA Cumulative Effects Assessment Practitioners Guide.

3.4.2 Methodology

Scope of the Assessment
Not all residual effects identified during the environmental assessment were selected for cumulative effects evaluation (CEA). The CEA section only includes those predicted residual effects that are not negligible or are not likely to combine with other projects or activities. Specifically, climate, air quality, noise, sediment quality, wetlands and navigable waters were not included in the CEA.

As this Report is intended to meet the purposes of both the provincial and federal environmental assessment requirements, it contains matters relating to potential socio-economic effects of the Project. However, when evaluating the significance of environmental effects pursuant to CEAA, the Responsible Authorities and the federal Minister of Environment will take into account "Any change that the Project may cause in the environment; any effect of any change to environment caused by the Project on health and socio-economic conditions, including physical and cultural heritage; the current use of lands and resources for traditional purposes by aboriginal persons; or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance; or any change to the project that may be caused by the environment. As a result, direct socioeconomic and visual and aesthetic resources are also not addressed in the cumulative effects assessment.

The selected valued ecosystem components are listed in Table 12.

Spatial Boundaries
Separate study areas were developed for the natural environment and the socio-economic environment because of the different spatial scales over which residual project effects may occur. The CEA study area for the natural environment was determined by referring to existing strategic land use management areas, consultation with CEA Agency and the Tahltan Nation, and professional judgement. The boundary was delineated to include: Tahltan Traditional Territory, the Cassiar-Iskut-Stikine Land and Resource Management Plan area, the Stikine River watershed and delta, and the transportation corridor between the project and the deep-sea port of Stewart.

Table 12. Valued ecosystem components Included in the Cumulative Effects Assessment

Physical
Surface Water
    Surface Water Quantity
    Surface Water Quality
Groundwater
	Cultural
	Archaeological and Heritage Resources

Biological
Aquatic Resources
Fish and Fish Habitat
    Dolly Varden char
    Bull trout
Terrestrial Ecosystems, Vegetation and Soils
    Ecosystems in forested subzones
    Ecosystems in parkland subzones
    Ecosystems in alpine subzones
Wildlife and Wildlife Habitat
    Grizzly bear (coastal population)
    Mountain goat	

Temporal Boundaries

Temporal boundaries for the CEA refer to the time periods for which the potential cumulative effects were assessed. The following time periods were used in the Proponent CEA:

- past, where past human actions may have influenced the existing environmental conditions;
- present, where the residual effects of the Project may combine with current human actions; and
- future, where future human actions may combine with the residual effects of the Project.

Past Boundary - The year 1964 was selected as the past temporal boundary, representing a time when effects similar to those of potential concern from the Galore Creek Project first occurred in the CEA study areas. Development of the Granduc copper-gold mine began in 1964, with operations commencing in 1971.

Present Boundary - The present temporal boundary was the period of time from the onset of baseline studies to completion of the environmental effects assessment for the Project. This covered the years 2004 to 2006.

Future Boundary - Future boundaries are valued ecosystem component specific and are based on the predicted length of time it would take for the valued ecosystem component to recover to baseline conditions, taking into account natural cycles of change in ecosystems. The future boundaries are stated in the appropriate sub-sections.

Other Projects and Activities
Human actions (projects and activities) to be considered in the cumulative effects assessment were identified by applying the following criteria:

- past (closed) industrial projects occurring within the cumulative effects assessment study areas;
- existing (active) projects occurring within the cumulative effects assessment study areas;
- reasonably foreseeable future projects occurring within the cumulative effects assessment study areas; and
- land use activities occurring within the cumulative effects assessment study areas.

Figure 9 outlines the location of the projects considered in the cumulative effects assessment.

Past Industrial Projects - Past industrial projects within the CEA study areas were confined to mining activities. Mining projects within the CEA study areas that have been active since 1964 (the past temporal boundary) but are now closed are listed in Table 13.

Existing Projects - The only active project within the CEA study areas is the Eskay Creek mine (an underground gold-silver-zinc-copper-lead mine that started operations in 1994 and is expected to close in 2007).

Table 13. Summary of Closed Mining Projects in the CEA Study Areas

Mine	Owner	Commodities	Project Type	Operational Period
Granduc	Canada Wide Mines Ltd	Copper, gold	Underground	1971 to 1978 1981 to 1984
Johnny Mountain	International Skyline Gold Corp	Gold, silver, copper, zinc, lead	Underground	1988 to 1990
Golden Bear	GoldCorp Inc.	Gold, silver, copper	Underground & Open Pit, Heap Leaching	1989 to 1994 1997 to 2001
Snip	Barrick Gold Corp.	Gold, silver, copper, zinc, lead	Underground	1991 to 1999
Silver Coin	Mountain Boy Minerals Ltd.	Gold, silver, base metals	Test mining, Exploration	1991 2004
Silver Butte	Silver Butte Mining Co.	Gold, silver, copper, zinc, lead	Underground, Test drilling	1991 1993

Reasonably Foreseeable Future Projects – Those projects within the CEA study areas that have entered or completed the BC environmental assessment process, but are not yet operational. The proposed Schaft Creek mine was included following discussion with the CEA Agency, although it had not entered the environmental assessment process at the time of the Proponent's assessment. Table 14 summarizes the projects that were included in the Proponent assessment. It should be noted that the proposed projects identified in Table 14 and in the pre -application stage, will be undergoing environmental assessments and will also include a cumulative effects assessment.

Land Use Activities - Land use activities that occur within the CEA study areas were identified through their inclusion in the Cassiar Iskut-Stikine Land and Resource Management Plan and through Traditional Knowledge studies. Land use activities selected for the CEA are summarized in Table 15. All of the activities have occurred in the past and are anticipated to occur in the future.

Table 14. Summary of Reasonably Foreseeable Future Projects within the Cumulative Effects Assessment Study Areas

Project	Owner	Project Type	Anticipated Operations	Status
Forrest Kerr Hydroelectric Project	Coast Mountain Power Corp	Hydroelectric power generation	From spring 2008 for greater than 50 years	Certified
Red Chris Mine	BcMetals Corporation	Open pit mine and milling: copper and gold	2007 to 2025	Certified
Mount Klappan Coal Project	Fortune Coal Limited	Open pit coal mining	20-year mine life	Pre-application
Kutcho Creek Mine	Western Keltic Mines Ltd	Underground and open pit mining: copper, gold, silver and zinc	11-year mine life	Pre-application
Schaft Creek Mine	Copper Fox Metals Inc.	Open pit mining: copper, gold, molybdenum, silver	15-year mine life	Pre-application

Table 15. Summary of Land Use Activities within the Cumulative Effects Assessment Study Areas

Activity	Summary
Agricultural Resources	A small amount of land is used for forage cultivation, primarily horse grazing pasture for guide outfitters, including areas along the Stikine River south of Telegraph Creek.
Fishing	The Stikine and Iskut rivers support a commercial fishery and subsistence fishing by the Tahltan Nation. Fishing is also a recreational activity within the study areas.
Guide Outfitting	As of 2000 there were 13 guide outfitters operating in the Cassiar Iskut-Stikine Land and Resource Management Plan area. The Project footprint overlaps with three guide-outfitting areas.
Resident and First Nations Harvest	Members of the Tahltan Nation and other BC residents harvest a variety of wildlife and vegetation for subsistence and economic purposes within the CEA study areas. The Project footprint overlaps with seven trapline areas: three active, 3 inactive and 1 of unknown activity status.
Mineral and Energy Resource Exploration	There is a substantial amount of exploration activity within the CEA study areas because of the significant mineralization and rich energy resources in the region. Recent exploration targets in the area surrounding the Project include the Copper Canyon, Foremore and RDN properties.
Recreation and Tourism	Recreation and tourism activities within the CEA study areas are primarily backcountry recreation, including boating, canoeing, kayaking, rafting, hiking, ski touring and heli-skiing.
Timber Harvesting (Forestry)	Little timber harvesting has occurred in the CEA study areas due to low timber values; less than 2% of the Cassiar Iskut-Stikine Land and Resource Management Plan is considered available for forestry. However, localized concentrations of timber suitable for harvesting occur throughout the CEA study areas, including areas adjacent to Bob Quinn and Klappan.

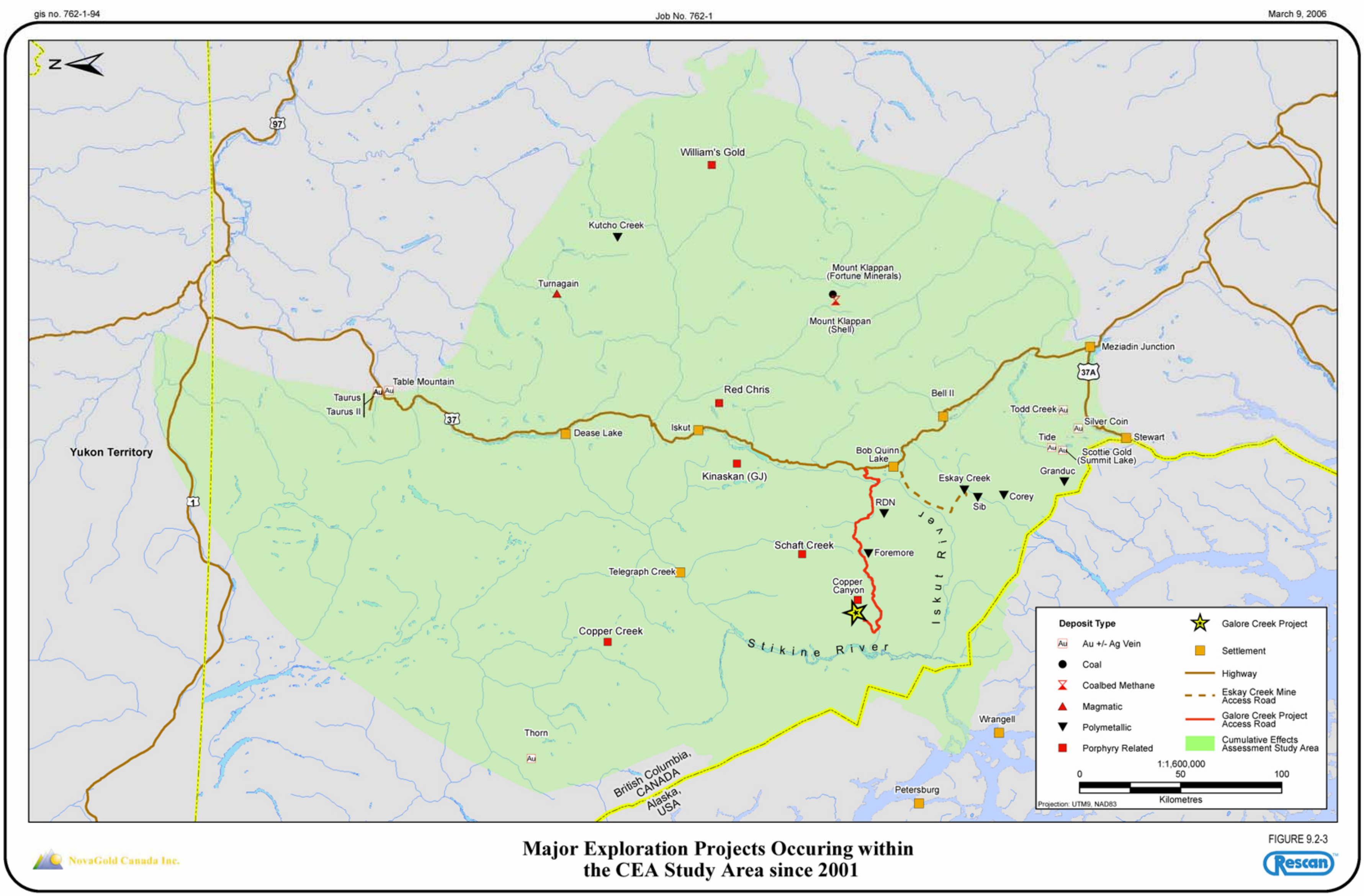

Figure 9 – Other Projects within the Cumulative Effects Assessment Study Area

Linkage with Other Human Actions
The Proponent used an assessment process to establish 'linkages', identified as 'effects of one or more actions overlapping spatially and temporally and acting in combination with residual project effects'. Spatial overlap between the residual effects of the Project and of other actions was evaluated by developing a "linkage map" for each valued ecosystem component, illustrating the areas where residual effects of the Project on a valued ecosystem component can reasonably be expected to occur. Temporal overlap was evaluated by examining the expected timing and duration of the residual effects of the project and of other actions. This process included an assessment of whether past human actions had an effect on the current condition of each valued ecosystem component.

Mitigation, Monitoring and Adaptive Management
Mitigation, monitoring and management procedures that are technically and economically feasible for the Proponent to conduct were identified. The need for management and monitoring on a scale beyond the scope of the Project was suggested where appropriate.

Residual Cumulative Effects
Residual cumulative effects are effects remaining after implementing mitigation measures. They are described with reference to their direction, timing, duration, magnitude, geographic extent and frequency. Areas where insufficient data were available to provide an assessment were highlighted, with potential cumulative effects being described as uncertain in those instances.

Assessment of Significance
In assessing the significance of each cumulative effect, the Proponent assumed that the identified mitigation measures would be implemented and would be effective as described. The significance of residual cumulative effects was determined based upon:

- whether as a result of cumulative human actions a threshold would be reached and/or exceeded; and
- the proportion of the cumulative effect that would be attributable to the Project, or "project contribution."

In certain circumstances, the exact environmental effects may be uncertain. However, they are not likely to be significant if the proposed mitigation measures are put in place. Additionally, follow-up and monitoring will be carried out as identified in the CSR and proponent's commitments. Should these programs identify the need for additional mitigation, then additional measures will be developed and carried out as part of adaptive management.

3.4.3 Cumulative Effects and Evaluation of Significance

The Project is described in this section. The cumulative effects assessment undertaken by the Proponent is summarized in Table 16 below.

Surface Water

<u>Surface Water Quantity</u>
The Application indicates that the residual effects of the Project on surface water quantity would be limited to the Galore Creek and Scud River watersheds. The Project will permanently alter flow pathways within the Galore Creek valley, upstream of the main dam. During operations, storage of water within the waste rock and tailings storage facility will result in changes to natural seasonal flow distribution at the mouth of Galore Creek. These impacts will be

exacerbated in winter months when no water will be released from the storage area. During winter low flow conditions, impacts may be felt downstream of Galore Creek within the Scud River. No residual impacts were identified within the Stikine River, downstream of the confluence with the Scud River.

Project components within More Creek, Sphaler Creek, Scotsimpson Creek and Iskut River watersheds are not expected to produce residual effects on surface water quantity.

There are no past, existing or proposed projects within either the Galore Creek or Scud River watersheds. Mineral exploration within the study area has taken place at the Galore Creek and Copper Canyon properties, and further exploration may be conducted in the future, though the Proponent stated that exploration activity does not affect surface water quantity. There are no known plans for the development of activities such as forestry or agriculture that have the potential to affect surface water quantity within the Galore Creek valley or the Scud River watershed.

The analysis indicated no potential for cumulative effects of the Project with other human projects or activities on surface water quantity.

Surface Water Quality

Effluent discharge from the tailings facility and the filter plant has potential for residual effects on water quality. The Proponent judged these potential project effects to be not significant.

Effluent from the tailings facility will be discharged into Galore Creek. Effects on water quality are predicted to be limited to Galore Creek and Scud River, from below its confluence with Galore Creek to above its confluence with Contact Creek, and not extend to the Stikine River.

Effluent from the filter plant will be discharged to the Iskut River via a diffuser. Potential effects on water quality will be limited to a localized area (less than 100 metres) of the Iskut River downstream of the diffuser based on annual average flow (average over 12 months). However, during the annual 7-day low flow (average seven lowest flow days in one year), potential effects, mainly related to total copper concentrations, extend downstream approximately six kilometres to the confluence of Iskut River and More Creek. The Proponent predicted that effects will not extend below the confluence and therefore not extend to the Stikine River, as a result of the additional volume of water from More Creek.

Table 16 - Summary of Proponent's Assessment of Cumulative Effects

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
Surface Water							
• **Surface Water Quantity**	• Permanently alter the flow pathways within Galore Creek valley, upstream of the main dam. • Changes to the natural seasonal flow distribution at the mouth of Galore Creek, during operations. • Impacts may occur downstream of Galore Creek within the Scud River, during winter low flow conditions.	Galore Creek and Scud River watersheds	-	Mineral exploration has taken place within the study area and further exploration may be conducted however, Proponent noted that exploration activity does not affect surface water quantity. Forestry activities and agricultural resources have potential to affect surface water quantity, but there are no known plans for the development of forestry or agriculture within the Galore Creek valley or the Scud River watershed.	No additional mitigation	No potential for cumulative effects.	No potential for cumulative effects
• **Surface Water Quality**	Effluent from the tailings facility will be discharged into Galore Creek: Effects on water quality limited to Galore Creek and the Scud River, from below its confluence with Galore Creek to above its confluence with Contact Creek. Effluent from the filter plant will be discharged into the Iskut River via a diffuser: Potential effects on water quality range from localized area (less than 100 m) of the Iskut River downstream of the diffuser based on annual average flow (average over 12 months) to approximately 6 kilometres to the confluence of Iskut River and More Creek during the annual 7-day low flow (average seven consecutive lowest flow days in one year), potential effects, related mainly to total copper concentrations, extend downstream.	Portions of mainstems of Galore Creek, Scud River and Iskut River.	For effects from tailings effluent - 20 years from closure, or 2049. For filter plant effluent effects - 2029 (i.e., 22 years from the start of the mine in 2007).	Mineral exploration activity in Copper Canyon Forestry activity (hauling) along the access corridor adjacent to the potentially affected area of the Iskut River.	Environmental effects monitoring program and adaptive management	No residual cumulative effects are anticipated.	No cumulative effects to assess.
Ground Water	Potential for contaminants from metal leaching, acid rock drainage, concentrate slurry and other fluids (including oils, solvents and fuels) to enter the Galore Creek valley groundwater aquifers.	Galore Creek	General consideration of future exploration	Mineral exploration has taken place at the Galore Creek and Copper Canyon properties, and further exploration may be conducted in the future. Exploration activity, however, is not anticipated to affect groundwater.	No additional mitigation	No potential for cumulative effects	No potential for cumulative effects
Aquatic Resources	Components of the Galore Creek Project have the potential to reduce productive capacity and thus have significant residual effects on aquatic resources. Approximately 30% of drainage area above tailings dam will be lost or altered during construction. At closure, additional habitat will be lost when diversion channel is redirected into tailings pond. Other effects on productivity relate to tailings effluent discharge degrading water quality in lower Galore Creek and small section of	Galore Creek valley and small portion of Scud River downstream of mouth of Galore Creek. Iskut River from site of filter plant effluent diffuser installation to More-Iskut confluence 6 kilometres downstream.	For tailings effluent - 20 years post-closure (2049). For filter plant effluent effects - until 2029 (i.e., 22 years from start of mine in 2007). For landslides - at 100 years post-closure, or 2129. Future temporal	Possible linkage to potential effects of the Galore Creek Project include: • mineral exploration activity • timber harvesting • proposed development of Schaft Creek mine. Past and Present: Mineral - Exploration at Galore Creek, Copper Canyon, Foremore, RDN, Schaft Creek properties; potential degradation of water quality leading to toxicity to biota. Effect of previous mineral exploration on aquatic resources is considered negligible.	No additional mitigation Throughout phases of Galore Creek mine, responsible Environmental Monitor will assess erosion control measures and environmental conditions to ensure mitigation of potential effects.	No residual cumulative effects are anticipated.	If forestry develops, Proponent considered highly improbable that significant cumulative effects would occur. If proposed Schaft Creek project proceeds, cumulative effects of access road, are assessed as not significant.

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
	Scud River below its confluence with Galore Creek. Discharge of filter plant effluent into Iskut River will cause some mortality and sublethal effects. Effects on surface or water quality are described above. Along access road corridor, reduced productivity may occur in event of a slope failure.		boundary is set at 2129, based on potentially longest-lasting effects (landslides).	Future: Mineral - Potential for Foremore, RDN and Schaft Creek (see below) to use Galore Creek mine access road; potential siltation, landslides and water quality effects from exploration. For mineral exploration at Foremore and RDN deposits cumulative effects are unknown and are dependent on further development of these deposits. Timber harvesting (Forestry) - Potential for increased siltation to water bodies along access corridor from increased traffic, new roads. No planned forestry activity in the foreseeable future. Forestry activities such as logging and road-building could result in increased localized erosion and increased potential for landslides. This could lead to cumulative effects in conjunction with potential siltation and landslides from Galore Creek Project, but extent would be limited to local area. Schaft Creek Mine - Potential overlap depending on access road for Schaft Creek; could increase siltation, landslides and erosion along Galore access road. Proposed Schaft Creek mine is in exploration phase but could potentially move forward into operations. If Schaft Creek project should be authorized to proceed following an environmental assessment, there is potential for cumulative effects on aquatic resources if Schaft Creek is accessed from More Creek section of Galore access road.			Future development of Foremore, Copper Canyon or RDN mineral properties could result in cumulative effects in relation to Galore Creek Project, but possibility of further exploration activity is unknown.
Fish and Fish Habitat	Road and tailings facility have potential to result in a residual effect on two valued ecosystem components: • Dolly Varden char, in streams within More Creek watershed (due to potential slope failures along mine access road, and destruction of food production habitat in one wetland in lower More Creek watershed) and within lower Galore Creek watershed (due to contamination of fish habitat from effluent in lower Galore Creek) • Bulltrout, in the lower Galore Creek watershed (due to contamination of fish habitat from effluent in lower Galore Creek). Residual effects on these valued ecosystem components are not predicted to be significant.	Mainstem rivers adjacent to the access corridor and individual stream crossings along the corridor.	For streams affected by major landslide - 2129, 100 years after mine closure. For effects from tailings effluent - 20 years post-closure (2049).	Past and Present: Mineral - Exploration at Galore Creek/Copper Canyon, Foremore and RDN properties; potential disturbance Future: Mineral - Exploration at Foremore, RDN, Galore Creek, and Schaft Creek properties; potential disturbance Timber Harvesting (Forestry) - Potential for increased siltation to water bodies along access corridor from increased traffic, landslides, new roads Potential for proposed Schaft Creek property to use Galore Creek access road.	Slope stabilization, settling ponds, sediment traps and landscaping along proposed road and within mine and tailings facility. Compensation activities: construction or improvement of wetland areas along proposed access corridor. At tailings facility, scheduled discharge of effluent during high flow periods, and ongoing monitoring of fish health	Residual cumulative effects could result if proposed Schaft Creek mine is developed and access corridor includes part of Galore Creek access corridor. Probability of these events occurring is unknown.	If forest harvesting is initiated along Galore access corridor, geographic extent would limit significance of cumulative effect. If access to proposed Schaft Creek project is linked to Galore Creek Project area, residual effects on fish and fish habitat would be low, and cumulative effect of both projects would be insignificant.

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
					and tissue quality downstream. Monitoring will assist ongoing assessment of mitigation and compensation measures.		
Terrestrial Ecosystem **Vegetation and Soils**	Residual effect on: • ecosystems in forested subzones • ecosystems in parkland subzones • ecosystems in alpine subzones. Residual effects are predicted to occur through permanent loss of terrestrial ecosystems in Galore Creek valley due to submergence of the pits and tailings area, and loss of terrestrial ecosystems in medium term as a result of construction and operation of access road. These residual effects were assessed as being significant. Potential for ecosystems to be degraded via introduction of invasive plant (separate out) species into previously undisturbed areas. These potential residual effects were assessed as not significant.	Galore Creek Project on ecosystem-based valued ecosystem components are local in extent, being limited to Project footprint and surrounding 1,000 metres buffer.	Final temporal boundary was established as 2229.	Past and Present: Mineral – Exploration at Galore Creek, Copper Canyon, Foremore and RDN properties; potential disturbance Recreation and Tourism – Limited recreational activity due to poor access Timber Harvesting (Forestry) – Limited access to merchantable timber, except in vicinity of Bob Quinn Future: Mineral - Potential for Foremore, RDN and/or Schaft Creek properties to use Galore Creek access road Recreation and Tourism - Access road may facilitate recreational activities including use of ATVs and snowmobiles; potential disturbance, especially in sensitive parkland areas; use of motorized vehicles may increase introduction of invasive plant species to area. Timber Harvesting (Forestry) – Access road may provide opportunity to harvest forests along More Creek (particularly in low elevation ICH); no commercial harvest zone in effect along Porcupine and Stikine rivers; use of motorized vehicles may increase introduction of invasive plant species to area. Schaft Mine – Access road options may cross the CEA study area; this could lead to increased disturbance, increased potential for introduction of invasive plant species, increased potential for human access.	Revegetation of exposed mineral soil, strict access control to limit human activities not associated with mine operations, measures to prevent or minimize the establishment of invasive plant species and reclamation activities following mine closure.	Potential for cumulative effects along the eastern portion of the access road. Future exploration activity at Copper Canyon property would likely combine with effects from Galore Creek mine area; the likelihood of further exploration activity is unknown. Combined effects would likely increase risks of invasive plant species being introduced to previously undisturbed areas; of elevated levels of ecosystem disturbance through increased traffic volumes and potential use of ATVs and snowmobiles, of direct loss of terrestrial ecosystems through potential timber harvesting along More Creek.	Combined effects could produce a future decline in the condition of valued ecosystem components at a regional scale. However, cumulative effects are limited in the scope of the impact. Overall cumulative effects of the Project are assessed as not significant.
Wildlife and Wildlife Habitat							
• **Grizzly Bear**	Possible residual effects on grizzly bear as a result of sensory disturbance of salmon-feeding behaviours during late summer/early fall in Porcupine River valley. Disturbance of salmon-feeding activities could potentially affect ability of bears to attain fat reserves required to ensure survival through winter hibernation,	Northern Coastal Study Area from the baseline studies	Future temporal boundary for grizzly bear was established as 2079, based on assumptions that mine activity will continue for 22 years (until 2029) and residual	Past and Present: Fishing - Commercial, recreational and First Nations fisheries occurring within and outside CEA grizzly bear study area: potential influence on salmon runs Guide Outfitting – CEA grizzly bear study area overlaps with two guiding territories: some direct mortality.	Design and management plan for wildlife will minimize potential for Project effects on grizzly bear population.	Potential effects of fishing activities on salmon runs identified as an action that could produce cumulative effects.	Cumulative residual effects on grizzly bears are unknown; the proposed mitigations for this Project only were assessed as not having adverse

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
	and could also affect reproductive success of females. Construction and operation of aerodrome in Porcupine River valley was identified as a source of sensory disturbance. Based on predicted range of the two grizzly bear sub-groups identified in study area (coastal and interior), residual effects would be restricted to local coastal population of grizzly bear in study area. Significance of potential effects on local coastal population of grizzly bear was assessed as uncertain.		effects may be apparent for approximately 50 years after that time.	Resident and First Nations Harvest – Hunting for subsistence and recreational purposes: some direct mortality. Mineral and Energy Resource Exploration – Exploration at Galore Creek and Copper Canyon: potential disturbance. Past: Recreation and Tourism – Uncertain, but likely no effect. Present: Recreation and Tourism – Boat, kayak and canoe tours for small groups down Stikine River; occasional groups ski touring over Andrei Glacier: potential for disturbance Future: Fishing - Commercial, recreational and First Nations fisheries occurring within and outside CEA grizzly bear study area: potential influence on salmon runs Guide Outfitting – CEA grizzly bear study area overlaps with two guiding areas: some direct mortality Resident and First Nations Harvest – Hunting in project area may increase as a result of improved access: some direct mortality Mineral and Energy Resource Exploration – Possibility of exploration in areas where mineral claims are held, including Copper Canyon: potential disturbance Recreation and Tourism – Potential increase in recreation and tourism activities along Stikine River: potential for disturbance Timber Harvesting (Forestry) – Tahltan Operating Area overlaps with CEA grizzly bear study area: potential loss of forest habitat adjacent to spawning streams affecting salmon runs		Probability of occurrence and magnitude of these potential effects are unknown, so potential for residual cumulative effects is also unknown. Project contribution to cumulative effects is likely to be of lower magnitude than effects of any decline in salmon stocks, should that occur.	effects.
• **Mountain Goat**	Residual effect on mountain goats as a result of sensory disturbance of feeding and natal habitats, potentially resulting in range shifts leading to indirect mortality and a reduction in reproductive success. Sources of these effects were identified as construction and mining operations in Galore Creek valley, and construction and operation of the access road, including active avalanche control measures.	Primarily northern access route study area, delineated on basis of topographic boundaries (e.g., glaciers and low elevation valleys) that could limit the movement of goats between landscape units, therefore providing ecologically meaningful	Future temporal boundary – 2079 (five decades post-closure).	Past and Present: Guide Outfitting – Active guiding in study area: some direct mortality. Currently CEA study area overlaps with three guiding areas. Resident and First Nations Harvest – Hunting for subsistence and recreational purposes. Hunting in Galore Creek area is currently low due to difficult access Mineral – Exploration at Galore Creek, Copper Canyon,	Project design and management plan for wildlife	Potential combined effects of mineral exploration, proposed Schaft Creek mine and the Project in eastern half of study area. Could lead to greater area of mountain goat habitat being disturbed, potentially resulting in	Cumulative residual effects on mountain goat are unknown; the proposed mitigations for this Project were assessed as not having adverse impacts. There is uncertainty as to cumulative effects

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
	With exception of disturbance in Galore Creek valley from continuous industrial noise sources (non-significant), potential effects on mountain goats assessed as uncertain.	borders for goat populations.		Foremore and RDN properties: potential disturbance Recreation and Tourism – Past unknown, but possible that heliskiing tenure area overlapped with study area; occasional groups ski touring over Andrei Glacier: potential disturbance. Current Heliskiing tenure area overlaps with study area; occasional groups ski touring over Andrei Glacier: potential disturbance. Eskay Creek Mine – A section of Eskay Creek Mine access road passes through the study area: may have disturbed mountain goat in past and continue to disturb. Future: Guide Outfitting – Active guiding in study area; may be facilitated by improved access, leading to increased mortality Resident and First Nations Harvest – Hunting in Galore Creek area may increase as a result of improved access Mineral – Possibility of exploration in areas where mineral claims are held, including at Copper Canyon, RDN and Foremore properties: potential disturbance Recreation and Tourism – Heliskiing tenure area overlaps with study area. Galore Creek Project access road may facilitate recreational activities including use of snow-mobiles: potential disturbance Eskay Creek Mine – Eskay Creek Mine access road is likely to remain operational until completion of decommissioning: potential future disturbance Forrest Kerr Hydroelectric Project – Access is via Eskay Creek Mine road: this road may therefore remain open leading to continued disturbance along road Schaft Creek Mine – Access road options may cross study area; potential for increased disturbance, increased risk of direct mortality, increased human presence in area.		long-term abandonment of habitats, indirect mortality and reductions in reproductive productivity. Future exploration activity at Copper Canyon property would likely combine with effects from Galore Creek mine site, including those from helicopter access to property. Likelihood of further exploration activity is unknown.	and sustainability over the long-term.
Archaeological and Heritage Resources	One archaeological site (helicopter crash site) is expected to be directly affected by the Galore Creek Project; indirect adverse effects on three other sites are possible during operations. Possible that unrecorded sites outside assessed development footprint could be	Stikine drainage system, with particular reference to northern portions known to have been used most intensively by Tahltan. Represented by portion		Use of Galore Creek Project access road for other industries and associated developments, such as forestry, increases potential for disturbance of known sites along road. Mineral exploration throughout Galore-More valleys will be primary source of potential additional disturbance to	Project redesign has served to avoid all but one of the recorded sites in the Galore Creek Project area.	None expected. Note that Galore Creek site represents less than 0.25% of the total Stikine region archaeological site database in	Residual adverse effects on heritage resources of Galore Creek Project in combination with other projects is considered not

Valued Ecosystem Components	Project Residual Effects	Spatial Boundaries	Temporal Boundaries	Effects of Other Human Activities/Projects	Proposed Mitigation	Residual Cumulative Effects	Assessment of Significance
	affected directly or indirectly by activities such as road maintenance.	of Stikine drainage system above confluence of Stikine and Iskut rivers that includes upper reaches of Stikine and Iskut tributaries and Klappan River.		archaeological resources. Possibility of increased eco-tourism activities in area could represent another source of disturbance to archaeological sites.		the CEA area.	significant.

Based on predictions of project residual adverse effects on water quality, the Proponent chose to restrict the geographical scope of the CEA to:

- Galore Creek and a confined section of the Scud River downstream of its confluence with Galore Creek; and,
- an interval of the Iskut River extending from the location of the diffuser to its confluence with More Creek.

The Proponent expected effects on water quality to be confined to these areas because beyond these areas effluent would be diluted such that there should be no measurable effects on water quality and aquatic receptors. There are no wetlands or lakes adjacent to the affected areas that could be affected.

The analysis in the Application used a future temporal boundary of 20 years post-closure, or 2049, for effects from tailings effluent, and the operations phase (until 2029) for effects from the filter plant effluent.

Effects from tailings effluent discharge into Galore Creek will probably be highest during operations. The Proponent assumed that discharge concentrations of contaminants of concern post-closure will not increase, based on adaptive management and monitoring that will continue through operations and beyond closure to protect water quality. Because no additional tailings will be deposited in the tailings facility after closure, tailings pond water quality is expected to gradually improve over time.

Filter plant effluent will only be discharged into the Iskut River during operations, while concentrate is produced.

Other human actions that were identified by the Proponent as potentially contributing to cumulative effects on surface water are mineral exploration and forestry activity.

<u>Mineral Exploration</u>
Mineral exploration has been undertaken periodically within the CEA area since 1964 (the past temporal boundary). In the Galore Creek Watershed, exploration has been carried out at Galore Creek and Copper Canyon within the last five years. Disturbances to water quality due to mineral exploration in the Galore Creek valley may have resulted from siltation from road runoff and discharge of adit drainage with high metal levels into the West Fork of upper Galore Creek. Impacts to water quality likely would have been localized when considering the naturally high Total Suspended Solids and metals in waters in Galore Creek. Therefore, the effect of previous mineral exploration on water quality is considered negligible. Future mineral exploration at the Copper Canyon property has the potential to link with water quality effects from the Project. The Proponent believes that any water quality effects related to trail-cutting, drill pad installation or drilling would, however, be minimal and that the potential for cumulative effects is negligible.

The analysis in the Application determined that there are no linkages between the Project and the following other projects within the Galore CEA assessment boundary:

- drainage from the Eskay Creek, Granduc, Golden Bear, Silver Coin and Silver Butte mines does not flow into any of the Project water bodies;
- the Stikine River is a receiving water body for the proposed Schaft Creek and Mount Klappan mines but since no measurable water quality effects from the Project are anticipated to reach the Stikine River, there is no meaningful overlap;

- effects to water quality in the Iskut River from filter plant effluent discharge do not extend downstream to the Forrest Kerr hydroelectric project or Eskay Creek road; and,
- residual effects from the proposed Red Chris mine do not extend to the Iskut or Stikine rivers, as discussed further below.

The Application further noted that Johnny Mountain and Snip are both closed mines that drain into the lower portion of the Iskut River Watershed, and there is no spatial link between these projects and the cumulative effects assessment boundaries for water quality.
The Red Chris mine project is situated in the Upper Iskut watershed and will discharge effluent into two separate receiving areas. The Application stated that there are no predicted effects to water quality in either the Stikine or Iskut rivers from the Red Chris mine project.

The Tahltan Nation Development Corporation holds the licence to log within the Tahltan Operating Area, which overlaps with the cumulative effects assessment boundary. Commercial forestry activities in the past have been largely restricted to the Bob Quinn area, and no harvesting has occurred in recent years. There is no planned forestry activity in the foreseeable future that could overlap the spatial boundary for surface water quality. However, the development of the access road along lower More Creek could increase access to western hemlock and hybrid spruce, both of which are species that can be harvested commercially.

Forestry activities such as logging and road-building could result in increased localized erosion and associated siltation. The Application indicates that any change related to forestry or increased traffic along the access road would not be expected to greatly modify total suspended solids levels in the Iskut River beyond its natural range of variability, noting that the maximum baseline level of total suspended solids in the affected receiving environment of the Iskut River exceeds 400 mg/L. The Application indicates that the spatial boundary of the cumulative effects assessment area is so localized (100 metres for most of the year) that the extent of the area is not considered significant and concludes the potential for cumulative effects is therefore negligible.

An Environmental Effects Monitoring Program will be implemented during operations to monitor water quality (and other components) in the regional project area. This includes the areas where project effects on water quality have been predicted. The goal of the Environmental Effects Monitoring Program is to ensure water quality is not degraded and to implement adaptive management measures, if necessary.

The Proponent concluded that there are no cumulative effects to assess with regard to surface water.

Groundwater
Predicted residual effects of the Project on groundwater are related to potential for contaminants from metal leaching/acid rock drainage, concentrate slurry and other fluids (including oils, solvents and fuels) to enter the Galore Creek valley groundwater aquifers. The least predictable and potentially most important residual effect is possible mobilization of metals from submerged waste, potentially acid generating rocks and tailings solids pore water components of the tailings in the impoundment.

The Proponent assessed the residual effects as not significant, with appropriate mitigation measures in place.

The Application states that there are no current plans for additional industrial development in or near the Galore Creek valley groundwater assessment area. Mineral exploration has taken place at the Galore Creek and Copper Canyon properties, and further exploration may be conducted in the future. Exploration activity, however, is not anticipated to affect groundwater.

The Proponent concluded that there is no potential for cumulative effects with respect to groundwater.

Aquatic Resources
The aquatic resources of the regional streams and rivers include benthic macroinvertebrates (benthos) and periphyton, although the latter are sparsely distributed. Total benthos abundance and taxon richness are fairly low throughout the region. This low productivity reflects the nature of the flashy stream habitat, which experiences widely fluctuating flows (related to freshet and rainfall events) and heavy sediment scour, and is characterized by low nutrient and high metal concentrations and sparse streambed sediment substrates for colonization.

Local lakes and wetlands along the access road support a diverse range of aquatic communities, including benthic invertebrates, zooplankton, phytoplankton and periphyton. Total abundance and richness of biological communities are variable and relate to altitude, nutrient and organic loadings and physical habitat variables within each water body.

The Proponent determined that some components of the Project have potential to reduce productive capacity of streams and rivers and thus have significant residual effects on aquatic resources.

Reduced productive capacity was linked to mortality, habitat loss and alteration within Galore Creek valley as a result of construction of open pits, storage facilities and ancillary structures. Other effects on productivity relate to tailings effluent discharge degrading the water quality in lower Galore Creek and a small section of the Scud River below its confluence with Galore Creek. This could lead to mortality and sublethal effects on local aquatic life. None of the above impacts are predicted to extend into the lower Scud River or Stikine River because of the supply of organic matter in the upper Scud watershed and increased water volumes in these larger rivers.

Filter plant effluent discharge into the Iskut River will cause some mortality and sublethal effects. Predicted effects on water quality range from a localized area (less than 100 metres) of the Iskut River downstream of the diffuser during annual average flow to a maximum of 6 kilometres further downstream to the Iskut-More confluence, during low flow periods (mainly related to predicted total copper concentrations). The Proponent predicts that no measurable effects will extend beyond this confluence because of increased water volume from More Creek.

The Application indicates that reduced productivity may occur in the event of. Large quantities of debris would block or alter water flow and levels, cause direct mortality to biota and degrade water quality through siltation. Downstream aquatic communities along the access road could be severely affected in the localized area of disturbance. However, effects are not predicted to extend to the Stikine or Iskut rivers, based on volume of water from the large rivers within regional waterways and the naturally high total suspended solids levels to which local aquatic species are already accustomed.

The Proponent concluded that project effects from a slope failure along the access road corridor would not be significant.

Within each watershed where effects were identified, the spatial boundary for cumulative effects assessment focused on the mainstem of each water body and included tributaries crossed by the access road and lakes or wetlands downslope of the road. This included: Galore Creek valley and a small portion of the Scud River downstream from the mouth of Galore Creek; watersheds of the access road, including Porcupine River, Scotsimpson, Sphaler and More creeks: and, the Iskut River from the site of the filter plant effluent diffuser installation to the More-Iskut confluence 6 kilometres downstream.

For estimating potential effects in the future, the Proponent used:

- 20 years from closure, or 2049, for tailings effluent effects;
- 22 years from the start of the mine in 2007, or 2029, for filter plant effluent; and,
- 100 years, or 2129, for landslides.

For establishing these boundaries, the Proponent considered the rate of recovery of aquatic communities in the Project area. Effects related to tailings effluent discharge into Galore Creek likely will be highest during operations and should decrease in magnitude and extent as the aquatic species adapt to the altered environment. This assumes that discharge concentrations of contaminants of concern during post-closure will not increase, based on adaptive management and monitoring that will continue through operations and beyond closure to protect water quality. Because no additional tailings will be deposited in the tailings facility after closure, tailings pond water quality is expected to gradually improve over time. Natural silt deposition from upstream glacial till will gradually cover the tailings, reducing contaminant transfer to the water column. Some metal leaching from waste rock is predicted to continue, but acid rock drainage should be controlled by the sub-aqueous submergence of high-risk acid rock drainage waste rock and tailings. Water quality modeling predicts that water quality in the tailings facility will improve to levels approaching baseline conditions within 10 years.

Filter plant effluent will only be discharged into the Iskut River during operations, when concentrate is being produced.

Habitat alteration related to landslides along the access road may cause effects that last for decades, depending on the severity of the landslide.

The Proponent indicated that future human actions with possible linkage to potential effects of the Project include:

- mineral exploration activity;
- timber harvesting; and,
- proposed development of the Schaft Creek mine.

Increased mineral exploration activity within the cumulative effects assessment boundary could combine with effects from the Project, although the likelihood of future development was unknown at the time of the Proponent assessment. No appreciable change in productive capacity is predicted based on the potential cumulative effects linked to forestry or to the proposed Schaft Creek project.

The Eskay Creek mine road runs parallel to the Iskut River and crosses the Ningunsaw River and several small tributary streams. Therefore, siltation and erosion associated with this road could temporarily affect water quality within the Iskut River. However, the Application indicates that the Project cumulative effects assessment spatial boundary does not approach or overlap this section of the Iskut River, so there is no linkage between the two projects.

Johnny Mountain and Snip are both closed mines within the lower portion of the Iskut River Watershed. No residual effects on the Iskut River were related to these mines, and the spatial boundary of the Project does not overlap with this area of the Iskut River. Therefore, no linkage was identified between these two closed mines and the Project.

Red Chris mine is situated in the Upper Iskut watershed and will discharge effluent into two separate receiving areas. The Application notes that there were are no predicted effects to either the Stikine or Iskut rivers water quality from the Red Chris mine project.

Both the Foremore and RDN deposits are in the early phases of exploration, and both are situated close to the proposed Galore Creek access road. Future development of these properties could involve the shared use of the eastern half of the access road, which would increase traffic, leading to potential increases in siltation and erosion, water quality degradation and effects on local populations of aquatic life. Should either Foremore or RDN proceed to operations, numerous potential mine-related effects could occur, although the magnitude of these effects is unknown at this early stage. Potential cumulative effects could include water quality issues relating to construction, effluent discharge, erosion and spills along the access road. Degraded water quality could then affect local aquatic communities downstream of mining activities. The Proponent's proposed management and mitigation measures would be essential in protecting the local aquatic environment. The Application notes that there is a potential linkage between mineral exploration at Foremore and RDN deposits and the Project, but cumulative effects are unknown and dependent on further development of these deposits. It should be noted that these and any other future mining projects would almost certainly require their own environmental assessment processes which will provide another opportunity to assess cumulative impacts.

The proposed Schaft Creek mine is in the exploration phase but could potentially move forward into operations should it proceed successfully through the environmental assessment and permitting processes. No spatial overlap between the Schaft and Galore Creek projects is identified in terms of potentially affected water bodies (i.e., effluent and other discharges or downstream aquatic effects to biota). However, if the Schaft Creek project should be authorized to move forward, there is potential for cumulative effects on aquatic resources if the More Creek section of the Galore access road is used to access Schaft Creek. The two projects could jointly contribute to siltation resulting from increased traffic creating dust and accelerating compaction and erosion along the potentially shared road. The Proponent believes any effects would be localized and temporary. However, road monitoring and maintenance would be implemented to mitigate any increased turbidity to local water bodies. Potential for cumulative effects on aquatic resources as a result of the proposed Schaft Creek mine is therefore expected to be negligible.

Forestry activities such as logging and road-building could result in increased localized erosion and increased potential for landslides. This could lead to cumulative effects in conjunction with potential siltation and landslides from the Project, but the extent would be limited to the local area.

Based on the above, the Proponent concluded that no significant adverse cumulative effects on aquatic resources are anticipated.

Fish and Fish Habitat

The Proponent identified that the access road and tailings facility have the potential to result in a residual effect on the following two valued ecosystem components in the Project area:

- Dolly Varden char in streams within the More Creek watershed (due to potential slope failures along the mine access road, and destruction of food production habitat in one wetland in the lower More Creek watershed) and within the lower Galore Creek watershed (due to contamination of fish habitat from effluent in lower Galore Creek); and,
- Bull trout in the lower Galore Creek watershed (due to contamination of fish habitat from effluent in lower Galore Creek).

Dolly Varden in the Project area currently exist in near-pristine habitats in the More Creek watershed (the most likely place where road-related slope failures and sedimentation could occur). Populations have adapted to the naturally high sediment load and cold temperatures that are prevalent in the lower watershed. In the Iskut watershed, Dolly Varden is distributed throughout larger rivers and the clear streams and wetlands east of the Iskut River. Because this area has a much lower gradient than the More Creek watershed, no effects on fish habitat are predicted from road construction.

Historical construction of an access road up the Scud River to Galore Creek in the 1960s altered fish habitat in some areas; however, much of this habitat has since been reclaimed by the river. Several salmonid species, including Dolly Varden, bull trout and others, currently spawn near former roadbeds in the lower Scud River, and old timbers from bridges provide rearing habitat at some old stream crossings. Fish are similarly adapted to the naturally high sediment and metal concentrations in the Scud River and Galore Creek.

Bull trout are currently found at low densities in a number of watersheds throughout the Galore Creek project area. Genetic analysis in 2004 and 2005 identified only two pure bull trout out of 156 tested: one in the lower Scud River, and one in the upper Iskut River. Despite these findings, it is possible that bull trout exist in or near Galore Creek in low numbers. Little is known about the existing condition of bull trout populations in the region, largely because morphological identification has proven to be ambiguous, and little genetic identification has been made

The cumulative residual effects on these valued ecosystem components are not predicted to be significant because of the limited geographic extent and low magnitude of the effects.

Fisheries valued ecosystem components have the potential to be influenced by the following activities:

- mineral and resource exploration;
- timber harvesting; and,
- proposed development of the Schaft Creek mine.

For assessment of residual cumulative effects along the access corridor, the spatial boundary was considered to be the mainstem rivers adjacent to the access corridor and the individual stream crossings along the corridor. The most likely locations for slope failures along the access corridor are in the More and Sphaler watersheds. In the event of a slope failure, individual small watersheds will be severely affected along with a particular section of the related mainstem watershed. No residual effects are likely on the Iskut and Porcupine rivers downstream because of their distance from the high-risk areas and their natural turbidity, which makes their resident fish less susceptible to increased sediment loads. Effects on Dolly Varden and bull trout in Galore Creek and the Scud River are limited to the lower reach of Galore Creek. No significant effects on fish or fish habitat are predicted for the Scud River.

For temporal limits of potential effects, the Proponent proposed:

- For streams affected by major landslide – 100 years after mine closure.
- For effects of tailing effluent – 20 years from closure or 2049.

Recovery of fish populations from slope failures could take from 3 years to more than 100 years, depending on the severity of the event. Sediment and debris deposition from such events may actually create habitat and promote the recovery of productivity within affected watersheds. Because steep slopes along the access road will be recontoured following mine decommissioning, it can be assumed that the risk of slope failure will significantly decrease following closure.

The residual impact of Project road-building activities on More Creek and its tributaries t was classified by the Proponent as negligible owing to the low magnitude and local scale of the potential effects. Other projects in the watershed (exploration at Foremore, Schaft Creek and RDN) could contribute similar low impacts in terms of type and magnitude, and would therefore have insignificant additive effects. Similarly, exploration in Copper Canyon is expected to have a very low magnitude impact on Galore Creek and downstream areas in comparison to the Project area. Thus, no measurable change in fish habitat is expected from these activities.

The Schaft Creek property lies north of the Project access road in the Mess Creek drainage. Effects of exploration activities at this property are probably similar to those at other projects in the area. Streams that would be affected in terms of water quality or fish habitat are in the Mess and Stikine drainages outside the Project area. Interest has been expressed in the possible use of the Galore access road as a means of accessing the Schaft Creek property. Increased traffic on the road could increase the potential for sedimentation and slope failure and subsequent risk to resident fish species. This situation would therefore present potential for cumulative effects.

The Proponent concluded that no residual effect on fish or fish habitat from past or current activities were linked to the Project, and only two future activities were identified as having potential to add to effects of the Project. In the event that forest harvesting is initiated along the Galore access corridor, then the limited geographic extent of possible activities would limit significance of the cumulative effect on More Creek and its tributaries. Should access to the proposed Schaft Creek project become linked to the Project area, the residual effects on fish and fish habitat would likely be low, and the cumulative effect of both projects would be insignificant.

Terrestrial Ecosystems, Vegetation and Soils

The Proponent determined that the Project would have a residual effect on the following ecosystem-based valued ecosystem components:

- ecosystems in forested subzones;
- ecosystems in parkland subzones; and,

- ecosystems in alpine subzones.

Residual effects are predicted to occur due to the permanent loss of terrestrial ecosystems in the Galore Creek valley due to the submergence of the pits and tailings area, and the loss of terrestrial ecosystems in the medium term as a result of the construction and operation of the access road. There is also potential for ecosystems to be degraded via the introduction of invasive plant species into previously undisturbed areas.

The level of disturbance associated with the Project was considered by the Proponent to be of high magnitude due to the complete change in ecosystem condition expected (i.e., existing ecosystems will be completely altered/lost for the duration of mine activities); however, these changes would occur at a local scale. While this results in significant effects within the local assessment boundary, the types of ecosystems to be disturbed have been documented throughout the Project area and are not limited to areas of direct disturbance. On a regional scale, therefore, anticipated ecosystem disturbance is considered less significant.

The effects of the Project on terrestrial valued ecosystem components are local in their extent, being limited to the Project footprint and a surrounding 1,000 metre buffer. Ecosystems will be disturbed primarily during construction, with day-to-day operational and maintenance activities having minor additional effects. Refer to section 2.10 of Part B of this Report for details on the evaluation of significance.

The temporal boundary was established as 2229. This was based upon the assumptions that mine operations will continue for the anticipated 22 years (until 2029) and that residual effects may be apparent for approximately 200 years following decommissioning and reclamation activities.

The following activities were identified as having the potential to influence valued ecosystem components associated with the access road:

- mineral exploration;
- recreation and tourism;
- forestry (timber); and,
- the proposed Schaft Creek mine.

Exploration activity has been undertaken at the Galore Creek, Copper Canyon, Foremore and RDN properties within the last five years. Disturbances to valued ecosystem components by exploration work in Galore Creek valley specifically has included clearing of vegetation for a small access road (now overgrown with deciduous plant species) and various drill-pad locations. Clearing of vegetation for drill-pads and trails would also be likely forms of disturbance associated with other exploration properties. Such disturbances are, however, likely local in extent and low in magnitude. Therefore, influence of exploration activity on the condition of ecosystem-based valued ecosystem components is considered negligible.

There are three recently active exploration targets within the cumulative effects assessment study area for ecosystem valued ecosystem components: Copper Canyon, Foremore and RDN properties. If exploration at these properties continues beyond 2006, then resultant disturbance, particularly from drillpad building and trail-clearing, may combine with disturbance expected from the Project during construction and operation phases.

The Copper Canyon property is located immediately next to the Project; Copper Canyon is an off-shoot of the Project East Fork. Further exploration work at this property has potential to disturb vegetated areas in addition to those disturbed by the Project. The Proponent indicates that the size of patches cleared would be marginal, especially when compared to vegetation-clearing activities that will be conducted in Galore Creek valley proper, and effects would occur at a local scale. The cumulative effects are therefore predicted to be negligible.

Both the Foremore and RDN properties are in the vicinity of the Project access road. Vegetation clearing in the area would be restricted to trail-cutting and drillpad building, which would have minimal levels of disturbance compared to clearing activities associated with building of the Project access road.

Both properties are in early stages of exploration; however, the Project access road could be seen as an attractive means of accessing these properties in the future. Should this occur, then disturbance along relevant parts of the road would continue beyond the life of the Project. In addition, potential for introduction of invasive plant species could increase with higher traffic volumes. As such, there would be considerable potential for cumulative effects.

The Schaft Creek property lies north of the Project access road, up the Mess Creek drainage. Effects of exploration activities at this property are probably similar to those at other projects in the area, with some vegetation clearing for trails and drill-pads. As indicated previously, there is potential for access to the proposed Schaft Creek mine to overlap with the cumulative effects assessment study area. If this were the case, then anticipated levels of ecosystem disturbance could increase, including introduction of invasive plant species.

Recreational activities and tourism have been largely restricted in the area because of poor access. As such they have had negligible influence on the existing condition of valued ecosystem components.

Development of the Project has potential to facilitate human access to the area for recreational activities, including use of all-terrain vehicles and snowmobiles. Any increase in human presence could increase the level of ecosystem disturbance, particularly in sensitive parkland areas. Strict access control will greatly reduce the risk of disturbance. Access for Tahltan cultural and traditional uses are subject to an agreement between the Proponent and Tahltan Nation.

The potential use of all-terrain vehicles and snowmobiles in the area also increases potential to introduce invasive plant species to the area, as propagules can easily become lodged in tires, tracks and frames of vehicles. This, coupled with the anticipated levels of disturbance associated with construction and maintenance activities, provides an opportunity for invasive plant species to become established. The potential for cumulative effects on valued ecosystem components as a consequence of recreation and tourism is therefore anticipated to be considerable if access is not rigorously controlled. Any vehicles using the access road that are not associated with the mine should be subject to the same management/mitigation measures that have been proposed for the Project.

The Tahltan Nation Development Corporation holds the licence to log within the Ministry of Forests and Range Tahltan Operating Area, which overlaps with the cumulative effects assessment boundary. Commercial forestry activities have been largely restricted to the Bob Quinn area, and no new harvesting has occurred in recent years. No harvesting has been done further to the west either, likely due to poor access. The influence of timber harvesting on the existing condition of ecosystem-based valued ecosystem components is therefore considered negligible.

The Project access road may open up harvesting opportunities along More Creek. Forest harvesting along More Creek could also increase potential to introduce invasive species to the area from increased vehicular traffic along the access road (logging trucks and smaller vehicles transporting falling crews). Vehicles using the access road that are not associated with the mine should be subject to the same inspection and invasive plant management/mitigation measures that have been proposed for the Project. The potential for cumulative effects in the More Creek area is assessed as considerable.

The westernmost end of the access road in the vicinity of Porcupine River and areas extending along the Stikine River has been designated a no-commercial-harvest zone in the Cassiar-Iskut-Stikine-Land and Resource Management Plan. It is unknown if the no-harvesting designation will change in the future; however, while this designation is in place, harvesting at the westernmost end of the access road is unlikely. The potential for cumulative effects in this area is therefore anticipated to be negligible.

Mitigation measures primarily involve the timely revegetation of exposed mineral soil, strict access control to limit human activities not associated with mine operations, measures to prevent or minimize the establishment of invasive plant species and reclamation activities following mine closure. A monitoring program has also been suggested for early identification of potential invasive plant problems.

The potential effects of mineral exploration, recreation and tourism, forestry and the proposed Schaft Creek mine may combine with the effects of the Project, with the greatest likelihood of cumulative effects occurring along the access road in the eastern portion of the cumulative effects assessment study area. Any future exploration activity at the Copper Canyon property would also likely combine with effects from the Galore Creek mine area; however, the likelihood of further exploration activity is unknown at this time.

The combined effects would likely increase the risks of invasive plant species being introduced to previously undisturbed areas; of elevated levels of ecosystem disturbance through increased traffic volumes and the potential use of all-terrain vehicles and snowmobiles, of direct loss of terrestrial ecosystems through potential timber harvesting along More Creek.

The condition of valued ecosystem components may decline in the immediate vicinity of direct disturbance areas as a result of the cumulative effects from human actions, particularly from the potential introduction of invasive plants. Similarly, ecosystem recovery may be delayed if the eastern portion of the proposed Galore Creek access road is kept open beyond the lifetime of the Project to facilitate access to other developments and exploration properties. Cumulative effects are unlikely to occur in areas further to the west, from the beginning of Sphaler Creek to the Galore Creek valley.

The Proponent concluded that there is potential for cumulative effects along the eastern portion of the Project access road but the overall cumulative effects of the Project are not significant.

Wildlife and Wildlife Habitat

Grizzly Bear

Grizzly bear are listed as a species of Special Concern by COSEWIC and are blue-listed in B.C. Baseline studies indicate that there is a healthy grizzly bear population in the cumulative effects assessment grizzly bear study area.

The Proponent effects assessment determined that the Project could have residual effects on grizzly bear as a result of sensory disturbance of salmon-feeding habitats and behaviours during late summer/early fall in the Porcupine River valley. Disturbance of salmon-feeding activities could potentially affect the ability of bears to attain fat reserves required to ensure survival through winter hibernation, and could also affect reproductive success of females. Construction and operation of the aerodrome in the Porcupine River valley was identified as a source of sensory disturbance. Based on the predicted range of the two grizzly bear sub-groups identified in the study area (coastal and interior), residual effects would be restricted to the local coastal population of grizzly bear in the study area. Predicting the magnitude of grizzly bear responses to disturbance in Porcupine River valley is difficult. Consequences of effects on over-wintering survival and reproductive success for the local coastal population are also unknown. The significance of potential effects on the local coastal population of grizzly bear was therefore concluded by the Proponent to be uncertain. Refer to section 2.11 of Part B of this Report for details on the evaluation of significance.

The Proponent indicated that it is unknown how quickly the grizzly bear population could recover from disturbance in the Porcupine River valley; recovery would depend on magnitude of the effects at the population level. Using the precautionary principle it is assumed that the potential effects of disturbance could continue over the long term (30 to 100 years). The future temporal boundary for the grizzly bear cumulative effects assessment was therefore established as 2079. This is based on the assumptions that mine activity will continue for the anticipated 22 years (until 2029) and that residual effects may be apparent for approximately 50 years after that time.

The following human actions were identified as having the potential to influence the grizzly bear population for the cumulative effects assessment:

- fishing;
- guide-outfitting non-resident harvest;
- resident and First Nations harvest;
- mineral exploration;
- recreation and tourism; and,
- forestry.

The Proponent believes that cumulative effects as a result of fishing activities were they to occur could be expected to adversely affect the grizzly bear population in the CEA grizzly bear study area. However, given that the probability of occurrence and magnitude of potential cumulative effects identified are unknown, the magnitude of change in condition cannot be determined.

Cumulative effects on grizzly bears are unknown but impacts from the Project are not considered to be significant. The Project contribution to any cumulative effects would likely be of lower magnitude than effects of any decline in salmon stocks.

Mountain Goat

Mountain goats in B.C. are provincially listed as Apparently Secure; species in this category are uncommon but not rare, are usually widespread in the province, but are a possible cause for long-term concern. Baseline studies undertaken by the Proponent indicated that the population in the CEA mountain goat study area is healthy and in favourable condition, and is therefore not approaching a threshold for concern.

The Proponent's effects assessment determined that the Project would have a residual effect on mountain goats as a result of sensory disturbance of feeding and natal habitats, potentially resulting in range shifts leading to indirect mortality and a reduction in reproductive success. The sources of these effects were identified as construction and mining operations in the Galore Creek valley, and construction and operation of the access road, including active avalanche control measures. The level of disturbance is anticipated to be greater within the Galore Creek valley than along the access road.

The Proponent noted that predicting the magnitude of goat responses to disturbance is, however, extremely difficult, and the population level effects of disturbance on survivorship and fecundity are not well understood. Therefore, with the exception of disturbance in the Galore Creek valley from continuous industrial noise sources (non-significant), potential effects on mountain goats were assessed as uncertain. Refer to section 2.11 of this Report for details on the evaluation of the significance of these effects..

The following human actions were identified as having the potential to influence the mountain goat population:

- guide outfitting;
- resident and First Nations harvest;
- mineral exploration, including at the Copper Canyon, Foremore and RDN properties;
- recreation and tourism;
- Eskay Creek mine;
- the proposed Forrest Kerr hydroelectric project; and,
- the proposed Schaft Creek mine.

The condition of the mountain goat population is anticipated to decline in localized areas as a result of the cumulative effects of human actions. Given the lack of available data to make a quantitative assessment, however, the magnitude of potential cumulative effects is uncertain, and the prediction of how a particular population will respond to the presence of human actions is difficult. Taking into account the wide availability of highly suitable habitat with good connectivity within the study area, however, cumulative effects are unlikely to appreciably affect the overall population levels.

Archaeological and Heritage Resources

One archaeological site (helicopter crash site) may be directly affected by the Project, although indirect adverse effects on three other sites are possible during operations. Unrecorded sites outside of the assessed development footprint could be affected directly or indirectly by activities such as road maintenance.

In terms of heritage resources, the Stikine region is a distinctive cultural area. Other projects used in this analysis relate to this specific region, defined as the Stikine drainage system, with particular reference to the northern portions known to have been used most intensively by the Tahltan. This is represented by the portion of the Stikine drainage system above the confluence of the Stikine and Iskut rivers that includes the upper reaches of the Stikine and Iskut tributaries and the Klappan River. The projects selected for this archaeological cumulative effects assessment are those within the identified CEA study area for which archaeological study results are available.

Use of the Project access road for other industries and associated developments, such as forestry, increases potential for disturbance of known sites along the road and other sites that have not been identified as yet but may be present in the region. Resource use activities such as hunting, trapping and fishing may increase within the general area as a result of access improvements, representing a source of potential additional disturbance to archaeological resources, both known and unknown.

Exploration throughout the Galore-More valleys will be the primary source of potential additional disturbance to archaeological resources. This large region has not been thoroughly examined for archaeological resources, and additional sites are likely present; however, all 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. Therefore, although some potential effects are predicted, they are anticipated to be minor. The potential for significant cumulative effects is therefore negligible.

The possibility of increased eco-tourism activities in the area could represent another source of disturbance to archaeological sites. The simple process of groups of people walking over the sites could disturb features or artefact locations, and some people may be inclined to take and keep artefacts. However, eco-tourism is unlikely to become a substantial activity in this area and so is not considered to have a significant potential effect on heritage resources in the region. The potential for significant cumulative effects is therefore negligible.

The total number of sites in the cumulative effects assessment archaeology area is listed below:

- total number of sites recorded by these projects: 96;
- total Stikine region site assemblage (estimate): 411;
- total number of sites potentially affected by all projects: 66 (16% of total known assemblage); and,
- total number of sites to be affected by the Project: 1 (0.25% of total known assemblage).

The Proponent indicates that project redesign has served to avoid all but one of the recorded sites in the Project area. This represents less than 0.25% of the total Stikine region archaeological site database the cumulative effects assessment area. The Proponent concludes that the residual adverse environmental effects on heritage resources from the Project, in combination with other projects, are considered not significant.

3.4.4 Issues Raised and Proponent Responses

During the Application review, the following key issues were raised by the public and government agencies regarding potential cumulative environmental effects of the Project:

- suggested the Copper Canyon deposit should be included in the environmental assessment;
- questioned the level of significance attached to archaeological resources that were identified;
- noted potential effects on mountain goats are deemed to be significant;

- requested cumulative effects on interior grizzly population be assessed;
- should consider the effects of spin-off development fostered by the Project and access road;
- cumulative effects of numerous mine proposals and mineral exploration projects in the Stikine River watershed should not be assessed in piecemeal fashion;
- assessment should have included proposed infrastructure projects;
- methods used to establish and utilize spatial and temporal bounds, especially in relation to water quality and fish/fish-habitat;
- selection of other projects/developments used in the analysis;
- inclusion of the whole Tahltan traditional territory;
- study area limits for assessment of archaeology and heritage resources;
- interpretation of cumulative effects on surface water quantity; and,
- interpretation of cumulative effects on terrestrial ecosystems, grizzlies and mountain goats.

During the Application review, the Tahltan Heritage Resource and Environmental Assessment Team raised the following issues related to the cumulative effects assessment:

- do not agree that the cumulative impacts study area is peripheral to intensive use areas;
- study should have included all culturally important historical use areas;
- assumptions used for the assessment need to be revised and the analysis needs to be re-conducted;
- all previous and existing industrial activity, including all projects in exploration and development phase should be included in CEA;
- temporal boundary for the filter plant effluent needs to be expanded
- interior grizzly bear population should have been included in the CEA;
- due to overestimation of suitable high value mountain goat habitat, underestimation of aircraft impacts and the number of unknown effects to goats, residual effects will be much higher than reported;
- temporal boundary for estimation of impacts from the tailings impoundment needs to be extended to life of the impoundment which is in perpetuity;
- spatial boundary of the CEA is too narrow;
- concerned about potential socio-cultural effects due to the high level of resource activities in the Tahltan traditional territory; and,
- analysis is required to support conclusions in the Application related to post-closure long-term water quality.

In response to comments, the Proponent updated its post closure long-term water quality predictions using a temporal boundary of 1000 years. This report predicted that throughout the life of the mine, water in the Central pit lake will not become acidic due the alkalinity of the inflowing groundwater and surface runoff. However, as a contingency, during Phase 1 of the closure period (Years 1 to 10), the Proponent is proposing to maintain high alkalinity within the pit lake through the addition of lime to prevent the development of acidic waters within the pit lakes and control metal concentrations. During this period, there will be extensive monitoring and in situ research completed on the pit walls to guide further mitigation efforts.

The Proponent also prepared a report assessing cumulative effects on the interior grizzly bear population. The report found the cumulative effects are unknown but the impacts from the Project are not considered to be significant if proposed mitigation measures are undertaken.

The Proponent provided the following responses:
- noted there has been limited exploration at Copper Canyon;
- noted efforts would be undertaken to avoid all archaeological sites where possible;
- noted expanding the study area for archaeological resources would not have altered the results of the CEA;
- explained approach to CEA and how the temporal boundaries were established for the CEA;
- noted it is unlikely that particles will be deposited close to the filter plant diffuser or will form accumulations of sediment with high metal content given the flow regime in the Iskut River and the relatively low quantity and particle size of suspended solids 0.05 milligrams per litre of suspended solids less than 0.45 microns in size);
- is not included in the NovaGold will participate with the Crown and Tahltans to help expand collective knowledge of cumulative impacts of all development on all valued ecosystem components;
- one condition of the Special Use Permit for the access road is that the road be decommissioned when it is no longer required for the Project. If the access road is to be kept open after it is no longer required for the Project, then the new Proponent should conduct a reassessment of the residual effects of the road at a regional scale.
- has committed to design and implement a Wildlife Mitigation and Monitoring Plan to mitigate potential wildlife effects;
- has committed to monitor the water quality of Galore Creek and the Scud, Iskut and Stikine rivers during operations and after closure to confirm modeling and ensure discharges meet permit conditions until regulatory agencies determine that conditions are stable and predictable; and,
- has committed to implement erosion and sediment control practices during construction to ensure that water quality is protected. Additionally there will be an Aquatic Effects Monitoring program to assess the effects of construction.

3.4.5 Conclusions

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from the Tahltan Heritage Resource and Environmental Assessment Team; and responses from the Proponent.

Based on the information in this Report, and provided that the Proponent conducts the mitigation as indicated and implements the actions described in the Summary of Commitments listed in Appendix F, EAO and the federal Responsible Authorities, in consultation with the Technical Working Group, are satisfied the Project is not likely to cause significant adverse cumulative environmental effects associated with the construction, operation and decommissioning of the Project.

4. ENVIRONMENTAL EFFECTS MONITORING AND FOLLOW-UP PROGRAM

4.1 BACKGROUND

Under section 16(2) of CEAA, the need for, and requirements of, a follow-up program must be considered during a comprehensive study. A follow-up program is required for this Project: 1) to provide information on environmental effects and mitigation resulting from project implementation that can be used to improve or support future EAs, including cumulative effects assessments; 2) to aid in the detection of unanticipated environmental effects, 3) to support or verify predictions made concerning the likelihood of "no significant adverse environmental effects".

The scale and long life cycle of the proposed Project necessitate the establishment of a comprehensive follow-up program pursuant to the CEAA. The Proponent proposed an environmental monitoring program, which would collect data and compile information to detect potential project impacts measured against an established baseline. The Proponent also committed to undertake a follow-up program to verify the accuracy of the predicted environmental effects of the Project and the effectiveness of the proposed mitigation.

Where federal regulatory processes exist for a specific development activity, the mitigation measures and follow-up requirements would be specified as terms and conditions by the federal regulatory instruments (e.g., *Fisheries Act* authorization; *Navigable Waters Protection Act* approval; *Explosives Act* permit; and licence under the *International River Improvements Regulations*). A proposed agreement between the federal government, (represented by Natural Resources Canada, Fisheries and Oceans Canada, Transport Canada, Environment Canada, Health Canada, and the CEA Agency) and the Proponent could complement federal regulatory instruments and help ensure that the Proponent implements the required follow-up program to the satisfaction of federal regulators.

4.2 PROPONENT COMMITMENTS AND OBLIGATIONS

The Proponent will ensure that the design, construction, operation and maintenance of the Project is carried out in an environmentally responsible manner, employing Best Management Practices, and complying with federal, provincial and municipal statutes. The Proponent will abide by all relevant commitments in Appendix F, and if certified, conditions identified in the provincial Environmental Assessment Certificate.

In the Application, the Proponent outlined an overarching environmental management system, which would form the basis for a more detailed management system to be developed during project permitting. The environmental management system is comprised of a series of written plans outlining the scope of environmental management proposed for the Project. Specific plans will be finalized for:

- Air Emissions and Fugitive Dust;
- Water Management;
- Tailings and Waste Rock;
- Pipelines;
- Filter Plant and Concentrate Loadout;
- ML/ARD Prediction and Prevention;
- Access Corridor Preliminary Acid Rock Drainage;
- Materials Management;
- Erosion Control and Sediment;
- Spill Contingency and Emergency Response;
- Fish and Fish Habitat;
- Wildlife Management;

- Domestic and Industrial Waste;
- Access Road;
- Aerodrome and Aircraft Operations; and,
- Archaeological and Heritage Site Protection.

The Proponent committed to the implementation of an environmental management system that is based on ISO 14000, which provides a framework for the development of both the management system and supporting audit program, including the requirement for continual improvement.

The Proponent committed to developing a reporting schedule for both federal and provincial agencies during the Project permitting phase. The reporting schedule will detail the requirements for both meeting with regulatory agencies as well as the provision of written reports detailing compliance with permit stipulations and any other areas requiring such attention.

The Proponent committed to monitoring the effects of the Project and to follow-up with the results of that monitoring in an annual summary report. The report will summarize how the Proponent has implemented mitigation measures and will comment on the effectiveness of those measures in avoiding or mitigating adverse environmental effects. A key aspect of the reports will be the identification of opportunities for adaptive management. In addition, , the Proponent committed to prepare a more detailed report outlining trends observed in the monitoring programs every three years. Those three-year reports will assess trends in the predicted effects of the Project, as outlined in the environmental assessment, and determine the success of mitigation measures or identify alternate measures to reduce environmental effects.

If any unforeseen adverse effects arise during the life of the Project, measures will be taken to correct those effects and prevent them from occurring in the future. If urgent conditions that required immediate action arise, the Proponent will promptly report directly to the appropriate regulatory authorities.

The Proponent's proposed monitoring plans are summarized below and potential adaptive management measures are indicated. These adaptive measures include feedback mechanisms and remedial actions. Further details on these proposed monitoring and follow-up programs can be found in Chapter 10 of the Application. Reporting for all the monitoring programs described below will include a summary of the data collected in an annual report and a detailed report every three years that will include trend analysis.

4.2.1 Climate Change and Glacier Monitoring & Follow-Up

Climate change monitoring for the Project will have three components:

- collecting meteorological and hydrological data collection and comparing it to regional norms;
- monitoring of changes to glaciated areas; and,
- documenting greenhouse gas emissions from the Project.

Analysis of this data will provide an early warning to changes in glacier dynamics that may influence the functionality and safety of the Project. Outcomes may include the adaptive management of the effects of the environment on the Project.

4.2.2 Air Quality Monitoring & Follow-Up

Air quality monitoring is planned for both the ambient and workplace environments. The air quality guidelines are different for ambient and workplace environments. The air quality monitoring for the ambient environment will consist of dustfall monitoring, whereas the air quality monitoring for the workplace will consist of control measures in the process plant and open pit mining areas.

If analysis of monitoring data highlights an area of concern, then adaptive management plans will be implemented. Outcomes may include increasing the rate of road watering. More significant measures, such as a change in equipment, may be chosen if a chronic adverse effect on air quality is identified. The Proponent will be responsible for implementing methods to mitigate environmental effects consistent with the environmental assessment.

4.2.3 Noise Monitoring & Follow-up

Noise monitoring in the workplace will consist of applying the best practical hearing protection equipment for the process plant and open pit mining work areas appropriate for the maximum equivalent noise levels associated with each work area. Appropriate practical hearing protection for different noise levels is determined by the Health, Safety and Reclamation Code for Mines in B.C. (Ministry of Energy and Mines, 2003). The Galore Creek mine health and safety personnel will implement the noise monitoring program and conduct periodic spot checks to verify that adequate hearing protection is being used in areas where the noise levels are greater than 83 dBA for a 12 hour shift. In addition, the personnel will implement mitigation measures to prevent exposure to peak impulse noises that exceed the Code.

Monitoring data will facilitate assessment of the environmental management system's effectiveness in maintaining a safe working environment with respect to noise. If the levels or extent of noise are determined to be greater than predicted in the environmental assessment, the noise source and attenuation models used in the environmental assessment will be updated. Outcomes may include an adaptive response strategy to mitigate the higher than predicted levels of noise.

Noise levels in worker's accommodation complex will be monitored once the mine begins to operate to confirm noise levels. The results will be compared to sound levels related to sleep disturbance in the World Health Organization Guidelines for Community Noise (1999). In the event that sound levels exceed these guidelines, technically and economically feasible mitigation measures will be implemented.

The potential noise effects of the Project on wildlife will form a component of the Wildlife Mitigation and Monitoring Plan (see following section). This will include an ongoing assessment of the effects of blasting and avalanche control noise on mountain goat populations and the effects of aircraft noise from the Porcupine aerodrome on the grizzly bear population feeding on spawning salmon along the Porcupine River.

4.2.4 Wildlife and Wildlife Habitat Monitoring and Follow-up

As part of the environmental monitoring program for the Project, a Wildlife Mitigation and Monitoring Plan will be implemented to document changes in wildlife abundance, behaviour, health, and habitat resulting from project development, operation and closure. Changes to wildlife will be documented to:

- assess the success of mitigation measures proposed in the plan;
- identify opportunities for adaptive management; and,
- enable the actual wildlife effects to be compared with those predicted in the environmental assessment.

The monitoring program will assess mine related effects through formal and informal monitoring programs that focus on wildlife behaviour, mortality, population dynamics, distribution and habitat loss. The effects of project activities on wildlife will be assessed by incidental observations of wildlife injury, mortality or abnormal behaviour associated with mine components (e.g., access roads, waste management, etc.). Long-term monitoring will be conducted on selected focal species (e.g., species of particular value or indicators of broader ecosystem health) to assess impacts at broader temporal scales. Habitat loss, change, and reclamation will be monitored and documented as the mine footprint is expanded and subsequently reclaimed post-operation.

The Project components selected for monitoring are those with the greatest potential for interactions with wildlife. Monitoring will occur through all project phases (construction, operation and decommissioning). The selected components include:

- access road;
- aerodrome and air traffic;
- transmission line;
- pit walls;
- waste and wildlife attractant management; and,
- tailings facility.

Four species have been selected for long-term monitoring: moose, mountain goat, western toad and grizzly bear. Each of these focal species was selected for one of the following reasons

- species identified as an important resource (e.g., moose);
- species whose populations could be appreciably affected by Project development (e.g., mountain goat);
- species with conservation status that requires monitoring under section 79(2) of the federal *Species At Risk Act* (e.g., western toad); or,
- ecological ‘umbrella’ species (e.g., grizzly bear).

Reporting (as described Section 4.2) will include a discussion of monitoring of the effects on wildlife from the: access road, aerodrome and air traffic, transmission line, pit walls, waste and wildlife attractant management, tailings facility, and chemicals released during an accidental spill (if applicable). The report will also the potential positive and adverse effects of habitat alteration and reclamation on wildlife.

The Wildlife Effects Monitoring Program reports will enable the recorded wildlife effects to be compared to those predicted in the environmental assessment and to identify opportunities for adaptive management. Mitigation methods will be developed in consultation with Agency staff and Tahltan Nation representatives as necessary.

4.2.5 Aquatic Effects Monitoring & Follow-up

The proposed Aquatic Effects Monitoring Program will be implemented to:

- ensure regulatory compliance with discharge limits and other criteria to be set at the permitting stage;
- verify the predictions of environmental effects assessments;
- detect any unforeseen impacts as measured against the baseline established as part of the initial environmental assessment; and,
- help identify cause-effect relationships between project activities and environmental impacts.

The Aquatic Effects Monitoring Program is designed in accordance with guidelines set by the B.C. Ministry of Environment as well as those published by Environment Canada (2002) to ensure compliance with the *Metal Mining Effluent Regulations* of the *Fisheries Act*. The guidelines require initial monitoring to establish a baseline and periodic monitoring to evaluate environmental effects. If environmental impacts occur, focused monitoring is conducted to establish the magnitude and geographical extent of the effect,and investigations are carried out to determine the cause of the effect so that mitigation measures can be implemented. The monitoring program outlined here should not be considered final; the program will be adaptive and will change in response to permitting requirements and monitoring results.

Long-term monitoring will be implemented during the construction, operation and closure phases. In addition to surface water monitoring, sediment, benthic invertebrates and fish will also be monitored. Under the *Metal Mining Effluent Regulations*, sediment sampling is mandatory for total organic carbon and particle size and recommended for metals analysis. All sediment variables will be analyzed as part of the program because sediment acts both as a sink for deleterious substances and is an important resource for benthic invertebrates. Benthic invertebrates will be sampled because they are relatively stationary and are likely to reflect changes in the environment more rapidly than other organisms, such as fish. Therefore, they will act as a good potential receptor for monitoring purposes. Fish will also be monitored because they have the potential to bioaccumulate some metals and have a higher social value than invertebrates.

Other organisms that are often monitored for long-term environmental impacts, such as periphyton, phytoplankton and zooplankton, will not be monitored for the Aquatic Effects Monitoring Program. While periphyton are stationary and likely to reflect environmental change rapidly, their distribution was found to be limited and patchy during the aquatic baseline studies. Long-term assessment of environmental impacts via periphyton monitoring would therefore be difficult. Phytoplankton and zooplankton will not be used in stream and river bio-monitoring because they are almost exclusively lake and wetland based.

The components of the Proponent's proposed Aquatic Effects Monitoring Program proposed are summarized below. Details of the monitoring program for each discipline, including the rationale behind the choice of monitoring locations and sampling frequency, were presented in the Application.

Hydrology

The objectives of the surface flow monitoring program will be to determine project-related effects to water quantity, to assist in the implementation and evaluation of mitigation measures associated with water management, and to provide data for the water quality and aquatic effects monitoring programs.

Based on the surface hydrology effects assessment, the Project components that require monitoring will be those with the greatest potential for impacts on water quantity, including the mine site and facilities in Galore Creek (open pits, tailings facility, diversion channels, etc.) and the access corridor.

Continuous flow monitoring will be conducted during the open-water season (April to November). Manual flow measurements will be taken at each site, several times during each open-water season, to define the annual rating relationship. Additional flow measurements will be taken during the winter low-flow period.

Stream flow within the Project area is determined by highly variable weather and climatic conditions, as reflected in the high variability in seasonal and annual flow patterns observed in baseline studies. Therefore, monitoring of water quantity effects requires concurrent monitoring of reference streams to distinguish Project effects from the background effects of natural annual and seasonal variability in stream flow.

Hydrometric monitoring will also be conducted along the access route in Sphaler Creek These stations will be used to monitor and assess the effects of activity along the access corridor. Instantaneous flow measurements will be taken at key times of the hydrograph (e.g., freshet, summer low flow, winter) on the Scud River downstream of Galore Creek, Porcupine River downstream of the aerodrome, and Iskut River downstream of the filter plant.

Surface Water Quality

Surface water quality will be monitored at exposure sites in the areas of the mine, access route, filter plant and aerodrome to ensure compliance with discharge limits and to monitor for effects in the receiving environment. Sampling sites will be located near-field, mid-field and far-field so that a gradient of effects can be assessed. Water sampling will be conducted weekly at the mine area discharge sites (e.g., tailings impoundment) and the filter plant. This sampling will be essential to ensure that effluent discharge could occur without water quality limits being exceeded.

Monthly water sampling will be conducted at three locations in the mine area and at a site 100 metres downstream of the filter plant outfall. All other stream sites, except those associated with the access corridor, will be sampled on a quarterly basis.

Three sites along the access corridor will be monitored to assess the impact of the corridor on stream water quality. Sampling water quality at these locations will allow the cumulative impact of the access corridor to be assessed in each watershed. Since no effluent will be released into these watersheds and given the low traffic expected, it is proposed to sample water quality on a bi-annual, rather than a quarterly basis.

All water samples will be analyzed for the same suite of parameters monitored during baseline studies (i.e., general physico-chemical variables, anions, nutrients, total cyanide, total organic carbon, and total and dissolved metals).

Toxicity Testing (Acute and Chronic)

Toxicological assessment will be used to establish causal linkages between chemical concentrations and biological responses. Standardized water toxicity bioassays using laboratory species will quantitatively assess the effects of effluents, taking into account bioavailability of the suite of chemicals present in varied concentrations. Toxicity testing will therefore inform water quality monitoring programs by showing the biological effects of changes in water chemistry, and by providing a tool to investigate causes behind changes in biological communities.

Toxicity testing on fish, invertebrates, algae and plants will be conducted in accordance with the guidance within the *Metal Mining Effluent Regulations* and adapted to fulfil the requirements set by the Ministry of Environment to determine whether the effluent has the potential to affect aquatic life. Endpoints measured in the toxicity tests include survival, growth and reproduction. All testing will be carried out by a certified bioassay laboratory. Sampling will occur at the mine's two final discharge points: the tailings impoundment and the filter plant.

Acute toxicity tests will initially be conducted monthly using rainbow trout fry (*Oncorhynchus mykiss*) and waterflea (*Daphnia magna)*. If the effluents are determined to not be acutely lethal over a period of twelve months then testing will be conducted on a quarterly basis, as per the *Metal Mining Effluent Regulations* guidelines. Chronic toxicity tests will be conducted twice a year on rainbow trout embryos, spiny waterflea (*Ceriodaphnia dubia*), common duckweed (*Lemna minor*), and a species of green algae (*Selenastrum capricornutum*). The algae test will be run with a 100% unfiltered treatment, along with full serial dilution of filtered effluent. All toxicity tests will be conducted in accordance with Environment Canada guidance. At each site, water samples will be collected from the outflow concurrently with scheduled water quality sampling.

Sediment Quality

Sediment will be sampled once annually, in conjunction with benthic invertebrate and fish sampling, to monitor the potential accumulation of deleterious substances and to assess total organic compounds and particle size for potential habitat differences important to the benthic invertebrate communities. Sampling will take place at all but four of the sites that will be sampled for water quality. The tailings impoundment, diversion channel and monitoring point Gal-3A will not be sampled because any potential changes to sediment quality will accumulate further downstream and therefore be more easily assessed at Gal-3, the nearest exposure site to the mine for which baseline data exist. For similar reasons, the filter plant itself will not be sampled for sediment, but a site 100 metres downstream from the filter plant outfall.

Samples will be analyzed for moisture content, particle size, nutrients, total organic compounds, total cyanide and total metals using the lowest feasible detection limit.

Benthic Invertebrates

Benthic invertebrate communities will be sampled in the mine and filter plant areas because these will be the two locations where effluent will be discharged into the aquatic environment. Water bodies along the access corridor and near the aerodrome will not be sampled because no discharges are planned; therefore no effects on the benthic invertebrate communities are expected.

Benthic community monitoring will provide a tool to assess potential impacts to aquatic life due to mining activity, based on changes from baseline and reference data. Data will include density, species richness, diversity indices, and Bray-Curtis dissimilarity indices, as well as relative abundance and several diversity indices related to bioindicator groups including chironomids, mayflies, stoneflies and caddisflies.

Benthic invertebrate sampling will occur in late summer when benthic communities are at their richest (prior to the majority of emergence) and and concurrently with a round of sediment and fish sampling. A qualified contractor will sort and identify all invertebrates to the lowest possible taxonomic level (typically genus).

Fish

As with benthic invertebrates, fish will only be sampled in watersheds that receive effluent discharge and in their corresponding reference watersheds. Fish sampling will therefore not take place at sites associated with the access route and aerodrome, since no significant effects to the fish communities are expected from activities in these areas. Fish sampling will not occur in the Scud watershed because no resident species exist in the main channel.

Fish community surveys will determine whether the mine affects fish growth, condition, reproduction or survival by comparing results with baseline data. Data will be collected on fish size (length and weight), age (scale, fin ray and otolith analysis), catch-per-unit-effort, sex, gonad weight, egg size, fecundity, liver weight, external condition and tissue metal analysis. Studies will concentrate on Dolly Varden (*Salvelinus malma*) and mountain whitefish (*Prosopium williamsoni*). Fish communities will be sampled using a combination of backpack electrofishers, minnow traps and beach seining.

Under *Metal Mining Effluent Regulations* guidelines, mines are not required to conduct fish tissue analysis if effluent mercury concentrations are less than 0.1 µg/L, as determined during the effluent characterization and water quality monitoring program. Concentrations of mercury in effluents will be monitored on a weekly basis as part of the water quality program at both the tailings impoundment and the filter plant, so if concentrations are greater than or equal to 0.1 µg/L at any time, a fish tissue analysis study will be conducted within that year. Dolly Varden will be used as the test species because it is the only species present at all four long-term monitoring sites. Tissue metals analysis will be conducted every three years, irrespective of the concentrations of mercury in the effluents.

Groundwater Monitoring
In addition to the Aquatic Effects Monitoring Program required under *Metal Mining Effluent Regulations*, groundwater elevation and water quality will also be monitored to assess the effects of project activities on groundwater. The monitoring program will document changes to baseline conditions due to project activities as well as monitor reference wells for comparison purposes. The proposed capture wells north of the tailings impoundment will be used for groundwater quality monitoring. For mine components outside of the Galore valley such as the aerodrome site, camps, and filter plant there is no existing hydrogeologic baseline data. Therefore, groundwater wells will be installed to characterize the aquifer(s) underneath these sites and to allow ongoing monitoring of groundwater elevation and quality. The number and position of these monitoring wells will be decided post-environmental assessment.

Reporting on the Aquatic Effects Monitoring Program will be done on a yearly, with more detailed reports every three years (except where more frequent reporting in specific situations is prescribed by permitting requirements) as discussed in Section 4.2. The Aquatic Effects Monitoring Program report will enable the actual aquatic effects to be compared to those predicted in the environmental assessment and identify opportunities for adaptive management. Mitigation methods will be developed in consultation with CEA Agency staff and Tahltan Nation representatives as necessary.

4.3 ISSUES RAISED AND PROPONENT RESPONSE

During the Application review, government agencies, the Tahltan Heritage Resource and Environmental Assessment Team and the public provided comments related to the proposed Environmental Effects Monitoring Programs. Comments sought further details on the proposed Aquatic Effects Monitoring Program. In response to comments, the Proponent prepared a report to update long-term water quality predictions for the pit (see discussion above in section 4.2). The Proponent will develop a long-term water quality management program at closure during the permitting stage, which will ensure compliance with discharge permits and address long-term closure goals. Water quality will continue to be monitored until regulatory agencies determine that the site conditions are stable and predictable.

U.S. federal and Alaska State agencies support adding an additional monitoring site downstream on the Stikine River. The Proponent has committed to add an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during permitting. U.S. federal and Alaska State agencies will be invited to review and comment on the Proponent's permit applications when specific details on monitoring will be discussed.

In response to comments from government agencies and the Tahltan Heritage Resource and Environmental Assessment Team, the Proponent has committed to assess during the permitting stage potential water treatment options (including, but not limited to, a water treatment plant) for operations and post closure, which are currently not expected to be necessary.

In response to comments from U.S. federal agencies, the Proponent has committed to monitor for polycyclic aromatic hydrocarbons in the lower Galore drainage and on the Stikine River below the mouth of the Scud River on an annual basis. In the event of an uncontained spill, the Proponent will implement a more frequent polycyclic aromatic hydrocarbons sampling program and report its results.

4.4 CONCLUSIONS

During the Application review, EAO, Responsible Authorities and the Technical Working Group have considered: the Application and supplementary information; comments from the public, government agencies and Tahltan Heritage Resource and Environmental Assessment Team; and responses from the Proponent.

Based upon the information in this Report, and provided that the Proponent conducts the measures as indicated above and implements the actions described in the Proponent's Table of Commitments listed in Appendix F, EAO and Responsible Authorities, in consultation with the Technical Working Group, are satisfied that the follow-up program developed during the environmental assessment will be sufficient to verify the accuracy of impact predictions and determine the effectiveness of measures undertaken to mitigate the potential adverse environmental effects of the Project.

PART C - REVIEW CONCLUSIONS

1. BASIS OF CONCLUSION

The conclusions from the review of the Project pursuant to the federal and provincial environmental assessment legislation are based on the following documents and review process:

- The Proponent's Application for an environmental assessment certificate;
- Supplementary reports and documents submitted by the Proponent during the Application review stage and listed in **Appendix A**;
- The Proponent's Table of Commitments listed in **Appendix F**; and,
- The assessment carried out by the Technical Working Group comprised of representatives of Canadian and U.S. federal, B.C. and Alaska State government agencies, local government and the Tahltan Central Council, with input from the public.

2. EFFECTS MONITORING AND FOLLOW UP

As summarized in **Appendix F**, the Proponent has committed to developing monitoring plans for Project construction and operations that provide a more detailed description of how various environmental impacts will be avoided, managed and mitigated. The Proponent has also committed to undertake measures for compliance, environmental effects monitoring, and follow-up, as summarized in **Section 4** (Part B) of this Report. A number of these measures involve consultation and collaboration with the Tahltan Central Council.

In addition to the Proponent's commitments towards environmental management and monitoring, the Proponent would also be required to comply with specific mitigation, monitoring and reporting requirements for pre and post construction operations as well as habitat compensation operations required by subsequent provincial and federal authorizations, permits, and approvals.

3. OVERALL CONCLUSION

3.1 CONCLUSION OF EAO

In conclusion, the review of the Project pursuant to BCEAA and summarized in this Report has considered:

- the Proponent's Application for an environmental assessment certificate;
- reports and documents submitted by the Proponent during the Application review stage to provide further information, clarification or note changes to the information contained in the Application (see Appendix A for list of documents);
- the Table of Commitments identified in Appendix ; and,
- comments provided by the Technical Working Group, which included representatives of the Tahltan Heritage Resource and Environmental Assessment Team, and the public.

EAO is satisfied that:

- the Application, together with additional clarifications and information provided during the review, adequately identified and assessed the potential significant adverse environmental, economic, social, heritage and health effects of the Project and potential effects on First Nations interests;
- public and First Nations consultation, and the distribution of information about the Project, have been adequately carried out by the Proponent;
- issues identified by the public, First Nations, Canadian and U.S. federal, B.C. and Alaska state government agencies, and local governments, that are within the scope of the environmental assessment, were adequately addressed by the Proponent during the review of the Application and subsequent material submitted by the Proponent; and,
- practical means have been identified to prevent or reduce to an acceptable level potentially significant adverse effects of the Project.

3.2 CONCLUSION OF FEDERAL RESPONSIBLE AUTHORITIES

Pursuant to the requirements of the CEAA, the Responsible Authorities have determined that, on the basis of the Comprehensive Study, taking into account the implementation of the proposed mitigation and commitments, the Project is not likely to cause significant adverse environmental effects.

APPENDIX A - APPLICATION AND SUPPORTING DOCUMENTS

June 2006	Application for an Environmental Assessment Application for the Galore Creek Copper-Gold-Silver Project (Volumes 1 – 16) submitted by NovaGold Canada Inc.
July 31, 2006	Report from Iain G. Bruce (BGC Engineering Inc.) to Dean Lindsay (NovaGold Canada Inc.) entitled “Galore Creek Project Open Pit Slope Design -Feasibility Geotechnical Report”.
August 17, 2006	Email from Dianna Stoopnikoff (NovaGold Canada Inc.) to Nicole Vinette (Environmental Assessment Office) identifying change to the location of the filter plant.
September 7, 2006	Report entitled “Water Quality Model Predictions Total and Dissolved Metals” submitted by NovaGold Canada Inc.
September 7, 2006	Report entitled “Porcupine River Floodplain Delineation near the Proposed Aerodrome Facility” submitted by NovaGold Canada Inc.
September 7, 2006	Report entitled “Galore Creek Human Health Effects Assessment” submitted by NovaGold Canada Inc.
September 22, 2006	Report from Iain G. Bruce (BGC Engineering Inc.) to Dean Lindsay entitled”Galore Creek Project Plant Site Design - Feasibility Geotechnical Report”.
September 26, 2006	Report entitled “Overland Pipelines Detailed Feasibility Study” by PSI submitted by NovaGold Canada Inc.
November 2006	Report entitled “Galore Creek Project: Post Closure Long-Term Water Quality Predictions (without mitigation)” submitted by NovaGold Canada Inc.
November 2, 2006	Letter from Dianna Stoopnikoff (NovaGold Canada Inc.) to Anne Currie (Environmental Assessment Office) identifying changes to construction camps.
November 14, 2006	Memo report entitled “Galore Creek Tailings Dam Geologic Condition” submitted by NovaGold Canada Inc.
November 20, 2006	Report entitled “Revised Tunnel Alignment and Related Geotechnical Investigations” submitted by NovaGold Canada Inc.
December 6, 2006	Report entitled “Galore Creek Project Interior Grizzly Bear Cumulative Effects Assessment” submitted by NovaGold Canada Inc.
December 13, 2006	Report “Installation of the Diffuser in the Iskut River for Discharge of Treated Concentrate Water” submitted by NovaGold Canada Inc.
December 2006	Report entitled “Galore Creek Conceptual Fish Habitat Compensation Plan” submitted by NovaGold Canada Inc.

APPENDIX B – MEMBERS OF THE TECHNCIAL WORKING GROUP

- Anne Currie – Environmental Assessment Office
- Nicole Vinette – Environmental Assessment Office
- Jo Harris – Environmental Assessment Office
- Bob Hart – Environmental Assessment Office
- Chris Barlow – Canadian Environmental Assessment Agency
- Mandy Sarfi – Canadian Environmental Assessment Agency
- Carl Alleyne – Health Canada
- Jessica Coulson – Natural Resources Canada
- Gavin Dirom – Mining Association of BC
- Adam La Rusic – Environment Canada
- Pat Lim – Fisheries and Oceans Canada
- Robert Mccandless – Environment Canada
- Derek Nishimura – Transport Canada
- Colin Parkinson – Transport Canada
- Andrew Robinson – Environment Canada
- Andrew Thrift – Natural Resources Canada
- Amy Crook – Centre for Science in Public participation
- Malcolm Foy – LGL Ltd., Environmental Research Associates
- Norm McLean - LGL Ltd., Environmental Research Associates
- Nalaine Morin – Tahltan Central Council
- Clarence Quock – Tahltan Central Council
- Marie Quock – Iskut First Nation
- Curtis Rattray – Tahltan Central Council
- John Holland – District of Stewart
- Andrew Webber – Regional District of Kitimat-Stikine
- Duane Anderson – Ministry of Energy, Mines and Petroleum Resources
- Sherrie Applegate – Ministry of Transportation
- Jeanien Carmody-Fallows – Ministry of Environment
- Chris Carr – Ministry of Energy, Mines and Petroleum Resources
- Dannie Carsen – Ministry of Community Services
- Karen Diemert – Ministry of Environment
- Maija Finvers – Ecosystem Information Science, Ecosystem Branch
- Doug Flynn – Ministry of Energy, Mines and Petroleum Resources
- Patrick Hudson – Ministry of Environment
- Iqbal Kalsi – Northern Health Authority
- Mark Love – Ministry of Environment
- John Love – Ministry of Environment
- Alexander Mackie – Ministry of Tourism, Sport and the Atrs
- Butch Morningstar – Ministry of Energy, Mines and Petroleum Resources
- Max Nock – Ministry of Economic Development
- Fred Oliemans – Integrated Land Management Bureau

- Jill Pardoe – Ministry of Energy, Mines and Petroleum Resources
- Ian Smythe – Ministry of Agriculture and Lands
- John Stevenson – Ministry of Agriculture and Lands
- Craig Stewart – Ministry of Environment
- Andrew Taylor – Ministry of Economic Development
- Ben Weinstein – Ministry of Environment
- Paul Wojdak – Ministry of Energy, Mines and Petroleum Resources
- Gord Wolfe – Ministry of Environemnt
- Michael Wu – Northern Health Authority
- Pamela Bergmann – U.S. Department of the Interior
- Tom Brookover – Alaska Department of Fish and Game
- Jim Cariello – State of Alaska, Department of Natural Resources
- David Cox – Forest Service, Department of Agriculture
- Thomas Crafford – State of Alaska, Department of Natural Resources
- Jeffrey DeFreest – Forest Service, Department of Agriculture
- John Dunker – State of Alaska, Department of Natural Resources
- Robert Erhardt – U.S. Forest Service
- Mark Fink – Alaska Department of Fish and Game
- Ed Fogels – State of Alaska, Department of Natural Resources
- Kenwyn George – State of Alaska
- Cindy Hartmann – National Marine Fisheries Service
- Kerry Howard – State of Alaska, Department of Natural Resources
- John Kato – U.S. Forest Service
- Jon Kurland – National Marine Fisheries Service
- Patty McGrath – U.S. Environmental Protection Agency
- Terry Otness – City of Wrangell
- Deborah Rudis – U.S. Department of the Interior - Fish and Wildlife Service
- Gordy Williams –Alaska Department of Fish and Game
- Diane Howe – Ministry of Energy, Mines and Petroleum Resources

Index #	Name / City / Affiliation / Submission Date	Correspondence	Issue	Proponent Response	Mitigation / Commitment	Government Response
1	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	Access route - it was encouraging to see NovaGold Canada Inc. (NovaGold) adopt the "northern route" for its access road and abandon plans for the "southern route" through critical salmon and wildlife habitat. We strongly urge that there continue to be no consideration of the "southern route" and that the Environmental Assessment Office (EAO) oppose any efforts, if such efforts are undertaken, to move the access route to the south.	Access road	No response required	No action required	Comment noted
2	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Access road: we favor the proposed northern access route more than the southern route that would have followed the Iskut and Stikine rivers.	Access road	No response required	No action required	Comment noted
3	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	VI. Toxicity Testing and Protecting Fisheries Several of the watersheds affected by the proposed Galore Creek Copper-Gold-Silver Project (Project) mine support traditional, commercial and sport fisheries. Several of these rivers currently have elevated background concentrations of metals. Project effluents will add many contaminants to surface waters. It is important to protect fisheries and fully understand all possible impacts from exposure to potential toxins. The toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing. A full suite of chronic toxicity tests needs to be conducted in all areas that will receive any type of discharge from the mine to establish baseline conditions. A full suite of chronic and acute toxicity testing should be conducted on a regular basis during mine life and afterwards. These results should be readily available to all interested parties.	Aquatics - chronic and acute toxicity testing	As part of the baseline studies, a full suite of chronic and acute toxicity tests are being conducted on a quarterly basis to assess background toxicity to four major aquatic ecosystem components (algae, plants, invertebrates and fish) using standardized freshwater toxicity bioassays required under federal Metal Mining Effluent Regulations (MMER) for operational mines. These tests include two acute tests (using the waterflea Daphnia magna and rainbow trout fry) and four chronic tests (growth inhibition tests with green algae (Selenastrum capricornutum) and duckweed (Lemna minor), survival and reproduction testing with the invertebrate Ceriodaphnia dubia, and embryo survival testing with fertilized rainbow trout gametes). For comparison, the Alaska Department of Environmental Conservation regulations for toxicity testing entail the use of specific bioassays selected on a site-by-site basis. The Kensington project permit, for example, requires four tests per year with each of fathead minnow, C. dubia, and S. capricornutum. The test protocols used by U.S. EPA (Alaska) and MMER (Canada) are very similar. The Project uses two of these species, and substitutes fathead minnow with trout to better represent the local fish community (salmon, trout, char, whitefish; cold-water species). Site-specific water quality objectives are proposed for the Project, in light of the naturally high concentrations of many metals in waters of the region. These will allow assessment of changes in water quality signaling potential impacts.	Toxicity testing at end-of-pipe and in the receiving waters of the Galore/Scud and Iskut watersheds will continue throughout the life of the mine to ensure that downstream environments are not impacted by discharged effluents from the Project. A post-closure monitoring program will be developed in conjunction with Canadian and U.S. federal and B.C. and Alaska State agencies and the Tahltan Central Council during the permitting stage.	The Environmental Assessment Office (EAO) notes that as part of provincial permitting pursuant to the *Environmental Management Act*, NovaGold will be required to undertake environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project.

4	Marlene Clarke Wrangell, Alaska September 7, 2006	Several of the watersheds affected by the proposed Project support traditional, commercial and sport fisheries. These fisheries are important to local aboriginal people and commercial interests. Several of these rivers have elevated background concentrations of metals already, before additions of discharge from this proposed Project. The mine effluents will add many contaminants to surface waters; reagents, diesel run off, surfactants, metals and nutrients, etc. It is important to protect fisheries and fully understand all possible impacts from exposure to potential toxins. The toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing. A full suite of chronic toxicity tests needs to be conducted in all areas that will receive any type of discharge from the mine to establish baseline conditions. We recognize that the B.C. water quality guidelines do not require chronic toxicity testing. This is not a conservative approach, especially in watersheds that already exceed the water quality guidelines. A full suite of chronic and acute toxicity testing should be conducted on a regular basis during mine life and afterwards. These results should be readily available to all interested parties.	Aquatics - chronic and acute toxicity testing	Refer to comment 3 & 8	Refer to comment 3 & 8	See response to 3
5	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Monitoring and Toxicity Tests: the Stikine River and the estuary it flows into support traditional, commercial and sport fisheries. These fisheries are important to local l people and commercial interests. Several of these rivers in the Stikine Watershed have elevated background concentrations of metals already, before additions of discharge from this mine. The mine effluents will add many contaminants to surface waters; reagents, diesel run off, surfactants, metals and nutrients, etc. It is important to protect fisheries and fully understand all possible impacts from exposure to potential toxins. The toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing. A full suite of chronic toxicity tests needs to be conducted in all areas that will receive any type of discharge from the mine to establish baseline conditions. We recognize that the BC water quality guidelines do not require chronic toxicity testing. This is not a conservative approach, especially in watersheds that already exceed the water quality guidelines. A full suite of chronic and acute toxicity testing should be conducted on a regular basis during mine life and afterwards. These results should be readily available to all interested parties.	Aquatics - chronic and acute toxicity testing	Refer to comment 3 & 8	Refer to comment 3 & 8	See response to 3

6	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Several of the watersheds affected by the proposed Project support traditional, commercial and sport fisheries. These fisheries are important to local aboriginal people and commercial interests. Several of these rivers have elevated background concentrations of metals already, before additions of discharge from this mine. The mine effluents will add many contaminants to surface waters; reagents, diesel run off, surfactants, metals and nutrients, etc. It is important to protect fisheries and fully understand all possible impacts from exposure to potential toxins. The toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing. A full suite of chronic toxicity tests needs to be conducted in all areas that will receive any type of discharge from the mine to establish baseline conditions. We recognize that the BC water quality guidelines do not require chronic toxicity testing. This is necessary approach, especially in watersheds that already exceed the water quality guidelines. A full suite of chronic and acute toxicity testing should be conducted on a regular basis during mine life and afterwards. These results should be readily available to all interested parties.	Aquatics - chronic and acute toxicity testing	Refer to comment 3 & 8	Refer to comment 3 & 8	See response to 3
7	Craig Olson Petersburg, Alaska September 7, 2006	Several of the watersheds affected by the proposed Project support traditional, commercial and sport fisheries. These fisheries are important to local aboriginal people and commercial interests. Several of these rivers have elevated background concentrations of metals already, before additions of discharge from this mine. The mine effluents will add many contaminants to surface waters; reagents, diesel run off, surfactants, metals and nutrients, etc. It is important to protect fisheries and fully understand all possible impacts from exposure to potential toxins. The toxicity testing to date focuses primarily on acute testing with minimal chronic toxicity testing. A full suite of chronic toxicity tests needs to be conducted in all areas that will receive any type of discharge from the mine to establish baseline conditions. We recognize that the BC water quality guidelines do not require chronic toxicity testing. This is not a conservative approach, especially in watersheds that already exceed the water quality guidelines. A full suite of chronic and acute toxicity testing should be conducted on a regular basis during mine life and afterwards. These results should be readily available to all interested parties.	Aquatics - chronic and acute toxicity testing	Refer to comment 3 & 8	Refer to comment 3 & 8	See response to 3

8	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	The issue of wild seafood being captured and marketed that contains naturally high levels of heavy metals that have bioaccumulated from a variety of industrial sources is receiving increased attention in our society today. BC and Alaska's marketing of salmon and other seafood from pristine waters of the Pacific Northwest is placed in jeopardy each time industry is allowed to dispose of its effluent in our rivers and streams. To continue to permit this is unacceptable.	Aquatics - bioaccumulation of metals in fish tissue	Modelling of predicted metal concentrations in sediment and water did not predict a measurable increase in metal concentrations downstream of the Scud River.	Tissue testing for heavy metals was conducted on fish from the mouth of Galore Creek and from the Scud River, and monitoring in Galore Creek will continue as part of the MMER for the life of the mine and beyond. Should monitoring reveal elevated tissue metal concentrations at these near-source sites, effluent management practices will be adjusted.	EAO and Canadian Environmental Assessment Agency (CEA Agency) note that NovaGold has committed to monitoring fish health and tissue quality, including, but not limited to, analysis of the full suite of 30 metals used in the baseline studies, in Galore Creek and other potentially affected rivers as part of the Aquatic Effects Monitoring Plan pursuant to federal Metal Mining Effluent Regulation and *the Environmental Management Act*. EAO notes that NovaGold has committed to establish an additional monitoring site downstream in the Stikine River at a depositional site to be determined during the permitting stage.
9	Tim Rutter Terrace, BC July 12, 2006 - Open House	Acid rock drainage (ARD) rock containment and runoff? I need more information on the holding ponds before I can comment.	ARD	The management of ARD is discussed in the following sections of the EA Application for an EA Certificate (Application) for the proposed Project: Section 5.3.6 (Project Description: Metal leaching & Acid Rock Drainage(ML/ARD)); 6.11.3 (Environmental Setting: Acid Rock Drainage & Metal Leaching); 7.6.3.1 (Environmental and Socio-Economic Effects Assessment: Metal Leaching & Acid Rock Drainage); 8.7 (Environmental Management and Mitigation Measures: ML/ARD Prediction & Prevention Management Plan)	No action required	EAO notes that NovaGold has committed to monitoring and managing, during operations and after closure, drainage from the tunnel, non-potentially acid generating dumps, ore and marginal storage stockpiles, pits, seeps and other mine areas, including the impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the *Environmental Management Act* effluent discharge permit limits and federal Metal Mining Effluent Regulation discharge criteria that are applicable at the time.
10	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	III. Waste Handling, Treatment and Disposal D. Ore Stockpiles If ore has any acid producing potential, ore and marginal ore stockpiles should be protected from rain and snowfall to prevent ARD.	ARD	The calculated time before acid generation is initiated exceeds the expected residency in the stockpile by many years; any marginal ore remaining in the stockpile at closure will be submerged in the impoundment.	Any remaining marginal ore stockpiles will be submerged in the waste rock storage impoundment at closure.	Comment noted
11	Craig Olson Petersburg, Alaska September 7, 2006	If ore has any acid producing potential, ore and marginal ore stockpiles should be protected from rain and snowfall to prevent/limit ARD production. (5.5.8-9).	ARD	Refer to comment 10	Refer to comment 10	Comment noted
12	Marlene Clarke Wrangell, Alaska September 7, 2006	If ore has any acid producing potential, ore and marginal ore stockpiles should be protected from rain and snowfall to prevent/limit ARD production. (5.5.8-9).	ARD	Refer to comment 10	Refer to comment 10	Comment noted

13	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	If ore has any acid producing potential, ore and marginal ore stockpiles should be protected from rain and snowfall to prevent/limit ARD production. (5.5.8-9).	ARD	Refer to comment 10	Refer to comment 10	Comment noted
14	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	If ore has acid producing potential, ore and marginal ore stockpiles should be protected from precipitation to prevent or severely limit ARD (5.5.8-9).	ARD	Refer to comment 10	Refer to comment 10	Comment noted
15	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Access Road: we are very concerned with any road construction in the Stikine River watershed that could cause erosion and water quality issues. All rock that is moved during road construction that contains acid producing sulfide ore must be dealt with carefully and placed in lined/capped storage piles.	ARD	The ARD potential of the road corridor has been assessed using regional geological and mineral occurrence data, and was followed up with ground truthing in summer 2006. As a result, an ARD Construction Management Plan will be developed prior to the start of the construction period (refer to Sec. 8.8 in the EA: Access Corridor Preliminary ARD Management Plan – this plan will be finalized before road construction commences); ARD assessment (including visual screening and chemical analysis) will be conducted along the length of the road during construction where the road intersects bedrock and the pre-construction assessment indicated possible ARD and metal leaching issues; ARD potential will be identified, then evaluated against the threshold criteria to determine how it should be managed; management will include segregation and appropriate disposal which will be dictated by specific site conditions. Table 8.8-2 in the EA (Volume III, page 8-123) provides the “Preliminary Guidelines for Management of ARD Generating Rock.” The Access Corridor Preliminary ARD Management Plan may be modified on the basis of a review of 2006 sampling results. A road construction management plan will also address the management of erosion and resulting sediment to ensure that water quality is protected.	Develop and adhere to Access Corridor ARD Management Plan	EAO notes that NovaGold has committed to assessing acid rock drainage potential of excavated faces during access road and diversion channel construction, using an on-site laboratory, and developing appropriate mitigation, including mitigation for closure, for any acid rock drainage encountered.
16	Lana Parker Wrangell, Alaska July 24, 2006	I am opposed to the development because I realize the impossibility of containing all exposed rainfall, seepage, spring water, etc. from interacting with the tailings and penetrating any reservoir established to contain those tailings. The best case scenario is that we end up with a highly toxic reservoir in 20 years, gradually leaching into the Stikine River as the long forgotten NovaGold corporation fades into memory and dissolves to reform under another name elsewhere.	Bonding	Discharge from the tailings impoundment will continue to be monitored post-closure. Dam integrity will also continue to be monitored post closure on an annual basis; the dam will be designed with a seepage collection system that pumps any water seeping from the dam back into the dam. Bonding is a requirement of the government and is reviewed every five years, even after closure of the mine, to ensure the amount is adequate to continue to manage the site in the event that the owner was to default.	Post-closure monitoring; maintain operation of seepage system post-closure	EAO notes that NovaGold has committed to the following: • plug wells and drains at mine closure; • monitor water quality after closure until regulatory agencies determine that conditions are stable and predictable; and • regularly monitor the water quality of Galore Creek, and

						the Scud, Iskut and Stikine rivers during operations and after closure to confirm modelling and ensure discharges meet permit criteria until regulatory agencies determine that conditions are stable and predictable.
17	Lana Parker Wrangell, Alaska July 24, 2006	I would like to know what steps there are to ensure that violating any conditions will be less lucrative than taking all appropriate safeguards if the proposed Project is awarded an EA certificate.	Compliance	NovaGold has developed corporate policy statements (Sustainable Development Policy Statement and Environmental Policy Statement - refer to Section 1 of the Application) which guide their business practices. Additionally, NovaGold views itself as a responsible corporate citizen and will apply best management practices at all times. Best management practices will not only ensure that the company's corporate image is protected, but also the environment.	NovaGold is a responsible corporate citizen and will apply best management practices throughout the construction, operation and closure of the Project.	EAO notes that NovaGold will be required to comply with the conditions identified in the EA Certificate.
18	Craig Olson Petersburg, Alaska September 7, 2006	Concentrate trucks and trailers will have tarpaulin or composite covers to reduce loss of concentrate due to dusting while underway. [Galore Creek EA, p. 5-148]. Concentrate trucks should not use tarpaulins, which are notoriously "leaky". Hard-top covers should be used on concentrate trucks.	Concentrate transportation	Tarpaulins are used worldwide. Problems arise with the use of tarpaulins when correct use procedures are not followed. NovaGold will develop an operating procedures manual and ensure that transportation contractors are trained in proper use of tarpaulins to guarantee their effectiveness. Arrow Transport, who presently hauls concentrate from Eskay Creek to the Port of Stewart, states that their tarp system is very effective. Additionally, the Galore Creek concentrate will be a filter cake rather than a dried product and therefore not particularly sensitive to dusting.	Develop an operating procedures manual for correct tarpaulin use and provide training for transportation contractors	EAO notes that NovaGold has committed to developing an operating procedures manual for correct tarpaulin use and provide training for transportation contractors if tarpaulins are used to cover concentrate trucks. NovaGold has also committed to participate with other industrial users of Highway 37 and government agencies to monitor the potential for metals contamination resulting from concentrate dusting along the highway.
19	Marlene Clarke Wrangell, Alaska September 7, 2006	Concentrate trucks and trailers will have tarpaulin or composite covers to reduce loss of concentrate due to dusting while underway. [Galore Creek EA, p. 5-148] Concentrate trucks should not use tarpaulins, which are notoriously "leaky". Hard-top covers should be used on concentrate trucks.	Concentrate transportation	Refer to comment 18	Refer to comment 18	See response to 18
20	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water Quality: Truck Transport - Concentrate trucks and trailers will have tarpaulin or composite covers to reduce loss of concentrate due to dusting while underway. [Galore Creek EA, p. 5-148] Concentrate trucks should not use tarpaulins, which are notoriously "leaky". Hard-top covers should be used on concentrate trucks.	Concentrate transportation	Refer to comment 18	Refer to comment 18	See response to 18

21	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	II. Cumulative Effects - Proper cumulative effects analysis is critical to a complete environmental assessment. We were very disappointed that the assessment of the Tulsequah Chief project ignored the obvious potential for the access road to lead to significant additional industrial development. We urge the EAO to avoid this mistake in the analysis of this proposed Project. We have spoken to many people on both sides of the international border. We share their concerns with respect to the potential danger to downstream interests and the need for complete analysis of both the direct impacts from the proposed Project itself and the effects of any spin-off development fostered by the proposed Project and access road.	Cumulative effects	This is a government to government issue	Government to respond	CEA Agency notes that NovaGold's cumulative effects assessment meets federal requirements. In addition, NovaGold has committed to participate with the Crown and Tahltan Central Council to help expand collective knowledge of potential cumulative effects of resource development on all valued ecosystem components.
22	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Cumulative Mining Impacts and Mine Expansion: there are numerous mine proposals and mineral explorations in the Stikine River watershed. We are concerned that environmental assessment of these projects will be done in a "piecemeal" fashion that will fail to calculate the cumulative effects such developments will have on the water quality in the Stikine River.	Cumulative effects	This is a government to government issue	No action required	See response to 21
23	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Cassiar Watch Society is based in Iskut and concerned about the wild salmon and wild rivers of northern BC, particularly the Iskut River tributary of the Stikine watershed. We are also concerned about the overall pace and scale of proposed mining and energy development in the Iskut region, and impacts upon our community due to a sadly lacking comprehensive regional infrastructure inquiry and planning process. We generally view the proposed Project, with access and infrastructure via the modified Northern Route to the Canadian port of Stewart, as the most independently comprehensive economic development opportunity for Tahltan communities, with many benefits to northwest BC mining service communities for the 2010-2030 time slot. While the NovaGold/Tahltan participation agreement was adopted hastily without wide Tahltan support (most Tahltan that use and occupy the land did not vote), when the proposed Project is viewed on a stand-alone basis for the 2010-2030 time period, it is a better project for the Tahltan than any of the other major energy and mining proposals that are out there attempting to go ahead on untreated Tahltan land. This proposed Project brings with it the beginning of the era of open pit copper mining on a grand scale within Tahltan territories. The power requirements alone boggle the mind when compared to the 1.5 megawatts needs of the whole community of Iskut. Bringing the North American centralized electrical power into Tahltan territory	Cumulative effects	The Galore Creek cumulative effects assessment followed the guidelines and requirements of the *Canadian Environmental Assessment Act* (CEAA). These guidelines require all adverse residual effects to be assessed and the level of significance of each to be determined. The selection of developments included in the EA for consideration of cumulative effects was guided by the Galore Creek Working Group, which includes Tahltan and Iskut representation. The assessment, as it appears in the Application, strictly follows CEAA requirements. The cumulative effects assessment of socio-economic issues highlighted that those effects would provide significant positive outcomes, especially in terms of opportunity and benefits to individuals, families and communities. The attainment of broad community support, and therefore a social license to operate, has been central to NovaGold's policies and activities including open house events in study communities as well as establishing a NovaGold office in Dease Lake. NovaGold have also signed a participation agreement with the Tahltan Nation to ensure social and environmental responsibility. Ratification of this agreement provides evidence of broad community support. The participation agreement has also been designed to work towards sustainability and an on-going legacy. This will assist the Tahltan in addressing many concerns regarding cumulative and on-going effects, such as boom and bust cycles.	CEAA to respond	See response to 21

		will change the economics of doing business across a wide range of industrial applications previously bound to the southern half of BC and north to Stewart. The vast region behind the Alaska panhandle becomes within the vision of lesser projects to follow when permitted to exist in a pre-treaty environment within Tahltan and other northern First Nation territories. The cumulative effects chapter (Chapter 9) begins to touch upon the scope of potential industrial enterprise under active investigation in 2006, with an eye to the 2010-2030 planning horizon for a typical 20-year mining or energy extraction project. Together the potential combined effects upon Tahltan culture, health, life style and environmental underpinning to traditional uses is huge. Some would say these impacts are all manageable given our know-how, while others would recognize the proposed pace and scale of development as a boom and bust scenario. Certainly it is beyond the scope of this cumulative effects assessment to consider the impacts of future projects that piggyback upon the infrastructure provided by the proposed Project. It is the firm belief of Cassiar Watch, and that of many wise indigenous elders that use and occupy the land, that a company proposing such widespread change as the proposed Project represents, must earn a certain social license to proceed with the good will of the host culture and community. What is the system of containment that will control the reaction started by the proposed Project approval process? Do NovaGold, its consultants, contractors and government counterparts bear a social responsibility to balance the overall regional implications, as the bringer of monumental change to the region?		Decisions regarding other developments and proposed projects in the study area are outside the scope of the EA. These are subjects for government to government discussions.		
24	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Access recommendations from the 2000 Cassiar Iskut-Stikine Land and Resource Management Plan (LRMP) were to steer mining economic development into the Canadian economy and Canadian infrastructure (see CIS LRMP economic development strategies). The preferred access alternative is presented as the modified northern route out to Hwy 37. However, the cumulative effects section indicates that at a later date, industrial traffic could be heavy if other non-renewable resource extraction projects are provided infrastructure to proceed to development during the same timeframe.	Cumulative effects	Refer to comment 23	Refer to comment 23	See response to 21

25	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	The cumulative impact assessment is inadequate. The cumulative effects assessment did not look at the summation of the currently proposed infrastructure projects in the Iskut region and wider Tahltan territories. It is the infrastructure projects which bring on secondary environmental and social impacts across the region. Too much industrial infrastructure capacity drains resources best left for future generations and reduces society's ability to pay the ongoing maintenance of such infrastructure, such as miles and miles of remote road infrastructure in the north. Non-renewable resource extraction from the Tahltan/Gitxsan and surrounding territories are obviously not sustainable over the fullness of time if these projects proceed concurrently. We have seen the near term dislocation of the forest economy in northwestern BC by unsustainable timber extraction policies. Sustainable mining is an oxymoron, as mining results in a hole in the ground. One mine at a time is sustainable use of dedicated regional industrial infrastructure. We do not need to extract the Iskut region's minerals and petroleum resources concurrently, nor super-size the Iskut region industrial infrastructure for a boom and a bust. One major extraction project at a time sets a long-term vision for the community and region of Iskut for current and future generations. It makes sense for the Galore Creek/Shaft Creek area to be considered as a planning unit for one mine and then the other in order to extend the life of the infrastructure and contribution to the regional economy over time. Iskut people could live with deferring the development east of the Stewart Cassiar Highway for at least fifty years to protect high value wildlife corridors and traditional uses. A transmission line north of Bob Quinn is not wanted or needed by Iskut people.	Cumulative effects	Refer to comment 23	Refer to comment 23	See comment to 21
26	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Again, we reserve the right to supplement these comments further. Thank you for your full attention and further consultation on these important matters.	EA process	Comment noted	None required	Comment noted

27	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	The public comment period was inadequate: We respectfully request an extension of the public review period until September 22nd, 2006. The environmental assessment (EA) documents are voluminous and present an extraordinary amount of technical material. The comment period was scheduled during the busiest part of the year when Iskut families are out fishing, hunting, guiding and camping on the land. We have not had adequate time to review, absorb and comment on the many important issues presented in the EA Application for the proposed Project. Related economic feasibility studies have not been circulated, nor have effluent standards and designs been finalized.	EA process	To be addressed by the EAO	To be addressed by the EAO	The length of the public comment period for the review of the Application was set out in an order issued by the EAO under section 11 of the *Environmental Assessment Act*. EAO considered request to extend the public comment period on the EA Application and decided no to extend the public comment period as representatives of the Tahltan Central Council, Iskut First Nation and Tahltan Band Council are participating on the Technical Working Group.
28	Bill Hesse General Manager Northern Thunderbird Air Inc. Smithers, Prince George, Vancouver, Mackenzie August 28, 2006	Letter of support	General support	No response required	No action required	Comment noted
29	C. Al McCreary President Hudson Bay Lodge Smithers, BC August 30, 2006	Letter of support	General support	No response required	No action required	Comment noted
30	Charles Northrup Partner Calderwood Realty Smithers, BC August 28, 2006	Letter of support	General support	No response required	No action required	Comment noted
31	Douglas McCrea President Central Mountain Air Ltd. Smithers, BC August 29, 2006	Letter of support	General support	No response required	No action required	Comment noted
32	Erica West Smithers, BC July 11, 2006 - Open House	The proposed Project sounds exciting. I believe the project will succeed and become prosperous. All studies have been closely examined.	General support	No response required	No action required	Comment noted
33	Glenn Bandstra President Frontier Chrysler Ltd. Smithers, BC September 6, 2006	I have lived in northern BC my whole life and welcome the new industry and business from responsible companies such as NovaGold. NovaGold's commitment to the community and the environment has been exemplary since their involvement in the proposed Project.	General support	No response required	No action required	Comment noted

34	Ian Richeits General Manager Bulkley Valley Wholesale Smithers, BC August 28, 2006	Letter of support	General support	No response required	No action required	Comment noted
35	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	We generally view the proposed Project, with access and infrastructure via the modified northern route to the Canadian port of Stewart, as the most independently comprehensive economic development opportunity for Tahltan communities, with many benefits to northwest BC mining service communities for the 2010-2030 time slot. While the NovaGold/Tahltan participation agreement was adopted hastily without wide Tahltan support (most Tahltan that use and occupy the land did not vote), when the project is viewed on a stand alone basis for the 2010-2030 time period, it is a better project for Tahltan than any of the other major energy and mining proposals that are out there attempting to go ahead on untreated on Tahltan land.	General support	No response required	No action required	Comment noted
36	John Brown President Trails North Holdings Ltd. Smithers, BC August 29, 2006	Letter of support	General support	No response required	No action required	Comment noted
37	Laird Ongman President Three Peaks Enterprises Ltd. Smithers, BC September 9, 2006	Letter of support	General support	No response required	No action required	Comment noted
38	Mark McKay President Northern Metals Fabricating and Machining Ltd. Smithers, BC August 31, 2006	Letter of support	General support	No response required	No action required	Comment noted
39	Michael Mehr Certified Accountant Edmison Mehr Chartered Accountants Smithers, BC August 30, 2006	Letter of support	General support	No response required	No action required	Comment noted

40	Phil Bandstra Bandstra Transportation Systems Ltd. Smithers, BC August 29, 2006	We write in support of the Project proposed by NovaGold We believe that the construction and development of a new mine in northwestern BC is essential to the continued economic well-being of this part of the Province, particularly with the cessation of the operations of Barrick Gold's Eskay Creek in 2007. We do not pretend to have the necessary sills to review and assess the extensive materials filed by NovaGold in support of the proposed Project; but are confident that with appropriate checks and balances in place, the proposed Project can be developed in a responsible manner. We trust that your office will ensure that those checks and balances are put in place; but encourage you to do so promptly and efficiently to ensure that northwestern BC does not miss out on the current mineral cycle. In short, we would like to express our support for the certification of the proposed Project.	General support	No response required	No action required	Comment noted
41	Robi McKnight Fireweed Motor Inn Smithers, BC August 29, 2006	Letter of support	General support	No response required	No action required	Comment noted
42	Sandra Hinchlitte Secretary Steelhead Excavating Ltd. Smithers, BC August 29, 2006	Letter of support	General support	No response required	No action required	Comment noted
43	Wayne Lillies Purchasing Smithers Lumber Yard Ltd. Smithers, BC August 29, 2006	Letter of support	General support	No response required	No action required	Comment noted
44	Gary E. Lockwood Salem, Oregon July 12, 2006 - Stewart Open House	Very professional and thorough presentation by all presenters.	General support	No action required		Comment noted
45	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Volume 3 Final Report (Section 8.5.4.3) Access road and discharge location is significantly close to the Iskut River Hot Springs Protected Area, managed by BC Parks.	Iskut River Hot Springs - Land Use Planning	NovaGold conducted noise and visual modeling to assess potential effects of the filter plant on Hot Springs Provincial Park.	NovaGold will construct a pull-out on the access road in front of the filter plant	EAO notes the Cassiar Iskut-Stikine Land and Resource Management Plan requires opportunities for the public be maintained. NovaGold has committed to provide a pull-out for visitor traffic near the filter plant so opportunities for the public to the park are maintained.

46	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Volume 3 Final Report (Section 8.5.4.3) If discharge is allowed to proceed to development, (which Cassiar Watch recommends against), then mitigation to obtain the social license to discharge to the Iskut River needs to be negotiated with the affected stakeholders and on a government to government basis with the Iskut people and their leadership. An effluent pipe discharging upstream of a major fish bearing river in Tahltan territory requires a level of consultation and accommodation specific to future use and occupation of that section of river. The use and enjoyment of the Iskut River Hot Springs and the recreational river running attributes of this scenic section of the Iskut River, combined with access to a put-in site and a take-out site along the Eskay Mine road, makes for some interesting opportunities for community-based economic development.	Iskut River Hot Springs - Land Use Planning	During the Application review, NovaGold provided additional information to the Technical Working Group on the diffuser design.	NovaGold will conduct environmental monitoring (collection and analysis of water, sediment and biota) combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project.	EAO notes that NovaGold has also committed to: modify the filter plant water treatment process if adverse effects are noted; work with Fisheries and Oceans Canada and use best management practices during the installation, operation and maintenance of the diffuser; and work with Fisheries and Oceans Canada and the Tahltan Central Councill, to ensure the design of the diffuser minimizes potential impacts on fisheries resources and waterborne traffic.
47	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Section 8.6.3. Cassiar-Iskut-Stikine (CIS) LRMP considerations describe Iskut River Hot Springs as a public use area, while filter plant plans refer to closing public access to this existing forestry road.	Iskut Hot Springs - access	The existing Devil Creek FSR will be gated at kilometre 8.3, the proposed location of the filter plant. NovaGold has discussed this access restriction with regulators and it has been agreed that NovaGold will locate a pull out area just before the filter plant. This area will provide safe parking for those visiting the hot springs. Additionally, as per the Participation Agreement, NovaGold and the Tahltan Nation will jointly develop procedures and protocols relating to the use of the access road	Develop pull out area for safe parking just before the filter plant; develop Access Road Protocol	See response to 45
48	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	NovaGold and the wider mining community should support a lasting conservation land use designation for the lower Iskut/Stikine River. Cassiar Watch Society, many resident Tahltan traditional users, river rat, fishers, hunters and recreationalists have been long time advocates for protection of the Craig River headwaters, Lower Iskut River and Lower Stikine Rive, for their contiguous high quality grizzly/salmon values and unroaded, unlogged rainforests. Such a designation would balance the long-term exploration and development of the huge mineralized landbase between the main stem Stikine and the main stem Iskut Rivers. Such development could extend use of proposed Project infrastructure to Shaft Creek for example, within this sizeable mining district.	Land use planning	Comment noted	No action required	The Province in consultation with the public, First Nations and government agencies, undertakes land use planning. The Cassiar Stikine-Iskut LRMP sets out the management direction for the area as well as strategies and objectives relating to protected areas and specific management areas, including the Lower Stikine-Iskut Coastal Grizzly/Salmon Zone.

49	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	We request that NovaGold be very clear in 2007 regarding what their intentions are over the fullness of time, vis a vis support for river and riparian conservation in the lower watersheds. We therefore request that NovaGold publicly support a lasting conservation designation for the lower Iskut/Stikine Grizzly/Salmon management zone that will assure maintenance of the roadless area status of the lower rivers rainforest and extensive riparian habitats. Such support from NovaGold would give the proposed Project a much broader social license to the energy intensive activity of extracting copper resources in the 2010 to 2030 time slot.	Land use planning	Refer to comment 48	Refer to comment 48	See response for 48
50	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	VII. Mine Size NovaGold used rather conservative mineral price estimates for its costing: a copper price of US$0.90/lb, a gold price of US$375/oz and a silver price of US$5.50/oz. This suggests that the mine might actually be twice as large as now proposed. The implications of this Project on both tailings and waste rock storage, and pit size, are not discussed in the EA. If there is a potential for the Project to be larger than discussed in the EA, the EA should specifically analyze the implication of this and develop methods to ensure the largest Project does not have harmful effects on fish, wildlife and water quality.	Mine expansion	Any significant modification to the project description as described in the EA (for example, as a result of increased reserves), would require an amendment to the EA certificate of the Project or perhaps another EA.	No action required	Comment noted
51	Craig Olson Petersburg, Alaska September 7, 2006	NovaGold used rather conservative mineral price estimates for its costing: a copper price of US$0.90/lb, a gold price of US$375/oz and a silver price of US$5.50/oz. Mineral prices are approximately double those quoted at present. This suggests that the mine might actually be twice as large as now proposed. The implications of this Project on both tailings, waste rock storage and pit size are not discussed in the EA.	Mine expansion	Refer to comment 50	Refer to comment 50	Comment noted
52	Marlene Clarke Wrangell, Alaska September 7, 2006	NovaGold used rather conservative mineral price estimates for its costing: a copper price of US$0.90/lb, a gold price of US$375/oz and a silver price of US$5.50/oz. Mineral prices are approximately double those quoted at present. This suggests that the mine might actually be twice as large as now proposed. The implications of this Project on both tailings, waste rock storage and pit size are not discussed in the EA.	Mine expansion	Refer to comment 50	Refer to comment 50	Comment noted

53	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Cumulative Mining Impacts and Mine Expansion: NovaGold used rather conservative mineral price estimates for its costing: a copper price of US$0.90/lb, a gold price of US$375/oz and a silver price of US$5.50/oz. Mineral prices are approximately double those quoted at present. This suggests that the mine might actually be twice as large as now proposed. The implications of this Project on both tailings, waste rock storage and pit size, are not discussed in the EA	Mine expansion	Refer to comment 50	Refer to comment 50	Comment noted
54	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	NovaGold calculated mine life and size using very conservative mineral price estimates: copper at US$0.90/lb, gold at US$375/oz and silver at US$5.50/oz. Mineral prices doubled with increasing demand, especially from Asia, and promise to stay higher than the above estimates. This suggests that the mine might actually be twice as large as now proposed due to mining ore bodies not considered in their proposal and mining might go on for much longer than estimated. The implications of this prospect on both tailings and waste rock storage, pit size and monitoring are not discussed in the EA.	Mine expansion	Refer to comment 50	Refer to comment 50	Comment noted
55	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	The Application for the proposed Project indicates in a number of places that there will be continuing monitoring of the Project during construction, operation and decommissioning. We would like to see a section in the Application or an addendum to it that summarizes exactly what the monitoring program will consist of, such as: what will be monitored, on what schedule, done by whom, evaluated by whom, and what actions will be taken if such monitoring reveals a problem with the design or operation of the Project.	Monitoring - water quality	Detailed monitoring programs will be a condition of permits; several detailed monitoring schedules are provided in the EA (e.g., Table 10.6-1 Aquatic Effects Monitoring Program) and it is anticipated that permits will include conditions for additional monitoring	Conduct monitoring as described in the EA and to comply with permit conditions for monitoring	EAO notes that NovaGold has committed to continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project. NovaGold will also provide annual reports and raw data from monitoring to appropriate Canadian and U.S. federal, B.C. and Alaska State agencies and the Tahltan Central Council.

56	Marlene Clarke Wrangell, Alaska September 7, 2006	Ongoing monitoring needs to be done on all ore and marginal ore stockpiles throughout the mine life and afterwards to determine if contaminants are being released.	Monitoring	During operations, drainage from the ore and marginal ore stockpiles will not flow into the receiving environment. It will be diverted to, and stored, in the tailings and waste rock storage facility. Water from the tailings and waste rock storage facility will be discharged according to a discharge schedule (mid-May to mid-October) and in a fashion that will meet receiving water criteria and permit levels. Ongoing monitoring will confirm that water discharged meets water quality criteria as defined by the MMER under the *Fisheries Act* and the regulatory and permit conditions. NovaGold is committed to maintaining the quality of downstream receiving environment water quality as stated in “Contingency for Non-Compliant Effluent” (Chapter 8, Environmental Management and Mitigation Measures, page 8-67). Once the mine is closed, the ore and marginal ore stockpiles will cease to exist as they will have already been processed in the mill, i.e. valuable ore minerals extracted and residual tailings produced. There will be a contingency plan for any marginal ore that may not be processed, such as submergence under water in the tailings and waste rock storage facility.	Monitoring	See response for 55
57	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Ongoing monitoring needs to be done on all ore and marginal ore stockpiles throughout the mine life to determine if contaminants are being released.	Monitoring	Refer to comment 56	Refer to comment 56	See response for 55
58	Craig Olson Petersburg, Alaska September 7, 2006	Ongoing monitoring needs to be done on all ore and marginal ore stockpiles throughout the mine life and afterwards to determine if contaminants are being released.	Monitoring	Refer to comment 56	Refer to comment 56	See response for 55
59	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	III. Waste Handling, Treatment and Disposal D. Ore Stockpiles Ongoing monitoring needs to be done on all ore and marginal ore stockpiles throughout the mine life and afterwards to determine if pollution is occurring.	Monitoring	Refer to comment 56	Refer to comment 56	See response for 55
60	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Monitoring and Toxicity Tests: ongoing monitoring needs to be done on all ore and marginal ore stockpiles throughout the mine life and afterwards to determine if contaminants are being released.	Monitoring	Refer to comment 56	Refer to comment 56	See response for 55

61	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Monitoring and Toxicity Tests: the only monitoring location on the Stikine River is an area with high flow, likely an erosional environment. This is an inadequate location to determine if metals and other pollutants are accumulating in depositional areas. We would like to see more monitoring locations on the Stikine River and better placement of monitoring sites.	Monitoring - aquatics	Aquatic baseline studies of water, sediment, primary and secondary production, and fish communities have been conducted at several sites along the Stikine River extending from above the confluence of Galore Creek with the Scud River to Alaskan waters. These studies provide a background assessment of environmental conditions in the Stikine River and will be used to monitor any potential changes to the Stikine River related to development of the Project. However, any change to water quality or biological communities would first manifest upstream, closer to the mine site in the Galore and Scud watersheds long before changes would be expected to occur in the Stikine River 30 km downstream. NovaGold is firmly committed to environmental monitoring throughout the life of the mine, and would respond promptly to any detected changes. Furthermore, modelling of the tailings impoundment discharge, and resulting receiving environment concentrations of metals and other constituents, predict that there will be no impacts to the Stikine River water and sediment quality.	In consultation with both American and Canadian regulators, the aquatics studies for the Galore Creek project were designed to characterize and assess potential changes to downstream water quality and biota. Monitoring of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters, will continue throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project.	EAO notes that NovaGold has committed to adding an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during the permitting stage.
62	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	V. Mine Closure The post-closure monitoring program will be designed to continue the sampling of seeps monitored during operations. Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. Monitoring once every five years, especially after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring requirements to detect environmental and structure-related maintenance issues and the budget needed to support these activities should be incorporated into post-closure funding.	Monitoring - post-closure	During operations, an Operation, Maintenance and Surveillance (OMS) plan will be developed in accordance with the Canadian Dam Association guidelines. This plan will outline plans for surveillance, maintenance and monitoring of the dam during operations, which include: • Daily visual inspections/monitoring by dam operators • Monthly water quality sampling of seepage areas from main tailings dam, surface water in the open water diversion systems and surface water in the tailings and waste rock impoundment • Annual safety inspections, to be conducted by a qualified Professional Engineer • Safety inspections following severe events such as flooding, windstorms, severe icing, extreme rainfall, seismic events, etc., to assess structural stability • Safety reviews by a qualified Professional Engineer every 5 years during construction of the main tailings dam and up to every 15 years after it is completed Details of these inspections are outlined in Section 8.4.3.2 of the Application. As a part of the closure program, a separate OMS manual will be developed for the dam. The closure plan must be reviewed and approved by geotechnical engineers from the Ministry of Energy, Mines and Petroleum Resources. During post-closure, the structural integrity of the main tailings dam and auxiliary facilities such as the operating spillway and seepage collection system will be inspected annually and maintained regularly (Section 14.4.1.4). Seepage from the dam will also be monitored during post-closure. The sampling frequency during post-closure will be established in conjunction with government agencies.	Conduct annual dam inspections and regular dam maintenance post-closure; monitor and sample dam seepage post-closure at a frequency established by the government	See response for 55

63	Craig Olson Petersburg, Alaska September 7, 2006	The post-closure monitoring program will be designed to continue the sampling of seeps monitored during operations. Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. Monitoring once every five years, especially after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring requirements to detect environmental and structure-related maintenance issues and the budget needed to support these activities should be incorporated onto post-closure funding.	Monitoring - post-closure	Refer to comment 62	Refer to comment 62	See response for 55
64	Marlene Clarke Wrangell, Alaska September 7, 2006	The post-closure monitoring program will be designed to continue the sampling of seeps monitored during operations. Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. Monitoring once every five years, especially after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring requirements to detect environmental and structure--related maintenance issues and the budget needed to support these activities should be incorporated into post-closure funding.	Monitoring - post-closure	Refer to comment 62	Refer to comment 62	See response for 55
65	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Monitoring and Toxicity Tests: further post-closure monitoring programs will be designed to continue the sampling of seeps monitored during operations. Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. Monitoring once every five years, especially after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring requirements to detect environmental and structure-related maintenance issues and the budget needed to support these activities should be incorporated into post-closure funding.	Monitoring - post-closure	Refer to comment 62	Refer to comment 62	See response for 55

66	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Benefits accrued to NovaGold shareholders need to be matched by a provision for long-term protection of the environment and fisheries. Proposed monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. There have been too many tailings ponds failures all over the world. Monitoring once every five years, especially after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring requirements to detect environmental and structure related maintenance issues and the budget needed to support these activities should be incorporated into post-closure funding. We propose monitoring every six months in perpetuity.	Monitoring - post-closure	Refer to comment 62	Refer to comment 62	See response for 55
67	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Discharging effluent to the Iskut River: suggest full study and implementation of return pipeline to the mill rather than discharge to the river. We are opposed to dumping the water from the slurry pipeline into the Iskut River. Many of the watersheds that were studied in the EA have naturally occurring elevated metals levels. Adding additional pollutants will stress fish and wildlife populations that the local residents rely on for food. We are opposed to any mixing zone in the Iskut, Scud or Galore watershed. We request that all water from the slurry pipeline be sent back to the mine site for re-use or treated to background levels before disposal by mixing this effluent into the Iskut River.	Pipeline - slurry	The development of a return pipeline to the mine site to carry the treated water from the filter plant is not a good use of resources, no only due to the estimated cost of $30M, but also due to the additional energy requirements to operate; the water that will be discharged from the filter plant into the Iskut River will be treated to meet the MMER; refer to comment 96 for a discussion on characterization of impacts relating to effluent discharge to the Iskut River from the filter plant given the worst case scenario; NovaGold is committed to maintaining the quality of downstream receiving environment water quality as stated in “Contingency for Non-Compliant Effluent” (Chapter 8, Environmental Management and Mitigation Measures, page 8-67).	Ongoing monitoring will confirm that water discharged meets water quality criteria as defined by the MMER under the *Fisheries Act* and the regulatory and permit conditions.	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
68	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Volume 3 - Final Report (Section 8.5.4.3) The cost of a return pipeline relative to overall Project cost is small and would greatly improve the social license to operate the mine. No design details of this alternative are provided.	Pipeline - slurry	Refer to comment 67	Refer to comment 67	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
69	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	IV. Slurry Pipeline and Transportation A rupture of the slurry pipeline at a stream crossing could result in the discharge of the equivalent of many truckloads of concentrate into the environment. Unlike dried concentrate, the slurry concentrate would be highly mobile. The potential of spills and spill size must be assessed and measures developed to prevent spills from harming water quality and aquatic life.	Pipeline - slurry, spill response	Industry experience has demonstrated that the transportation of liquids through pipelines is a safer alternative than overland transportation, from both an environmental and human perspective, thereby greatly reducing the likelihood of spills from a buried pipeline when compared to trucking (estimated to be 20-50 trucks per day one-way); Section 5.7 (Spill Avoidance) discusses pipeline design with respect to avoiding identified geohazards; provisions for managing spills will be put in place that include double lined pipes at bridge crossings, monitoring system and emergency shut-off valves, remotely operated emergency drain and reservoir, placed at the lowest point in the pipeline, to drain and contain the maximum content of the pipeline in the event of a rupture; development of a Spill Response Plan prior to pipeline operation and as a permit condition; persons trained in spill response on site at all times.	Develop Spill Response Plan and provide training in spill response	NovaGold has committed to equipping the pipelines with leak detection systems to permit rapid detection and response to leaks or ruptures due to erosion of the pipe or damage from external sources such as debris flows. NovaGold will also provide shutdown procedures, shutoff valves, a spill response plan and an emergency drainage sump at the low point of the slurry pipeline alignment to minimize the extent and consequence of any spillage from the pipeline following a breach to the line.

70	Craig Olson Petersburg, Alaska September 7, 2006	A rupture of the slurry pipeline at a stream crossing could result in the discharge of the equivalent of many truckloads of concentrate into the environment. The possible spill size needs to be assessed along with adequate preparation for spill response (personal training, containment, impact assessment and clean-up). Unlike dried concentrate, the slurry concentrate would be highly mobile. In this particular location, with avalanche danger and rock slides, the slurry pipeline could actually pose more potential environmental danger than trucking the concentrate in hard-topped trucks.	Pipeline - slurry, spill response	Refer to comment 69	Refer to comment 69	See response for 69
71	Marlene Clarke Wrangell, Alaska September 7, 2006	A rupture of the slurry pipeline at a stream crossing could result in the discharge of the equivalent of many truckloads of concentrate into the environment. The possible spill size needs to be assessed along with adequate preparation for spill response (personal training, containment, impact assessment and clean-up). Unlike dried concentrate, the slurry concentrate would be highly mobile. In this particular location, with avalanche danger and rock slides, the slurry pipeline could actually pose more potential environmental danger than trucking the concentrate in hard-topped trucks.	Pipeline - slurry, spill response	Refer to comment 69	Refer to comment 69	See response for 69
72	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water Quality - slurry pipeline: a rupture of the slurry pipeline at a stream crossing could result in the discharge of the equivalent of many truckloads of concentrate into the environment. The possible spill size needs to be assessed along with adequate preparation for spill response (personal training, containment, impact assessment and clean-up). Unlike dried concentrate, the slurry concentrate would be highly mobile. In this particular location, with avalanche danger and rock slides, the slurry pipeline could actually pose more potential environmental danger than trucking the concentrate in hard-topped trucks.	Pipeline - slurry, spill response	Refer to comment 69	Refer to comment 69	See response for 69
73	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Possible pipeline spills needs to be assessed along with preparation for spill response: personnel training, containment, impact assessment and clean-up. With avalanche and rock slide danger, the slurry pipeline could pose more potential environmental danger than trucking the concentrate in hard-topped trucks.	Pipeline - slurry, spill response	Refer to comment 69	Refer to comment 69	See response for 69

74	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Plans for hydropower development need to be fully revealed. Access to power is the kingpin for many other proposed development projects in the Stikine watershed and surrounding area. The method and location of power generation for this Project could greatly impact fishery resources and conservation areas set out in the LRMP. Some power options discussed could have significant impacts to the Lower Iskut/Stikine Grizzly/Salmon Management Zone's roadless area and open the area to more industrial development. Many proposals for power generation have been discussed for the Stikine region recently. NovaGold's cumulative impact assessment has not addressed how power infrastructure for this Project will affect power generation and transmission line capacity in the region. This needs to be thoroughly discussed through publicly available reports and forums in a timely manner, along with other proposed regional industrial development infrastructure. Overbuilding infrastructure for this Project puts our Iskut community vision at risk to unwanted concurrent development closer to home.	Power	As outlined in Section 5.13.7 of the Application, the development of the Project is based on power being available near Bob Quinn Lake to service the Galore Creek Mine. At Bob Quinn an interconnection substation will be constructed that will transfer the power to the Galore Creek 138 kV transmission system which will deliver it to the mine site. Power will be purchased under a contract with BC Hydro to service the Project. In August of 2006, NovaGold acquired Coast Mountain Power Corp., which was developing the Forrest Kerr Hydroelectric Project located on the lower Iskut River as well as the necessary infrastructure to link to the hydroelectric site to the closest BC Hydro interconnection point at Meziadin Junction. It should be noted that power generated at the Forrest Kerr site has been pre-sold to BC Hydro under a long-term energy contract. Coast Mountain is now held as an independent Company of NovaGold, and by utilizing its expertise in project construction and financing, NovaGold plans to construct the Forrest Kerr Project independent of the Galore Creek Mine and meet the timeline requirements stipulated in Forrest Kerr Project's contract with BC Hydro. By ensuring the development of the Forrest Kerr Project, NovaGold is providing a much needed green –renewable energy source for the Province, which will help to offset the power shortage BC Hydro is currently facing.	None required	Comment noted
75	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	What is NovaGold's real plan relative to hydro development? Are you attempting to acquire the transmission line EA approval, right of way, and potential BC Hydro operating system modifications which would meet the Project's energy demands? Actual construction of the hydro site on the Iskut River main stem could then become the secondary asset, not altogether required for the Project to proceed on schedule. Please fully explain your plans.	Power	Refer to comment 74	Refer to comment 74	Comment noted
76	S. Ross Rettie Director, Professional Practices and Ethics Association of Professional Engineers and Geoscientist of BC Burnaby, BC August 15, 2006	My comment is positive in nature and is to advise the EAO that NovaGold and their coordinating technical consultant/report authors, Rescan Environmental Services Ltd., have been extremely responsive in ensuring that the Project application is fully compliant with the *Engineers and Geoscientists Act*, concerning the requirements that each contributing professional engineer and professional geoscientist identify the areas of the report that each is responsible for, complete with the application of their professional seal/stamp, date and signature.	Professional conduct	No response required	No action required	Comment noted

77	Craig Olson Petersburg, Alaska September 7, 2006	It is good that topsoil is to be salvaged in two lifts (root zone and then lesser developed materials below it). However, the mine should salvage two lifts of material from all areas disturbed by mining. Section 5.5.7 excludes numerous large areas and no area should be excluded from soil salvage. Plant re-establishment is greatly improved by increased depths of soil and sub-soil. Nurse-crops should be established on all topsoil storage piles to protect the piles from erosion and compaction and improve biotic potential when replaced. This will increase the available material for redistribution described in Section 14.3.3.	Reclamation	Soil will be salvaged from all areas disturbed during the mining operation except the tailings pond. It is estimated that salvage from these areas will result in a net positive balance of topsoil (Section 14.3.3.3). Use of topsoil in reclamation will contribute toward establishing self-sustaining revegetation. The topsoil stockpiles will be revegetated with appropriate plant species to prevent erosion (Section 14.3.2.2).	Salvage and stockpile topsoil for use in reclamation; protect topsoil stockpiles through revegetation and other practices as described in the Application	Comment noted
78	Craig Olson Petersburg, Alaska September 7, 2006	The proposal to use "just enough organic matter to allow native seed propagation" (8.2.2.5) on waste rock piles is insufficient. Maximum available soils and organics should be calculated based on available materials and depth thereby maximized. The documents mention "excavated surface soils, organic matter" in numerous places but it is only in Section 6.12.3.6 that organic forest soils (organics and A and B horizons) are salvaged. It is unclear whether the volumes will be sufficient for intended placement and whether or not the salvaged materials will be of suitable pH (forest soils and organics are often acidic, which may inhibit plant growth).	Reclamation	It is estimated that a net positive balance of topsoil will be salvaged for use in reclamation / revegetation (Section 14.3.3.3). If required, soil amendments will be added to correct soil fertility deficiencies (Section 14.3.6.1).	Salvage and stockpile topsoil for use in reclamation; through assessment of reclamation, determine if soil amendments will be required.	Comment noted
79	Marlene Clarke Wrangell, Alaska September 7, 2006	The proposal to use "just enough organic matter to allow native seed propagation" (Section 8.2.2.5) on waste rock piles is insufficient. Maximum available soils and organics should be calculated based on available materials and depth thereby maximized. The documents mention "excavated surface soils, organic matter" in numerous places but it is only in Section 6.12.3.6 that organic forest soils (organics and A and B horizons) are salvaged. It is unclear whether the volumes will be sufficient for intended placement and whether or not the salvaged materials will be of suitable pH (forest soils and organics are often acidic, which may inhibit plant growth).	Reclamation	Refer to comment 78	Refer to comment 78	Comment noted

80	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Soil salvage: Section 5.5.7 excludes numerous large areas and no area should be excluded from soil salvage. Plant re-establishment is greatly improved by increased depths of soil and subsoil. Native plant nurse crops should be established on all topsoil storage piles to protect the piles from erosion and compaction and improve biotic potential when replaced. The proposal to use "just enough organic matter to allow native seed propagation" (Section 8.2.2.5) on waste rock piles is insufficient. Maximum available soils and organics should be calculated based on available materials and depth thereby maximized. The documents mention "excavated surface soils, organic matter" in numerous places but it is only in Section 6.12.3.6 that organic forest soils (organics and A and B horizons) are salvaged. It is unclear whether the volumes will be sufficient for intended placement and whether or not the salvaged materials will be of suitable pH Forest soils and organics are often acidic, which may inhibit pioneer plant growth.	Reclamation	Refer to comments 77 and 78	Refer to comments 77 and 78	Comment noted
81	Marlene Clarke Wrangell, Alaska September 7, 2006	It is good that topsoil is to be salvaged in two lifts (root zone and then lesser developed materials below it). However, the mine should salvage two lifts of material from all areas disturbed by mining. Section 5.5.7 excludes numerous large areas and no area should be excluded from soil salvage. Plant re-establishment is greatly improved by increased depths of soil and sub-soil. Nurse-crops should be established on all topsoil storage piles to protect the piles from erosion and compaction and improve biotic potential when replaced. This will increase the available material for redistribution described in Section 14.3.3.	Reclamation	Refer to comments 77 and 78	Refer to comments 77 and 78	Comment noted

82	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	III. Waste Handling, Treatment and Disposal C. Tailings Dam The dam is currently designed to contain the 1 in 200 wet year discharge volume. Overflow the dam would release contaminated water into the environment via the emergency spillway. For this reason, the dam and impoundment should be designed to hold water generated by the Probable Maximum Flood plus residual snowmelt.	Tailings dam - design	The Probable Maximum Flood (PMF) is a hydrological concept that is used for dam safety design. It is assumed to be the most extreme flood event that could be produced within a watershed and is often considered to be an event with a 1 in 10,000 year or higher probability of occurrence. A dam needs to be able to pass the PMF through a spillway without overtopping of the dam and the main tailings dam in Galore Creek will be designed with such a spillway. The PMF, with its associated low probability of occurrence, is used for dam safety design due to the large consequences of a dam failure. It is not a suitable design criteria for other water management structures (e.g. diversion channels), for dam storage calculations or for the development of water management plans. When designing water management structures, hydrological events with lower return period (e.g. 1-in-100 year or 1-in-200 year return periods) are used. The Galore Creek tailings facility is designed to be able to retain water without discharge from 15th October to 15th July (i.e., 9 months) in any year of mine operations, under runoff conditions up to 1 in 200 wet year conditions. These design criteria were chosen as the winter months were considered the critical months for water quality in the Galore Creek watershed. The design criteria provides for a very large volume of available storage within the tailings facility (>45 Mm3 for most of the operational life of the mine). Figure 7.5-13 of the Application illustrates the available storage volume within the storage facility and compares it to the volume of water produced in a 1 in 200 year storm event. It is clear that the facility will easily store a Q200 with no discharge through the spillway. The emergency spillway for the facility is designed to safely pass peak flows from the PMF (assumed to derive from a PMP or Probable Maximum Precipitation event) without overtopping the dam and conservatively assuming a full reservoir (water level at spillway level) at the start of the PMF event. The storage available within the impoundment will be a maximum in October each year decreasing to minimum values in the following spring and summer prior to completion of the next raise of the dam crest. Therefore, although the tailings facility is not designed to store inflows from a PMF, depending on the time of year when the PMF occurs, there may or may not be significant amounts of storage available within the reservoir. Whenever a PMF occurs during any year of operation, the combination of available storage and spillway capacity will always be sufficient to prevent overtopping of the dam. It should also be noted that high flow events are not considered the critical hydrological conditions for water quality. Under flood flow conditions, there will be high rates of runoff from natural watersheds surrounding the storage facility	As described in the Application, NovaGold will ensure that the dam will hold a one in 200 wet year nine month discharge volume and that the dam will safely pass a PMF (a 1 in 10,000 year event) in a scenario when the impoundment is already full.	The Ministry of Energy, Mines and Petroleum Resources notes the failure of the dam would result in very high environmental consequences. MEMPR is confident that the dam has been designed using conservative criteria for maximum credible earthquake and followed the Canadian Dam Association Safety Guidelines (1999). EAO and CEA Agency note that NovaGold has committed to established an ongoing initiative with the Tahltan Central Council, and relevant Canadian and U.S. federal and B.C. and Alaska State government agencies to assess, at a conceptual level, the potential effects of a catastrophic dam failure and develop a plan for remediation of those effects.

				and within the rivers downstream of the facility. These will provide dilution for any releases from the facility.		
83	Craig Olson Petersburg, Alaska September 7, 2006	The dam is designed to contain the 1 in 200 wet year discharge volume (Project Application, p. 5-158). Overflow/overtopping the dam would release contaminated water into the environment via the emergency spillway. For this reason, the dam and impoundment should be designed to hold water generated by the Probable Maximum Flood plus residual snowmelt. The final dam design is one that will contain the Probable maximum flood and there is not-Potentially Acid Generating (PAG) material available throughout the mine life (which is stored in external waste dumps). The tailings dam should be constructed so that it will also contain the Probable Maximum Flood during operation instead of the 1 in 200 year event as the dam design basis storm. (Section 5.9.3.2)	Tailings dam - design	Refer to comment 82	Refer to comment 82	Refer to response for 82

84	Marlene Clarke Wrangell, Alaska September 7, 2006	The dam is designed to contain the 1 in 200 wet year discharge volume (Project Application, p. 5-158). Overflow/overtopping the dam would release contaminated water into the environment via the emergency spillway. For this reason, the dam and impoundment should be designed to hold water generated by the Probable Maximum Flood plus residual snowmelt. The final dam design is one that will contain the Probable maximum flood and there is not-PAG material available throughout the mine life (which is stored in external waste dumps). The tailings dam should be constructed so that it will also contain the Probable Maximum Flood during operation, instead of the 1 in 200 year event as the dam design basis storm. (Section 5.9.3.2).	Tailings dam - design	Refer to comment 82	Refer to comment 82	Refer to response for 82
85	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water Quality: Tailings Dam - the dam is designed to contain the 1 in 200 wet year discharge volume (Project Application, p. 5-158). Overflow/overtopping the dam would release contaminated water into the environment via the emergency spillway. For this reason, the dam and impoundment should be designed to hold water generated by the Probable Maximum Flood plus residual snowmelt (Section 5.9.3.2).	Tailings dam - design	Refer to comment 82	Refer to comment 82	Refer to response for 82
86	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	The dam is designed to contain the 1 in 200 wet year discharge volume (Project Application, p. 5-158). Overflow/overtopping the dam would release contaminated water into the environment via the emergency spillway. For this reason, the dam and impoundment should be designed to hold water generated by the Probable Maximum Flood plus residual snow melt. The final dam design is one that will contain the Probable maximum flood and there is not PAG material available throughout the mine life (which is stored in external waste dumps). The tailings dam should be constructed so that it will also contain the Probable Maximum Flood during operation instead of the 1 in 200 year event as the dam design basis storm. (Section 5.9.3.2)	Tailings dam - design	Refer to comment 82	Refer to comment 82	Refer to response for 82

87	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	The potential for the greatest impact to the salmon, crab and shrimp resources on which our fleet depends is from a catastrophic failure of the tailings and waste rock impoundment dam. This will indeed be a significant structure. We believe the dam must be designed and built to the most conservative standards. The plan states "The intent will be to leave all the PAG waste in a flooded condition for perpetuity". Therefore not only would a dam breach result in the impacts from the event itself but it would uncover the PAG waste rock which would result in the flow of a high-level acid waste into the Scud River system for a long-term period. The fact that a dam breach would only be seen as a 50-year event at the mouth of the Stikine River does not bring any comfort. The tailings sediment, with its load of settled heavy metals, would be deposited all along the watercourse and potentially significantly increase the absorption of these metals throughout the ecosystem. Obviously, none of this is acceptable to anyone. Leaving aside the issue of how damages would be paid to users of the affected resources, it must be assured that a catastrophe such as this does not occur. We request that the design and construction criteria for the dam structure be reviewed with the appropriate U.S. and Alaska government agencies and that all concerned be in accordance on the final design and construction standards. We trust that the most conservative criteria will be used and that those conservative criteria will result in the highest probability that the dam structure will indeed last into perpetuity.	Tailings dam - integrity	The tailings dam has been designed to meet or exceed the Canadian Dam Associations – Dam Safety Guidelines. The final outer dam slopes have been designed to withstand ground motions associated with the Maximum Credible Earthquake (MCE) without allowing catastrophic failure. Estimates of permanent displacements and crest settlements of proposed rockfill dam during this MCE were estimated using various pseudostatic methods including: Seed, 1979; Newmark, 1969; Swaisgood, 1998 and Bureau et al., 1985. Using these methods, the estimated deformations range from 0.1 to 0.3 m. These deformations are considered to be moderate and will be accommodated by ensuring sufficient freeboard and crest width, as well as by thick filter zones flared onto the abutments. The freeboard on the proposed Galore tailings dam will vary from 12 to 9 m over the life of the mine, so the estimated seismic displacements are far less than the freeboard. In addition, the ultimate crest width is 30 m wide and the two downstream filter zones are each 4 m wide so any lateral displacements caused by an earthquake will not impair the functionality of the filters. Lastly, BGC Engineering Inc. has retained two renowned senior geotechnical engineers to review the geotechnical engineering design for this project: Dr. N.R. Morgenstern & Dr. A. M. Robertson.		NovaGold has committed to constructing the tailings dam to Canadian Dam Association guidelines (19990 to withstand a 1 in 10,000 year earthquake and avalanche induced wave and to safely pass a Probable Maximum Flood. U.S. federal and Alaska State government agencies will have opportunities to review and comments on key provincial permit applications such as the *Mines Act* and *Environmental Management Act* permits.
88	Gayle Gross Wrangell, Alaska September 8, 2006	As a resident of Wrangell, Alaska, I can understand the importance of resource development in our state as well as in Canada. That being said, my concern is from the standpoint of living downriver of this Project. Any breach or failure of the proposed earthen dam will affect our side of the river. I understand that this dam will rank third highest for earthen dams in the world, when complete. I ask that you consider your downstream neighbors, as well as the Canadians living and working the lower end of your border on the Stikine River, during this assessment process.	Tailings dam - integrity	Refer to comment 87	Refer to comment 87	See response for 87
89	Angela Brand Danuse Stewart, BC Mayor, District of Stewart July 12, 2006 - Open House	The Council of the District of Stewart does not have any concerns regarding the Project. As Mayor, I talk to the community and the majority of comments I receive are favorable and in anticipation of the Project starting. As for the projected number of trucks that would be going though the community, because other projects (current ones) will be stopping before this one is up and running, we will be welcoming trucks. Very informative presentation and great slides that help visualize the discussion.	Truck traffic - Stewart	No response required	No action required	Comment noted

90	Frank Kamermans Debbie Kremzar Bitter Creek Mercantile Ltd. Ripley Creek Inn Ltd.	As a resident, business person and significant landholder in Stewart, I believe that the secondary and tertiary environmental effects that this Project might have are serious and have not been addressed forthrightly. It appears a lot of work has been done to mitigate environmental concern directly on or adjacent to the Project site and special attention has been given to the enviro/sociocultural impacts of that neighbourhood, all to the company's credit. However, to simply leave Stewart as a beneficiary of the transportation and shipping in the positive light of "jobs" neglects to identify their impacts. The number of trucks and those anticipated from other projects will have a significant and dramatic detrimental effect on our main street. My wife and I have seven buildings with businesses on this route, all of which are historically significant and have been restored in the past ten years (or continue to be restored) to create a context and provide a livable community as opposed to a boom/bust this town otherwise devolves into after "the mine closes". We have occupied them with either lease purchase operators in the case of the gas station and a grocery store or our own businesses which include hotel buildings, a gift shop, a museum, one of the finest restaurants in the northwest and currently finishing up the restoration of a bus depot and gallery. Our efforts and investments are generally tourism supported and grow despite a declining population and are no major 'part-time' employer. Our vision entails sustainable incremental growth and is not based on anticipation of another boom and the short-term windfalls that are inherent in the long term pains of such development.	Truck traffic - Stewart	An analysis of all alternatives was undertaken during the development of the Project design and supporting infrastructure. This analysis included consideration of transportation options. The currently most viable route is the one which is proposed. However, should the construction of a by-pass in Stewart proceed as outlined in the official Community Plan, NovaGold would be in support and alter its current transport route to take advantage of the by-pass. The effects assessment considered potential effects of the Project on Stewart. From an issues scoping exercise, which included direct input from public open house events and interviews with key informants in Stewart, the following valued components were identified: economic development, business development, employment, incomes and traffic. The effects assessment reported that positive effects would result for all valued components, with the exception of traffic and transportation in Stewart. The analysis showed that adverse traffic and transportation effects would be experienced during the operational phase of the Project. However, balanced against the positive gains of employment, incomes, business opportunities and economic development, the significance of the adverse transportation effects was reduced. This balance is especially important in light of the forthcoming closures of the Huckleberry and Eskay Creek mines which generate significant taxes and income in Stewart.	No action required	EAO notes that NovaGold has committed to participate with other Port of Stewart users and the Ministry of Environment in a joint air monitoring program. NovaGold is also willing to use an alternate access route through Stewart if one is developed.

91	Frank Kamermans Debbie Kremzar Bitter Creek Mercantile Ltd. Ripley Creek Inn Ltd.	It has been suggested by local government representation and the bulk terminal owner on many occasions and again with the possible increase in traffic that a bypass of Main Street across the Bear River estuary and wetlands is an option. I would like to identify that my wife and I own 500 feet of estuary frontage (from 5th Avenue to 3rd Avenue and a block across), which includes two salmon rearing and spawning streams as well eight more of our buildings, many historical and some that were moved to avail themselves of the site and all of which are adjacent to the main street holdings. Our Ripley Creek Inn had four separate buildings that front the estuary and preserve a natural boundary for wildlife and waterfowl to everyone's benefit. We maintain and promote good stewardship of this invaluable asset, however are often stymied by local authorities that continue to erode the fringes of the wetlands, often in direct contravention of protection agencies and with impunity. This may be beside the point, but after years of effort and investment in the natural values of Stewart, values that seem self-evident to any visitor, we are no longer prepared to idly stand by and watch an unholy league of company, local politician and port operator lay waste to it. In defense of the wetland and its denizens and to use an apropos analogy, we are no longer willing to let you 'crap in our nest'.	Truck traffic - Stewart	Refer to comment 90	Refer to comment 90	See response to 90

92	Frank Kamermans Debbie Kremzar Bitter Creek Mercantile Ltd. Ripley Creek Inn Ltd.	I need to be satisfied that every option and every possible alternative is soundly considered free of prejudice; that the environmental issues here confront the same rigorous scrutiny that they would be subject to on the mine site if it was in downtown Whistler. I believe this company independently (or more likely as a soon to appendage of a huge faceless and soulless multinational) has even more obligation to satisfy every person and community touched by its process. So much so that beyond the traffic and estuary/wetland destruction issues, maybe marine transport issues like, where they flush toilets? Ultimately who does what with the product when and where. The cost of being big.	Truck traffic - Stewart	Refer to comment 90	Refer to comment 90	See response to 90
93	Gody Appenzeller Owner & Operator Harbour Lights General Store Stewart, BC September 4, 2006	My wife and I own & operate the Harbour Light General Store in Stewart. We hope and commend NovaGold for choosing Stewart as their seaport destination. Any increase in the community of Stewart would be a blessing in our store. The concern my wife and myself have is with the increased traffic that would come along 5th Avenue (Stewart's main street downtown; also known as 37A). It could potentially have a negative impact on our business. If NovaGold chooses to use property from the District of Stewart on the eastern seaboard of the harbour, these concerns would be eliminated. If you need more information, I would gladly provide it to you.	Truck traffic - Stewart	Refer to comment 90	Refer to comment 90	See response to 90

94	Gody Appenzeller President Stewart Harbour Authority Stewart, BC September 4, 2006	Firstly, I would like to thank NovaGold for considering the Port of Stewart for their shipping needs. If it comes to fruition, we will have tremendous opportunities to support each other. As of today, we don't know which properties NovaGold is considering to receive, store and load their ore onto ocean-going vessels; this is where one of our concerns lies. If truck traffic comes through downtown on Highway 37A over to Stewart Bulk, it will pass by our harbour, which is situated on a very narrow stretch of highway. Presently this area has insufficient access to parking, loading, unloading of supplies and equipment and no boat-launch facility. This has been, and is today, a contentious issue with the traffic we have now. As of today we have approximately 40,000 to 50,000 tourists annually crossing the Canadian border from Hyder to Stewart (using highway 37A), not counting local commercial truck traffic coming and going to Stewart Bulk Terminal. At the same time more and more traffic is also happening in our harbour as people choose Stewart as their new home; all of this in a three-km perimeter. The Stewart Harbour Authority and the Portland Canal Stewart Yacht Club 2000 are both nonprofit corporations run totally by volunteers with a very small budget. Many Harbour Master Presidents from Stewart Yacht Club have addressed these issues with Land and Water BC, Ministry of Highways, Fisheries and Oceans, and mayor and council of the District of Stewart, with their support to mitigate the problems (i.e. access to parking, loading, unloading and a boat-launch). If required, I have many letters and blueprints from the past from the various government departments in my office and can make them available to you. If NovaGold should choose the second option and negotiates a proposal for the property at the District of Stewart to lease and build their own multi-purpose docking facility over on the eastern seaboard of the Stewart Harbour, it would eliminate most of the commercial truck traffic concerns, as this access would bypass the town. Over five years ago, the Stewart Yacht Club built a boat-launch ramp on the eastern seaboard, but over time, the Bear River silt has built up and the accessibility is limited.	Truck traffic - Stewart	Refer to comment 90	Refer to comment 90	See response to 90
95	Bonnie Demerjian Stikine River Books Wrangell, Alaska September 5, 2006	As a Wrangell resident and one who cares deeply about the future of the Stikine River, I want to remind you that "everyone lives downstream". I am aware that you have conducted environmental studies; in what depth and in what measure of caring, I can't begin to know. I only hope that something besides the bottom line is ruling the expected decision to open this mine. So far, BC	Water quality	NovaGold has committed to monitoring of water, sediment and aquatic organisms of receiving water sites. Weekly water sampling is conducted during freshet, quarterly sampling at a suite of sites through the area, and monthly sampling at key sites, to characterize spatial and temporal variability in water quality.	Site-specific water quality objectives are proposed for the Project, in light of the naturally high concentrations of many metals in waters of the region. These objectives will allow assessment of changes in water quality signaling potential impacts. Monitoring will continue through the	EAO notes that NovaGold has committed to continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments

		has evidenced extreme nonchalance in regard to the sustainability of its natural resources and the maintenance of wilderness areas in the south. Now the north is being made ready for despoliation. In the past, Wrangell and the upper river had a closer connection that faded some with the building of Highway 37, but there is a growing awareness here of the importance of the Stikine as a wild place. The salmon too, are a valuable and mutual resource. Have you truly addressed the problem of keeping the water pure? I will be following with great interest the future of the Project, as will the entire town of Wrangell. After all, we're downstream.		Water quality modelling of the controlled release of effluent from the tailings impoundment facility into Galore Creek indicated that potential impacts to water quality would be low in magnitude and would be restricted to the upper section of the Scud River immediately below its confluence with Galore Creek.	life of the mine and following closure to ensure that downstream environments are not impacted by effluents discharged from the Project. Monitoring results will be reported to government agencies.	are not impacted by effluent discharged from the Project. NovaGold will also provide annual reports and raw data from monitoring to appropriate Canadian and U.S. federal, B.C. and Alaska State agencies and the Tahltan Central Council.
96	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	III. Waste Handling, Treatment and Disposal B. Filter Plant The treatment proposed for the effluent discharge from the filter plant requires a 0.7km mixing zone in the Iskut River. We recommend that full characterization of impacts needs to be done using maximum discharge with least dilution, i.e. worst case scenarios. The use of additional treatment to remove metals and other possibly toxic substances in the discharge needs to be fully discussed in the EA and measures developed to ensure there are no water quality impacts or dangers to fish and wildlife from discharge.	Water quality - Iskut River / filter plant	In the Application, characterization of impacts relating to effluent discharge to the Iskut River from the filter plant addressed the worst case scenario to be encountered on an annual basis, i.e. annual seven-day low flow. During annual seven-day low flow, model calculations determined a dilution factor of 140:1 between river water and effluent at 7 m to 51 m downstream of the discharge point (Table 7.6-18). Using the hazard quotient calculations (Table 7.6-20), it was determined that at worst, there is potential for low-level effects to aquatic receptors under the seven-day low flow scenario. According to Table 7.6-18, the worst case scenario would be encountered during a seven-day Q10 scenario, i.e. lowest flow rate over seven days in ten years. Characterization using this worst case scenario was not presented in the Application. Upon re-evaluation of the data using the seven-day Q10 scenario (Table 1- available from NovaGold), it was found that HQ values ranged from 0 to 4.3, indicating that at worst, the potential exists for low-level effects to aquatic receptors due to changes in water quality from filter plant effluent release. The maximum HQ value was for copper, which is the primary component of the concentrate. Thus, the conclusions of the effects assessment for the worst-case scenario, i.e. seven-day Q10 scenario, is the same as presented in the Application. Site-specific water quality objectives for the receiving environment will be established in conjunction with BC Ministry of Environment regulators. Effluents will meet these objectives to ensure that the downstream environments are protected. Treatment of discharges from the concentrate filter plant will produce effluent meeting MMER requirements and discharge permit levels.	Monitoring of water, sediment, and biota, alongside chronic and acute toxicity testing of the receiving waters, will continue through the life of the mine and following closure to ensure that downstream environments are not impacted by discharged effluents from the Project.	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

97	Marlene Clarke Wrangell, Alaska September 7, 2006	Filter plant - the filtration and precipitation treatment proposed for the effluent discharge from the filter plant will require a 0.7km mixing zone in the Iskut River (Section.7.2.3 of the Application - Water Treatment and Discharge, p. 5-146). It appears that a dilution of 120 will be required for copper, which is highly toxic to fish. Full characterization of impacts needs to be done using maximum discharge with least dilution scenarios. The use of additional treatment to remove metals and other possibly toxic substances in the discharge needs to be fully discussed in the EA.	Water quality - Iskut River / filter plant	Refer to comment 96	Refer to comment 96	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
98	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water Quality - filter plant: the filtration and precipitation treatment proposed for the effluent discharge from the filter plant will require a 0.7km mixing zone in the Iskut River (Section.7.2.3 of the Application - Water Treatment and Discharge, p. 5-146). It appears that a dilution of 120 will be required for copper, which is highly toxic to fish. Full characterization of impacts needs to be done using maximum discharge with least dilution scenarios. The use of additional treatment to remove metals and other possibly toxic substances in the discharge needs to be fully discussed in the EA.	Water quality - Iskut River / filter plant	Refer to comment 96	Refer to comment 96	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
99	Craig Olson Petersburg, Alaska September 7, 2006	Filter plant - the filtration and precipitation treatment proposed for the effluent discharge from the filter plant will require a 0.7km mixing zone in the Iskut River (Section.7.2.3 of the Application - Water Treatment and Discharge, p. 5-146). It appears that a dilution of 120 will be required for copper, which is highly toxic to fish. Full characterization of impacts needs to be done using maximum discharge with least dilution scenarios. The use of additional treatment to remove metals and other possibly toxic substances in the discharge needs to be fully discussed in the EA.	Water quality - Iskut River / filter plant	Refer to comment 96	Refer to comment 96	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
100	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Our family commercial fishes on the lower Stikine River. We have observed that the Iskut salmon runs have not recovered from the hovercraft operation in the 1990s. Great care must be taken to protect the Iskut. Filtration and precipitation treatment proposed for the effluent discharge from the filter plant will require a 0.7km mixing zone in the Iskut River (Section.7.2.3 of the Application - Water Treatment and Discharge, p. 5-146). It appears that a dilution of 120 will be required for copper, which is highly toxic to fish. Full characterization of impacts needs to be done using maximum discharge with least dilution scenarios. The use of additional treatment to remove metals and other possibly toxic substances in the discharge needs to be fully discussed in the Environmental Assessment.	Water quality - Iskut River / filter plant	Refer to comment 96	Refer to comment 96	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

101	James Bourquin Wild River Director Cassiar Watch Iskut, BC September 8, 2006	Volume 3 Final Report, Section 8.5.4.3 1. Water treatment details not released or finalized (Section 8.6.2), therefore impossible to comment further than Cassiar Watch disapproves of dumping the 70 cubic meters per day liquid fraction into the Iskut River for the life of the mine.	Water quality	Water treatment plans for the filter plant will be detailed in the feasibility study and will be a requirement of permit conditions	NovaGold will develop final designs for the filter plant water treatment facility in the feasibility studies	See response for 55. In addition, NovaGold has specifically committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
102	Craig Olson Petersburg, Alaska September 7, 2006	Tailings Pond Discharge: in addition to Galore Creek, the Scud River will be used as a mixing zone for ammonia, selenium and cadmium mine effluent discharge. There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River for many constituents, most notably ammonia, lead, zinc and cadmium (Section 7.6.4.1 Effluent Discharge, p. 7-231, and Table 7.6-16). There is no prediction of the length of the mixing zone required for the Scud River.	Water quality - Galore Creek, Scud River/ tailings discharge	Hydrodynamic modelling was performed to predict Galore Creek dilution in the Scud River. Winter low-flow and summer high flow conditions were modeled for both baseline and operational, i.e. effluent discharge, scenarios. Please refer to Section 7.6.2.2 for an overview of the model. Section 7.6.4.1 (pages 7-233 to 7-247) presents the results of the model, including mixing lengths for selected parameters.	Ongoing monitoring will confirm the accuracy of the models	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
103	Marlene Clarke Wrangell, Alaska September 7, 2006	Tailings pond discharge: in addition to Galore Creek, the Scud River will be used as a mixing zone for ammonia, selenium and cadmium mine effluent discharge. There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River for many constituents, most notably ammonia, lead, zinc and cadmium [Section 7.6.4.1 Effluent Discharge, p. 7-231, and Table 7.6-16). There is no prediction of the length of the mixing zone required for the Scud River.	Water quality - Galore Creek, Scud River/ tailings discharge	Refer to comment 102	Refer to comment 102	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
104	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water quality - tailings pond discharge: in addition to Galore Creek, the Scud River will be used as a mixing zone for ammonia, selenium and cadmium mine effluent discharge. There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River for many constituents, most notably ammonia, lead, zinc and cadmium [Section 7.6.4.1 Effluent Discharge, p. 7-231, and Table 7.6-16). There is no prediction of the length of the mixing zone required for the Scud River.	Water quality - Galore Creek, Scud River/ tailings discharge	Refer to comment 102	Refer to comment 102	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
105	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	Unlike other rivers, sockeye salmon spawn in the numerous side channels of the Stikine and Scud. Tailings pond discharge: in addition to Galore Creek, the Scud River will be used as a mixing zone for ammonia, selenium and cadmium mine effluent discharge. There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River for many constituents, most notably ammonia, lead, zinc and cadmium (Section 7.6.4.1 Effluent Discharge, p. 7-231, and Table 7.6-16). There is no prediction of the length of the mixing zone required for the Scud River.	Water quality - Galore Creek, Scud River/ tailings discharge	Sockeye have not been found to spawn in the Scud River further than ten km upstream from the confluence of the Scud and Stikine Rivers. This does not overlap with the mixing zone at the confluence of the Scud River and Galore Creek; refer to comment 102 for discussion on mixing zone in the Scud River	On-going monitoring will confirm the accuracy of the models	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

106	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	The planned discharge from the mine site into Galore Creek seems to present a very acceptable situation in most cases. It is interesting that the predicted sulphate and zinc concentrations during the summer high flow when the effluent is being discharged will be lower than those in Scud River during winter low flow conditions when no effluent is being discharged. At least this is what the flow and dilution model in the Application suggests. From tables 7.6-14 through 7.6-16, it is apparent that the ammonia residue from blasting agents and zinc have significant hazard quotients (HQ). Some heavy metals such as cadmium, lead, and others also demonstrate HQ greater than one under the worst-case model of water quality in the mine discharge area. We understand that some heavy metals have an HQ actually lower in Galore Creek than in the Scud River due to the settling of particulates in the tailings impoundment area. The Application states: "For dissolved zinc and ammonia, the potential exists for moderate effects to aquatic life at the mouth of Galore Creek". The Application does not indicate what steps will be taken to mitigate this issue. The view seems to be that because there are high levels of metals naturally occurring in the Galore Creek/Scud River aquatic environment, the elevated levels of ammonia, zinc and other metals do not have to be addressed and mitigated. We do not agree.	Water quality - Galore Creek, Scud River/ tailings discharge	With respect to effluent release from the tailings and waste rock storage facility, NovaGold is committed to meeting or exceeding all water quality criteria and maintaining water quality downstream as stated in "Contingency for Non-Compliant Effluent" (Chapter 8, Environmental Management and Mitigation Measures, page 8-67). The following mitigative measures for the release of effluent from the tailings and waste rock storage facility into Galore Creek were listed in the Application (Table 7.6-4): • Restricted periods of effluent discharge (May to October), with option to delay for up to three months, pending effluent quality • Environmental effects monitoring of water (refer to Section 10.6, Aquatic Effects Monitoring Program).	Extensive and on-going water quality monitoring during operation	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
107	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	We oppose the concept of mixing zones and believe that the receiving water environment should be protected from development activity and that the development activity should be able to support the treatment of effluent that results from its operations. This should be the case with this Project as well.	Water quality	Site-specific water quality objectives for the receiving environment will be established in conjunction with MOE regulators. Effluents will meet these objectives to ensure that the downstream environments are protected. Treatment of discharges from the concentrate filter plant will produce effluent meeting MMER requirements and discharge permit levels.	Monitoring of water, sediment, and biota, alongside quarterly chronic and acute toxicity testing of the receiving waters, will continue through the life of the mine and following closure to ensure that downstream environments are not impacted by discharged effluents from the Project.	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
108	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	The proposal to discharge effluent from the concentrate filter plant at a concentration of 0.02 mg/L for dissolved copper and 0.15 mg/L for particulate copper into the Iskut River, whose natural level of copper is as low as 0.0003 mg/L, is unacceptable. The use of a mixing zone to dispose of industrial waste should not be permitted. The fact that the natural concentration of copper is as high as "0.018 mg/L during freshet" indicates that it is at that elevated level for relatively short periods of time. The effluent should be processed to the point of the mean concentration (measured on a weighted time basis) of the receiving water to protect the aquatic habitat of the respective systems. This will avoid any increased impacts due to future aggregations of projects, each with their respective "mixing zones" which could add to total levels of heavy metals in the watershed.	Water quality - Iskut River/filter plant	The protection and maintenance of water quality and aquatic habitat in the Iskut River downstream of the filter plant will be maintained and mitigated through monitoring of sediment, benthos, water quality, fish and toxicity test results, as outlined in the Aquatic Effects Monitoring Program (Section 10.6).	Aquatic effects monitoring	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

109	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	We are pleased to have the opportunity to comment on the proposed Project. This is a very significant project and appears well capable of providing significant economic opportunity to the area in which it is located, as well as good economic returns. United Southeast Alaska Gillnetters does not support or oppose the Project. Our main concern, similar to that of the native peoples in the area, is that the Project be developed in such a way that it protects the existing lifestyles and industries that have existed for a long period of time on the resources that area provides, or, in the case of salmon, nurtures. We are, of course, concerned mainly about potential and actual impacts on the salmon, and to a lesser extent, the crab and shrimp resources that depend on the Stikine estuary and its tributary systems.	Water quality	Most of the salmon fisheries occur on the Stikine River, approximately 40 km downstream of the mine site. Our modelling predicts that the mine will have no impact on water, sediment, or fish tissue quality in the Stikine, or lower Scud River.	Long-term monitoring of water at the discharge point, and sediment and tissue quality in the near-source receiving environment will ensure that the mine has no impact on these parameters. Should an effect be detected, tailings and effluent management practices will be adjusted.	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream. NovaGold has committed to maintain intensive receiving environment, aquatic, fisheries and wildlife monitoring programs, developed in cooperation with university researchers, regulatory agencies and the Tahltan Central Council, to ensure aquatic, water quality and wildlife resources are not impacted by the Project and protected for future generations. NovaGold has also committed to add an additional monitoring site downstream on the Stikine River at a depositional site to be determined during the permitting stage.. NovaGold will continue conducting receiving environment monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project.
110	Lana Parker Wrangell, Alaska July 24, 2006	I am a resident of Wrangell, Alaska and am concerned about the Project. I would like to know what assurances we have downstream that there will be zero outflow from this Project. Open pit mining brings tailings to the surface where they are crushed and exposed to the elements. This exposure ensures that the release of (sometimes) toxic (in large quantities) chemicals are released into the surroundings. I would like to know how these elements will all be retained on the site.	Water quality	Modelling of water and sediment quality of the tailings impoundment discharge and resulting receiving environment concentrations of metals and other constituents predicts that there will be no impacts to the Stikine River. Site-specific water quality objectives (WQOs) will be established in conjunction with MOE regulators. Effluents will meet discharge permit conditions and receiving waters will meet these WQOs to ensure that the downstream environment is protected. Treatment of effluent from the concentrate filter plant will follow MMER requirements.	In consultation with both American and Canadian regulators, the aquatics studies for the Project were designed to characterize and assess potential changes to downstream water quality and biota. Monitoring of water, sediment, and biota, alongside quarterly chronic and acute toxicity testing of the receiving waters, will continue through the life of the mine and following closure to ensure that downstream environments are not impacted by discharged effluents from the Project	See response for 109.
111	Lana Parker Wrangell, Alaska July 24, 2006	The Stikine is a jewel and it is hard for me to imagine what possible fortune might be worthy of its jeopardy. It is irreplaceable, whatever amount of gold and copper reside in Galore Creek.	Water quality	Comment noted	No action required	Comment noted
112	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver,	III. Waste Handling, Treatment and Disposal A. Tailings Pond We recommend that NovaGold treat discharges from the tailing pond to meet background water quality levels in the Scud and Iskut rivers. Currently, there is no treatment proposed for the	Water quality	Site-specific water quality objectives will be established in conjunction with MOE regulators. Effluents will meet these objectives to ensure that the downstream environment is protected.	Monitoring will continue throughout the life of the mine and following closure, to ensure that downstream environments are not impacted by discharged effluents from the Project. Monitoring results will be reported to	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

	Whitehorse, Juneau September 8, 2006	tailings pond discharge to Galore Creek and Scud River. With natural background for many metals and other constituents greater than water quality guidelines in both the Scud and Iskut rivers, there may be little assimilative capacity for additional load from the effluent discharges. Increasing metal and other constituent even more could be harmful to aquatic life.			government agencies.	
113	Craig Olson Petersburg, Alaska September 7, 2006	With natural background for many metals and other constituents greater than water quality guidelines in both the Scud and Iskut rivers, the contaminants discharged add to the total contaminant load of the rivers. Since the rivers already are carrying metals in excess of water quality guidelines, there may be little assimilative capacity for additional load from the effluent discharges. Increasing metal and other constituent concentrations even more cannot be conducive to sustaining aquatic life, and could be detrimental to any species on the edge of survival. The best discharge scenario would be for the mine to treat discharge effluent to meet background water quality levels in the Scud and Iskut rivers.	Water quality	Refer to comment 112	Refer to comment 112	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
114	Marlene Clarke Wrangell, Alaska September 7, 2006	With natural background for many metals and other constituents greater than water quality guidelines in both the Scud and Iskut rivers, the contaminants discharged add to the total contaminant load of the rivers. Since the rivers already are carrying metals in excess of water quality guidelines, there may be little assimilative capacity for additional load from the effluent discharges. Increasing metal and other constituent concentrations even more cannot be conducive to sustaining aquatic life and could be detrimental to any species on the edge of survival. The best discharge scenario would be for the mine to treat discharge effluent to meet background water quality levels in the Scud and Iskut rivers.	Water quality	Refer to comment 112	Refer to comment 112	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

115	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water Quality: Tailings Pond Discharge: with natural background for many metals and other constituents greater than water quality guidelines in both the Scud and Iskut rivers, the contaminants discharged add to the total contaminant load of the rivers. Since the rivers already are carrying metals in excess of water quality guidelines, there may be little assimilative capacity for additional load from the effluent discharges. Increasing metal and other constituent concentrations even more cannot be conducive to sustaining aquatic life and could be detrimental to any species on the edge of survival. A better discharge scenario would be for the mine to treat discharge effluent to meet background water quality levels in the Scud and Iskut rivers.	Water quality	Refer to comment 112	Refer to comment 112	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
116	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	With natural background for many metals and other constituents greater than water quality guidelines (in both the Scud and Iskut rivers, the contaminants discharged add to the total contaminant load of the rivers. Since the rivers already are carrying metals in excess of water quality guidelines, there may be little capacity to assimilate additional load from effluent discharge. Increasing metal and other constituent concentrations even more cannot be conducive to sustaining aquatic life and could be detrimental to any species on the edge of survival. The Scud River shrimp especially come to mind here. The best discharge scenario would be for the mine to treat discharge effluent to meet background water quality levels in the Scud and Iskut rivers.	Water quality	Refer to comment 112	Refer to comment 112	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
117	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	First a general comment on the Application: from our cursory review of this extensive document, we believe it to be a very thorough and comprehensive report. We have only reviewed sections of specific interest and we apologize if we raise concerns that are addressed elsewhere in the Application. It is apparent to us that this Project will go forward based on current market prices. We hope the models used in the analysis prove to be correct and the Project indeed operates with minimum environmental damage. If the models prove inaccurate, we trust that the Canadian authorities will make the necessary adjustments to assure that environmental degradation is minimized.	Water quality - prediction models	On-going monitoring will confirm the accuracy of the models	NovaGold will work with authorities to ensure compliance	See response for 55.

118	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	This Project would be located in Canada, east of Wrangell, Alaska near the Galore Creek and Scud rivers, both of which lead to the Stikine River. The Project has the potential to impact other streams and rivers that are part of the Stikine River watershed. The Stikine River flows into southeast Alaska and many people here rely on this river for clean healthy salmon, Dungeness crabs, other fish and seafood, commercial tourism and recreation. The Stikine River supports all five pacific salmon species. The Stikine Flats are extremely important to Alaskans; they make up the largest estuary ecosystem in southeast Alaska and the Dungeness crab and dive fisheries rely directly and indirectly upon this estuary. Further, residents of Wrangell and Petersburg depend on the Stikine River for high-quality fishing, hunting, and other wilderness experiences. Any pollution or degradation of fish habitat in the Stikine watershed will adversely harm the people in southeast Alaska, and developments on the Canadian side of the Stikine River, like the proposed Project, have the potential to adversely affect our members' and constituency's quality of life, yet provide no economic benefits to Alaskans. For these reasons, we are very concerned about developments in the Stikine River watershed and have concerns about the Project.	Water quality	Mr. Camus's concerns have been documented and addressed in full throughout this table.	n/a	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
119	Marlene Clarke Wrangell, Alaska September 7, 2006	Please note that I am a resident of Wrangell, Alaska, which sits at the mouth of the Stikine River. Our community depends on the fish runs up the Stikine River. Five species of salmon use the Stikine as a highway to their spawning grounds. Eulachen, trout, migratory birds and river wildlife which use the river and depend on the land abutting the river, could be irreversibly damaged from this mining proposal. To think of the mighty Stikine becoming a poisoned waterway saddens me. Of what use would this beautiful river be to anyone if the waters were so poisoned it was no longer a resource for food and recreation? My family not only uses the Stikine for hunting and fishing, but also to play and travel on. Please seriously consider my comments.	Water quality	Ms. Clark's concerns have been documented and addressed in full throughout this table.	n/a	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.

120	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	Our concerns cover four major areas: the design and maintenance of the tailings dam; the discharge of effluent into Galore Creek from the mine site; the discharge of effluent into the Iskut River from the slurry dewatering process; and the continued monitoring of the Project during construction and operation to assure that the assumptions made for the models in the Application are appropriate. If they are found to be in error, the proper adjustments should be made to bring the operation into compliance with Metal Mining Effluent Regulations permit levels. A fifth concern would have been the construction of the access road to the mine, but we believe that with the proper project design and administration, the potential impacts from this activity will be relatively short lived and minimal compared to the others mentioned above.	Water quality	Mr. Duckett's concerns have been documented and addressed throughout this table.	n/a	See response for 55 and 87.
121	Kenneth Duckett Executive Director United Southeast Alaska Gillnetters Ketchikan, Alaska August 27, 2006	This is a very significant project that should provide economic benefits to the area in which it is located, the regional economy in general and its owners. We believe some of these economic resources should be used to further improve the effluent treatment for the Project, eliminating mixing zones and providing for increased project monitoring. We appreciate the opportunity you have afforded us to comment on this project and its EA. We hope the long-term results of your efforts produce a project that protects the environment and of which all affected parties can be proud.	Water quality	Mr. Duckett's concerns have been documented and addressed in full throughout this table.	n/a	See response for 55. In addition, NovaGold has committed to meeting or exceeding all water quality criteria and maintain water quality downstream.
122	Chris Zimmer US Coordinator Transboundary Watershed Alliance Vancouver, Whitehorse, Juneau September 8, 2006	V. Mine Closure The tailings pond will be left in perpetuity to preserve a reducing environment. It is unclear whether or not there is adequate planning to protect terrestrial wildlife and birds from contacting contaminated tailings materials or contaminated water.	Wildlife exposure pathway from tailings	The tailings and all potentially acid-generating rock from the mine will be submerged by at least four m of water in the tailings impoundment. The water quality model, presented in Section 7.6 of the Application, predicted that the concentrations of the parameters analyzed in water will approach baseline soon after closure, given the dilution effect of the large tailings facility. The addition of large amounts of water to the tailings facility will raise the water level; subsequently a new non-contaminated shore line will be created. Nevertheless monitoring of the facility will be ongoing. The approach of Section 7.13.7 (Chemical Hazards wildlife assessment) was to therefore identify the chemicals of potential concern for wildlife in association with the tailings pond and to highlight the need for monitoring of these chemicals in the soil, vegetation and water. The specific monitoring programs 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 or if any of these chemicals do not return to near baseline levels soon after closure a formal risk evaluation and identification of appropriate management measures for valued ecosystem component (VEC) species will be undertaken. If at any point risks are identified, appropriate mitigation	Ongoing monitoring and appropriate mitigation and management measures if risks are identified	See response for 55. NovaGold has committed to maintain intensive receiving environment, aquatic, fisheries and wildlife monitoring programs, developed in cooperation with university researchers, Canadian and U.S. federal and Alaska State government agencies and the Tahltan Central Council, to ensure aquatic, water quality and wildlife resources are not impacted and protected for future generations. NovaGold has committed to add an additional monitoring site downstream on the Stikine River at a depositional site to be determined during the permitting stage.

				and management measures would then be evaluated and implemented to protect wildlife and birds from contacting contaminated tailings materials or water.		
123	Craig Olson Petersburg, Alaska September 7, 2006	The tailings pond will be left in perpetuity (water capped?) to preserve a reducing environment. It is unclear whether or not there is adequate planning to protect terrestrial wildlife (along the shoreline) and birds from contacting contaminated tailings materials or contaminated water.	Wildlife exposure pathway from tailings	Refer to comment 122	Refer to comment 122	See response for 55 and 122.
124	Marlene Clarke Wrangell, Alaska September 7, 2006	The tailings pond will be left in perpetuity (water capped?) to preserve a reducing environment. It is unclear whether or not there is adequate planning to protect terrestrial wildlife (along the shoreline) and birds from contacting contaminated tailings materials or contaminated water.	Wildlife exposure pathway from tailings	Refer to comment 122	Refer to comment 122	EAO notes that NovaGold has committed to continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project
125	Rob Cadmus Water Quality and Mining Organizer Southeast Alaska Conservation Council Juneau, Alaska not dated	Water quality: tailings dam - the tailings pond will be left in perpetuity (water capped?) to preserve a reducing environment. It is unclear whether or not there is adequate planning to protect terrestrial wildlife (along the shoreline) and birds from contacting contaminated tailings materials or contaminated water.	Wildlife exposure pathway from tailings	Refer to comment 122	Refer to comment 122	See response for 124.
126	Stan Tomandl & Ann Jacob Chair & Treasurer Friends of the Stikine Society Victoria, BC September 8, 2006	It is unclear whether or not there is adequate planning to protect terrestrial wildlife along the shoreline and birds from contacting contaminated tailings materials or contaminated water.	Wildlife exposure pathway from tailings	Refer to comment 122	Refer to comment 122	See response for 124.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

TABLE OF CONTENTS

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Acronyms:

ABA	acid base accounting
ARD	acid rock drainage
DFO	Fisheries and Oceans Canada
EC	Environment Canada
ECDV	Ministry of Economic Development
HC	Health Canada
MEMPR	Ministry of Energy, Mines and Petroleum Resources
MMER	Metal Mining Effluent Regulations
ML/ARD	metal leaching/acid rock drainage
MOE	Ministry of Environment
NH	Northern Health
NMFS	National Marine Fisheries Service
NPAG	not-potentially acid generating
NRCan	Natural Resources Canada
PAG	potentially acid generating
PMF	probable maximum flood
KSRD	Kitimat-Stikine Regional District
TC	Transport Canada
TMF	tailings management facility
USDOI	United States Department of the Interior
US EPA	United States Environmental Protection Agency
SOA	State of Alaska
USDA FS	United States Department of Agriculture Forestry Service

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

<table>
<tr><th>Parameter</th><th>Agency</th><th colspan="2">Comment Received</th><th>Proponent Response/Mitigation Measure/Commitment</th><th>Government Response</th></tr>
<tr><td>Air Quality</td><td>EC</td><td>1.1.1.1</td><td>The air quality analysis is generally thorough and very conservative. More information is sought about the waste incinerator, such as estimated throughput, nature of emissions controls, and estimated emissions.</td><td>The air emissions from the waste incinerator at Galore Creek were based on Canadian Council of Ministers of the Environment (1992) incinerator emissions criteria and an estimated throughput of 100 kg/hr that was deemed typical for a remote mine camp. A typical incinerator is manufactured by Westland Incinerators, Edmonton (Series no. CY-100-CA) and this unit includes a double chamber cyclonator with an acid gas scrubber. Estimated air emissions are provided in the table below.

<table><tr><th>Parameter</th><th>Units</th><th>Value</th></tr><tr><td>Particulate Matter (TSP)</td><td>g/s</td><td>0.011</td></tr><tr><td>SO_2</td><td>g/s</td><td>0.138</td></tr><tr><td>NOx</td><td>g/s</td><td>0.212</td></tr><tr><td>NOx as NO_2</td><td>g/s</td><td>0.021</td></tr><tr><td>CO</td><td>g/s</td><td>0.030</td></tr></table>
NovaGold is compiling the necessary information for its permit application pursuant to the Environmental Management Act.

Commitment: NovaGold will provide details to regulators during the permitting stage once the final selection decision has been made.</td><td>EC is satisfied with NovaGold’s response.</td></tr>
<tr><td>Air Quality</td><td>EC</td><td>1.1.1.2</td><td>Sections 7.3.3 and 8.2 of the Application refer to "scrubbers." It is unclear where the scrubbers will be used, and if the emissions inventory has taken into account emissions reduction due to the scrubbers.</td><td>The detailed feasibility study will define the use of scrubbers and these will be outlined during the permitting stage.

Commitment: The use of scrubbers will be outlined during the permitting stage.</td><td>EC is satisfied with NovaGold’s response.</td></tr>
<tr><td>Air Quality</td><td>EC</td><td>1.1.1.3</td><td>EC requests that the proponent confirm that off-road diesel equipment used at the project site will be model year 2006 or later (i.e., as</td><td>NovaGold cannot guarantee at this time that all off-road diesel equipment will be new, particularly during</td><td>EC is satisfied with NovaGold’s response.</td></tr>
</table>

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			opposed to older equipment previously used elsewhere).	construction. Commitment: NovaGold will make reasonable efforts to use post-2005 equipment, but cannot guarantee that all off-road diesel equipment will be new, particularly during construction.	
Air Quality	EC	1.1.1.4	The list of mitigation measures in sections 7.3.3 and 8.2 of the Application refers to "use of low sulphur diesel fuel when practical." EC recommends the proponent modify this commitment to "use of ultra low sulphur diesel fuel [always]." During the construction phase, the project can achieve this by purchasing diesel fuel that is legal for on-road use (something they may be intending to do anyway). As of 2010 (i.e., during the project's operation phase), ultra low sulphur diesel fuel will be the only diesel fuel legally available for the non-rail, non-marine market.	Commitment: NovaGold will comply with the law and use the lowest sulphur-content fuel reasonably available on the market.	EC is satisfied with NovaGold's response.
Air Quality	EC	1.1.1.5	Ambient air quality modelling predicts an NO_2 exceedence in one scenario. However the proponent has used conservative (worst-case) emissions and modelling assumptions and the exceedence occurs in close proximity of the mine site. Further the proponent commits to good mitigation measures and an extensive monitoring program. The one modelled exceedence does not suggest significant adverse air quality impacts.	Comment noted. Commitment: None required.	No further comment.
Air Quality	HC	1.1.1.6	HC's review of the air quality effects assessment focused on the results of the air dispersion modelling. Dispersion modelling is outside of HC's expertise, and HC leaves it to other agencies, such as EC, that possess this expertise, to critique the methodology used and the validity of the assumptions made in the modelling. HC's working assumption is that the concentrations of airborne emissions predicted by CALPUFF modelling are essentially correct. Based on this assumption, the levels of airborne contaminants appear to be well below established federal and provincial ambient air quality guidelines. While these guidelines are not primarily intended for the protection of human health, it does not appear that significant impacts on health are expected to occur from the levels of contaminants predicted.	Comment noted. Commitment: None required.	HC is satisfied with NovaGold's response.
Air Quality	HC	1.1.1.7	Page 3-4. Please provide additional justification for the choice of the Saturna station to provide background concentrations. It would appear that the meteorological conditions at this coastal site may be sufficiently different from the inland project site that background concentrations	While Galore Creek is not located on the coast the climate is coastal. Saturna is the only CAPMoN monitoring station in BC and the closest to Galore Creek.	HC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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			may not be comparable.	Commitment: If a more appropriate reference station is identified, NovaGold will use the new station.	
Air Quality	HC	1.1.1.8	The report states that the NONROAD2005 model predicts emissions for a variety of non-road equipment categories but it does not have the ability to predict non-road emissions for Canadian jurisdictions. Please clarify how this limitation affects the reliability and validity of the predictions made with this model.	The jurisdiction has no relevancy in emission estimates for individual equipment. Commitment: None required.	HC is satisfied with NovaGold's response.
Air Quality	HC	1.1.1.9	Page 3-17 One of the limitations of the CALPUFF dispersion model is that it cannot accurately predict short-term emissions and peak concentrations. These limitations also affect the application of the dispersion modelling to assess the potential for health impacts, and it does not necessarily preclude the possibility of short-term episodes when acute health impacts may occur during short periods of elevated peak concentrations beyond the average values. Thus, the inherent limitations of CALPUFF and the resolution of the modelling used in predicting maximum concentrations within the active mine area, does not necessarily provide confidence that the concentrations will be consistently within the occupational health exposure limits. In any case, the occupational health exposure limits only apply to CO, NO_2 and SO_2, and not for particulate matter. Air sampling measurements is the preferred way to assess whether localized air quality will be within health exposure limits. However, HC does not recommend air monitoring as a routine operating practice unless there is some indication that it would be advisable, e.g., in the case of certain accidents or operational upset conditions	The shortest possible averaging period (1 hour) was used for the CALPUFF model runs. Commitment: NovaGold will monitor workplace contaminants to ensure compliance with occupational health exposure limits.	HC is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.1	Note that the closest non-continuous monitoring site is Stewart (as the crow flies), followed by Kitwanga and then Hazelton. The closest continuous monitoring site is Terrace followed by Kitimat.	Comment noted. Commitment: None required.	No further comment.
Air Quality	MOE	1.1.2.2	Figure 7.2-1 Yellow line should be called 'inter-annual average', not 'annual average'. Table 7.2-9 Given that climate change is being tagged here as a global phenomena (p 7-15), a proposed mitigation strategy for the removal of carbon sinks due to vegetative clearing (1.5 kt CO_2e) could be to sponsor planting vegetation in some other location (in B.C., Canada or elsewhere).	The carbon uptake across the surface area of the waste rock and tailings storage pond and the carbon sequestering of phytoplankton will reduce the net greenhouse gas emissions. In addition, the ongoing reclamation commitment includes revegetation of the disturbed areas. Natural revegetation in the area will occur at a fast rate due to high precipitation and temperate climate.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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				Commitment: Reclamation commitments have been described in the EA Application.	
Air Quality	MOE	1.1.2.3	Page 8-4, 8.2.1 Construction Phase: Air pollutant sources during construction are identified and set out in Table 8.2.1. One potentially major source that was not identified are the emissions from smoke during open burning of land clearing debris, (i.e. building the road, airstrip, camps, etc.). How will the land clearing debris and timber be dealt with?	Commitment: NovaGold will abide by the Open Burning Smoke Control Regulation during construction.	MOE notes the Regulation requires alternatives to burning to be evaluated as part of permitting.
Air Quality	MOE	1.1.2.4	Page 8-5, "No-Idling Policy" and "Speed Limits" are presented as methods for reducing vehicle emissions. In practical terms, for the idling issue, what would this entail and how would it be implemented? What speed limits are being projected? Provide details as to how these mitigative policies will be implemented, measured and monitored.	The employee training program, particularly during operations, will include education on no idling and speed limit policies. The policies will be enforced in a similar manner as other safety and environmental policies and rules on site, with an emphasis on education. Commitment: Specific policies and enforcement measures will be included in the site safety and environmental policy manual.	MOE is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.5	Page 8-6, section 8.2.2, Operation Phase: Mitigative strategies are listed in Table 8.2-2 for Operations Phase Air Emissions and Fugitive Dust. What monitoring programs will be proposed to assess the effectiveness for the strategies implemented? Provide a monitoring proposal which describes the monitoring methodology, locations and frequency for the project. Monitoring requirements would necessarily include both $PM_{2.5}$ and PM_{10}. The Ministry would be interested in partnering on some of the long-term monitoring aspects of this project due to the relatively pristine airshed in which this project is located. Discussions regarding a collaborative effort can occur during the permitting process.	Commitment: NovaGold will develop a site-wide air quality monitoring program as part of the permitting stage. The program will be designed to assess the effectiveness of mitigation strategies.	MOE is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.6	Page 8-9 Air Monitoring. It is noted that mitigation strategies for air emissions and fugitive dust are not all incorporated in the commitment table. Refer to section 15 for further comment.	Commitment: NovaGold will: minimize fugitive dust and emissions by using clean, high-efficiency technologies for diesel mining equipment; undertake preventative maintenance to ensure optimum performance; use large haul trucks for ore and waste	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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				transport to minimize the number of trips required; use appropriate control methods such as road watering and vehicle speed regulations to minimize the generation of fugitive dust; and segregate waste prior to incineration to minimize toxic air emissions. Further mitigation will include minimizing idling, minimizing the number of blast holes, stemming blast holes, upgrading road surface materials, storing concentrate under cover, and using dust suppression at the primary crusher. A site-wide air monitoring program will be developed during permitting to assess the effectiveness of mitigation strategies.	
Air Quality	MOE	1.1.2.7	The proponent is aware that this project will have an impact on the air quality in the town of Stewart through increased truck, marine and fugitive dust emissions. Increased air quality monitoring is being considered for that area due to the overall increase of industrial activity. As a result, port industrial users may be asked to partner with MOE for the installation and monitoring costs for this project.	Comment noted. Commitment: NovaGold will participate with other Port of Stewart users and MOE in a joint air quality monitoring program.	MOE is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.8	Page 8-293, Section 8.15.3 Main Features and Environmental As approximately 80,000 m^3 will be felled, (in addition to lesser vegetation disturbance) it would be expected that open burning of non-salvageable wood waste might be considered. If so, the proponent is to note that construction phase wood waste burning would be regulated pursuant to the Open Burning Smoke Control Regulation, (OBSCR).	Commitment: NovaGold commits to abide by the Open Burning Smoke Control Regulation during construction.	MOE is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.9	Page 8-317, Road Dust Suppression: Part of the road dust suppression plan should include consider paving the road up to the concentrate filter plant and load out facility from Highway 37. This will minimize the impacts that fugitive dust could have on Highway 37.	NovaGold will consider the suggestion along with other potential dust suppression measures during the permitting stage. Commitment: NovaGold will implement dust control measures at the intersection of the access road and Highway 37.	MOE is satisfied with NovaGold's response.
Air Quality	MOE	1.1.2.10	B.C. has provincial standards for many air pollutants. These are commonly confused with a threshold with which an industry can pollute up to. This is far from the case. Given: a) the size of the project; and b) that this environment is pristine, it is necessary to have a minimum 3-5 years of non-continuous air quality monitoring once the mine begins operation. MOE would like to work in co-operation with the proponent to	Commitment: NovaGold will develop a site-wide air quality monitoring program as part of the permitting stage. The program will be designed to assess the effectiveness of mitigation strategies.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			ensure that an appropriate long-term air monitoring program is established. This would include PM_{10}, $PM_{2.5}$, dustfall identification and other monitoring as required.		
Air Quality	MOE	1.1.2.11	Drought conditions can also lead to increased fugitive dust emissions.	The months of June and July were used in the CALPUFF model to assess the driest and likely highest fugitive dust weather conditions in the Galore Creek valley. Commitment: None required.	MOE is satisfied with NovaGold's response.
Aircraft	TC	2.1.1.1	6.21 Residual Adverse Effects and Their Significance, S5.13, S8.16. Porcupine River Aerodrome - The information provided in the Application was insufficient for TC to comment. However, NovaGold has stated that the design will meet the requirements of TC's *Aeronautics Act* and Canadian Aeronautics Regulations. West More Heliport - the information provided by NovaGold was insufficient for TC to comment. Since the information required by TC may not be provided until the "permitting stage", it is important to note that if TC requires any design changes, it may result in a potential environmental effect that may require further assessment.	Comment noted. Commitment: NovaGold will provide the required aerodrome design information to TC during the permitting stage.	TC is satisfied with NovaGold's response.
Aircraft	TC	2.1.1.2	3.4.1 Air Access, S.5.13.1, S8.16.1, App5-K. The report states that the plan is to build the aerodrome and the helipads to certification standards. TC encourages everyone to follow the recognized safety parameters of CAR 302, TP 312 and CAR 325 (exemption). Also, it may be a requirement in the future for CAR 704 & 705 passenger carrying service. The physical layout shown on Fig 5.13-2, does meet the dimensions for a code 3D-NP. However, there is insufficient detail to comment on any other area of the standard such as lighting, marking, runway slope, approach paths, or possible hazards presented by the terrain.	Commitment: NovaGold will provide all the necessary details for TC review and approval prior to construction of the aerodrome.	TC is satisfied with NovaGold's response.
Aircraft	TC	2.1.1.3	6.9 Accidents and Malfunctions, S8.11, 8.16, 13.1 to 13.4, App 5-E, 5-I, 13-A, 13-B, 13-C. In the Application it states that the West More helipad is to be temporary. However, during the winter months avalanche control will be conducted by helicopters. Will the helicopter operate only from the base camp or will the West More helipad also be required?	The West More heliport will be temporary. Avalanche control will be based from the filter plant site or the Galore Creek valley. Commitment: None required.	TC is satisfied with NovaGold's response.
ARD	EC	3.1.1.1	Geochemistry - Interpretation The geochemical interpretation in Appendix 5A by Stephen Day P.Geo and Dylan McGregor GIT meets a high standard for its scope and rigour. Its core interpretation uses a	NovaGold calculated the impact of changing the neutralization potential ratio from 2.0 to 1.3. The reduction in potentially acid generating rock tonnage	EC is satisfied with NovaGold's response regarding the reduction in dam height if the neutralization

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			model which balances neutralization potential determined only from carbonate mineral content (e.g. calcite, magnesite) against acid potential determined from sulphide content corrected for copper sulphides. It therefore discounts any contribution to neutralization potential from dissolving silicate minerals discussed above. The interpretation compares Sobek, modified Sobek, and carbonate determinations of neutralization potential for 46 samples (Appendix 5A, page 42, Section 3.3.1.3). Figure 3-8 appears to show that the Sobek method yields 20 to 25 percent more neutralization potential in a EC Detailed Comments: The Application September 19, 2006 Page 2 sample than that yielded by the modified method. No table of results appears with the graph. Since the Sobek method appeared to dissolve calcic and aluminum silicate minerals, the authors chose to rely on results of the modified method of determining neutralization potential (Appendix 5A, page 27, Section 3.2.2.1.2). They also derived neutralization potentials by the "evolved carbon dioxide method" (Appendix 5A, page 27, Section 3.2.2.1.2). Figure 3-11 compares results from the modified neutralization potential method with those derived from carbonate analyses, showing modified results are higher "by 5 to 16 kg $CaCO_3$/t" (page 46). This comparison, together with the paste pH of highly weathered gossan samples, persuades the authors to discount all modified neutralization potential determinations by a uniform 10 kg $CaCO_3$/t, an amount which they assert, "is comparable to the calcium and magnesium carbonate content of the rock" (page 47). Since the authors have already discounted Sobek method results, this additional reduction in the estimated neutralization potential of Galore waste rocks moves their interpretation towards overstating any risk of acid generation. On pages 87 and 88 (Appendix 5A, Section 3.3.8.2.1), the authors explain how they derive and apply molar ratios of calcium and magnesium concentrations to sulphate concentrations. They estimate a site specific ratio of 1 to 1.6 for Galore rocks then propose the use of a site criterion of 1.3, which implies that rocks with neutralization potential less than 1.3 times the acid potential are possibly acid generating. However, they then state, "NovaGold has decided to use a criterion of 2, which provides an additional factor of safety."	was approximately 86 Mt. This corresponds to a reduction in volume of approximately 43 Mm^3 in the tailings storage facility. (Rock specific gravity of 2.6 and swell factor of 1.3). Referring to the fill curve, the waste/tailing storage facility (see Figure 1 in "The *Galore Creek Waste and Water Management Feasibility Geotechnical Report*" which can be found in Volume VII of the Galore EA Application as Appendix 5-I), this would result in an overall reduction of approximately 5 m in the tailings dam crest elevation. Commitment: NovaGold will use a conservative neutralization potential ratio of 2 to segregate potentially acid generating (PAG) from not-potentially acid generating (NPAG) material for underwater disposal. NovaGold will continue to monitor to verify pre-mining conditions and update the operational management plan for waste rock, tailings, low grade ore and construction materials as more information is gained from the site. This document is a living document with updates submitted to MEMPR and MOE for review and approval whenever significant changes occur.	potential is 1.3 instead of 2.0. MEMPR notes that EC is a member of the Northwest Mine Development Review Committee and will have an opportunity to provide input in to the development of on going monitoring and appropriateness of the selected ratio and adaptive management strategies.
ARD	EC	3.1.1.2	Geochemical factors not considered The testing program lacks procedures which would have aided the prediction of geochemical activity. The weathering properties of feldspar depend in part on its	NovaGold's test work indicates that silicate buffering does not provide sufficient neutralization to reduce the mobility of copper and other elements. It is in	See response to 3.1.1.1.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			calcium content (i.e. the albite-anothite ratio in plagioclase feldspars). XRF or whole rock determinations (e.g., CaO, Fe_2O3, MgO, NaO, etc) could have been compared to XRD mineralogy to help identity feldspars present. Similarly, electronic microprobe of feldspar grains could have helped to determine if they were calcium-bearing and capable of contributing neutralization like the calcium or aluminum silicate minerals mentioned above. A full assessment of geochemical risk of mining wastes requires the mineralogical and chemical interpretation to be applied to the permeability of the wastes. In recent years, geoscientists have made progress in modelling 'reactive transport in porous media', including for example, how minerals or salts react with constituents in pore water and dissolve or precipitate, thus increasing or decreasing the permeability of wastes. The Application lacks reactive transport models of waste rock and tailings pore water. Galore rocks contain significant gypsum or anhydrite, weakly soluble minerals. In gypsumbearing wastes with relatively low permeability such as tailings, the pore water moves very slowly. Pyrite oxidation at a pyrite-gypsum contact would not proceed, or would quickly reach equilibrium and stop. In sand-sized or larger particles with higher permeability, the pore water sulphate moving down the waste column will re-precipitate as gypsum and other salts. These precipitating hydrated salts will cause a volume expansion, effectively lowering the permeability between adjacent particles. Waste rock containing sufficient gypsum may form self-sealing layers. Similarly, the pore water in Galore waste rock with sulphate at saturation or equilibrium will inhibit dissolution of pyrite into Fe_2+, SO_4= and H+ (i.e. acid). Sulphate with dissolved calcium and magnesium contributed from carbonates will buffer or hold the pH at a higher level than would occur with no gypsum present. Despite the field evidence and geochemical interpretations, and without attempting to model reactive transport in mine wastes, the proponent made the decision to assign all rocks with a neutralization potential ratio of less than 2 as potentially acid generating. The proponent then decided that rocks categorized in that way must remain water covered. This has led NovaGold to design a very large dam to retain a water cover over the waste.	NovaGold's interests to minimize the size of the dam. Commitment: NovaGold will continue test work during mine operations to attempt to minimize volumes of waste rock requiring subaqueous disposal in the impoundment. See response for 3.1.1.1.	
ARD	NRCan	3.1.1.3	C.2.10 - Project Description -Section 5.3.6.2: p. 5-31: Impossible to assess this observation as the distribution is not seen on any figure but is critical to later geochemical models described: "The widespread distribution and high proportions of primary sulphate minerals in Galore	This issue is addressed in Volume IV, Appendix 5A where distribution and proportion of total sulphur and primary sulphate minerals is described.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			Creek rocks".	Commitment: None required.	
ARD	NRCan	3.1.1.4	C.2.12 - Project Description -Section 5.3.6.6: page 5-36: unit "D" is nowhere described (D = dyke??)	Unit "D" is described in Volume IV Appendix 5A Section 1.4.2.2. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.5	F.1.6 - Acid Rock Drainage Potentially acid generating rock identification protocols will require ongoing effort and refinement. NRCan commends the proponent for their efforts in this regard so far. PAG rock cannot be used for any construction purposes, which reinforces the additional comments provided by Reviewer B in this submission. Acid generation must be prevented from occurring in the ore stockpile. Operational procedures for processing stockpiles must consider not only the blending requirements for mill feed but the need to rotate the inventory to ensure ore does not oxidize for an extended period of time on the stockpile. The prevention of ARD is best implemented before oxidation starts and this applies to piles of PAG material, whether ore or waste.	PAG rock will be used for construction only for structures that will be submerged, such as upstream portions of the dam. The calculated time of over 22 years before acid generation is initiated exceeds the expected residency in the stockpile by many years; any marginal ore remaining in the stockpile at closure will be submerged in the impoundment. It is in NovaGold's interest to minimize oxidation in the ore stockpile in order to maximize mineral recovery in the process plant. Commitment: NovaGold will only use PAG rock for construction in areas that will be submerged behind the dam.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.6	G.1.6 - Acid Rock Drainage / Metal Leaching (ML/ARD) The information presented in the Application was sufficient in detail to enable NRCan to undertake the technical review of ML/ARD issues, including mineralogy and geochemistry of the principal units of the deposit which will be disturbed or mined and results of mineralogical analyses and of static and kinetic geochemical testing. With respect to ML/ARD issues, the specific sections of the Application reviewed include Sections 5.3, 5.5, 5.6, 5.9, 5.10, 5.11, 5.12, 6.6, 6.11, 7.6, 7.7, 8.3, 8.4, 8.7, 8.8, 8.10, 8.12, 8.15, 8.18, 9.4, 10, 11.5, 11.6, 13, 14 and Appendix 5-A. In general, ML/ARD potential exists for the project in relation to the following activities: 1. Access road and pipelines construction; 2. Tunnel construction; 3. Diversion, spillway and ditch constructions; 4. Overburden removal; 5. Active open pit mining and ore storage; and 6. Tailings and waste rock disposal. Overall, three key management plans; the ML/ARD Prediction and Prevention Management Plan, the Tailings and Waste Rock Management Plan and the Water Management Plan, if used as designed to identify and manage potentially acid generating and metal leaching materials in the Galore Creek valley mine site and the access road/tunnel construction, should effectively enable the	Comment noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			mitigation of significant adverse environmental effects caused by ML/ARD. The following comments are in areas where questions remain with respect to the ML/ARD management program for the project:		
ARD	NRCan	3.1.1.7	G.1.6.1 - Material Classification 1. For Galore Creek valley materials, it's apparent that rock type classification, mineralogy and sulphur content cannot be used as independent indicators to determine PAG and NPAG rock. Based on geochemical testing of Galore materials, conventional modified neutralizing potential tests overestimate the available buffering capacity, therefore the potential for ML/ARD will be identified using a site-specific carbonate (calcium and magnesium) neutralization ratio of $IC_{Ca,Mg}$ to acid potential that defines PAG and NPAG rock. This relationship is: $IC_{Ca,Mg}$ / AP = 1.3, meaning that a value equal to or higher than 1.3 will not likely generate ARD over the long term (ref. page 6-137, volume I). However, in the Application it also states that NovaGold is proposing to use a more conservative 2:1 cut-off ratio value. Please clarify what the operating ratio will likely be to classify PAG and NPAG rock (ref. 8-111, volume III).	See response to 3.1.1.1.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.8	Assuming that the humidity cell tests (HCTs) adequately represent the potential ML/ARD materials for the Galore Creek project, the majority of the humidity cell tests could be discontinued as the tests have undergone sufficient cycles and are presenting very slow oxidation and depletion rates. Field conditions would typically be even slower. Any further information obtained from continuing most of the humidity cell tests would require significant time and resources, with limited value added. However, NRCan has suggested that select humidity cells representing certain zones should be continued based on the leachate chemistry trend results to date - what is the status of the following HCTs? a) Central-Southwest-West Fork Zone (HCTs 1-5,8,10,12,18,29, 32) b) Junction Zone (HCTs 7, 45, 47, 50) c) Copper Canyon Zone (HCTs 15,16, 20, 36, 38)	Comments noted. Following discussions with MEMPR and MOE, the following waste rock tests are continuing: - Central Zone: HC-29, 32, 01, 02, 03, 04, 05, 08, 10, 12, 18, 23 - Copper Canyon: HC-36, 38, 42, 15, 20, 27, 16 - Junction Zone: HC-45, 47, 07, 17, 50. Commitment: NovaGold will continue some of the humidity cell tests started during the environmental assessment review to monitor the progress of neutralization potential depletion, continue on-site barrel tests and bi-annual monitoring of toe seeps from upland dumps, maintain an overall up-to-date site water and load balance to compare predictions of metal loadings with actual conditions, and conduct annual audits of management potentially acid generating and non-potentially acid generating rock at the drill face in pit.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.9	Overall, as part of an ongoing ML/ARD prediction and prevention program, it appears that the humidity cell testing program and its results to date have provided sufficient information to decide that a reasonable	Comment noted. Commitment: See response for 3.1.1.8.	NRCan is satisfied with NovaGold's response.

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			environmental management and mitigation proposal is to deposit all potential ML/ARD materials under a permanent water cover in an engineered facility. Therefore, it does not appear that further extensive humidity cell testing is likely to alter this environmental management decision and proposed mitigation strategy for ML/ARD materials.		
ARD	NRCan	3.1.1.10	G.1.6.2 - Waste Rock It is clear that the mine waste rock identification and classification of PAG and NPAG rock materials is comprehensive to date, and is expected to be continually improved using block modelling and acid base accounting (ABA) results. This will be very important information when sequencing the waste rock and constructing the tailings dam out of NPAG materials only, and for the final closure and post-mine reclamation phases of the Project. However, on page 11-51, volume III, it states that "waste rock, both NPAG and PAG would be used for construction of the embankment shells because of its low unit cost in comparison to quarried rock." Please clarify the stated use of PAG in the construction of embankment shells and describe any proposed mitigation measures to prevent ML/ARD.	Use of PAG rock is explained as limited to only upstream of the dam below the ultimate water line of the dam. Mitigation is submergence behind the dam. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.11	Based on information provided in Appendix 5-A, the flooded mine pits (5 in total) and walls are not expected to become acidic, although it was noted that the footwall of the Central zone deposit has elevated sulphide content and is likely PAG. Are there potential ML/ARD issues related to the PAG footwall and groundwater contamination through fault structures?	Potential for acid generation for those components was considered in the water quality predictions. Pit lake chemistry was assumed to be non acidic for the water quality modelling. Commitment: NovaGold will continue to monitor and develop models for pit water quality and groundwater during operations.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.12	It does not appear that potential misclassification of waste rock as NPAG when it's actually PAG (based on a 3% classification failure rate), will lead to any significant long term ML/ARD problems (ref. p. 95 of appendix 5-A). However, training of heavy equipment operators and others to visually identify PAG rock may provide one final opportunity before final material placement to prevent the development of (albeit rare) ARD "hot spots".	Comment noted. Visual auditing of rock has been included in the prediction and prevention plan. Commitment: Procedures will be refined during construction and operations.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.13	The rocks along the proposed access road and tunnel area have been mapped in 200 m segments and ranked in terms of ML/ARD potential (ref. p. 6-137 to 6-140 volume 1 and p. 7-225 volume II). Although no geochemical data is available yet, the Application describes that potential ML/ARD exists in the following areas, representing approximately 35% of the new 118 km of new road out of the total	A preliminary management plan for potentially ML/ARD materials generated from road construction was presented in Section 8.8 (Vol III) of the EA Application. Table 8.8-2 outlines the following proposed mitigative measures: i) disposal by compaction in till or burial in limestone matrix and ii) temporary capped storage	NRCan is satisfied with NovaGold's response.

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			corridor distance of between 128-140 km: a. Along Scotsimpson Creek b. South portal, Scotsimpson valley side c. Near the confluence of the Porcupine River and Sphaler Creek d. Discrete areas east and west of Round Lake. Beyond constructing limestone-lined collection ditches to collect runoff from these areas, what other mitigation plans are proposed to manage ML/ARD materials? Removal and disposal of ML/ARD materials may be necessary in some cases where construction avoidance is not possible. Hauling materials to distant disposal sites may be voluminous, expensive and not necessarily required. Depending on geochemical properties, local on-site co-disposal, near to where the material is originally discovered but away from watercourses, may be more appropriate for small quantities of naturally occurring ML/ARD materials that have not been excessively fractured into finer grained materials during blasting or the excavation process.	prior to subaqueous disposal at mine or burial in limestone formation near Round Lake. Commitment: NovaGold will implement the plan for management of potentially ARD materials encountered along the access road. NovaGold will assess acid rock drainage potential of excavated faces during access road and diversion channel construction, using an on-site laboratory, and develop appropriate mitigation, including mitigation for closure, for any acid rock drainage encountered. NovaGold will continue to collect hydrological data within the study area throughout the life of the project to update the water balance and hydrological models.	
ARD	NRCan	3.1.1.14	During the construction of the main Galore Creek diversion channel, other smaller diversion channels and the main tailings dam emergency spillway, PAG materials may be encountered. Have the materials to be excavated been adequately characterized, and if so, what are the mitigation plans to address ML/ARD if encountered?	An appropriate characterization and mitigation plan is being developed as part of the permitting stage pursuant to the *Mines Act*. Commitment: NovaGold is committed to address characterization of excavated materials during permitting and to implement an appropriate mitigation plan.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.15	As stated in the Application, the "laboratory testing and field evaluation have shown that fresh PAG rock will ultimately generate acid, however there will be a delay between time of exposure and onset of ARD generation." This delay is conservatively estimated at 22 years (but this could be 40+ years in reality) for the large majority of rock at the site (ref. p. 5-25, volume I). Based on preliminary analyses of ARD potential it has been assumed that half (or approximately 500 million tonnes out of the 1 billion tonnes) of waste rock produced will be acid generating and require flooding in perpetuity (ref. 8-48, volume III). According to the Application, the average PAG waste rock oxidation exposure time is reported to be 35 months before flooding. Although ARD will apparently not develop quickly, it is preferable that the rock is not acidic prior to submergence because it could contribute acidic leachate and leaching of acidic salts could contribute to the tailings impoundment acid and metal load. Therefore, can in-situ neutralization of PAG rock be	Calculated time to onset of oxidation or ARD is in excess of 22 years and time to submergence is three years. Therefore, additional mitigation is not necessary. Commitment: NovaGold will conduct an ongoing monitoring program during mining to assess the ARD in the impoundment.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			achieved in the tailings facility or can the delay in flooding be reduced to help further mitigate any potential acid generation from the outset? (ref. Table 5.10-1 on p. 5-179, volume 1).		
ARD	NRCan	3.1.1.16	Based on kinetic geochemical tests, leaching potential of several metals (Cd, Cu, Mo, Pb and Zn) could be correlated with the concentrations of these metals in the rocks. Could this type of correlation be used as another assessment method in the acid base accounting block model?	The methodology used in the environmental assessment and presented in Volume IV, Appendix 5A (section 3.4) is considered appropriate for the water quality predictions. NovaGold does not believe that further refinement as described in the comment would provide any additional level of accuracy in the predictions due to variations in the mineralogy. Commitment: NovaGold is committed to ongoing monitoring and refinements in ARD long term predictions.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.17	With respect to PAG and NPAG waste rock materials segregation, NRCan will expect to soon see the leach column tests provide the value of 'x' in the following criterion developed to help segregate dam construction rock, "paste pH>6, NP/AP>3, Cu/S.	The value of "x" is currently under development and an indicative number should be available by the end of October. It should be noted that "x" only refers to classification of initial 2006 dam construction rock. If "x" is exceeded, rock will be considered unsuitable for dam construction and rock will be placed in the upland area if it is NPAG. See section 8.7. The value of "x" will not affect the submerged volume of waste disposed in the impoundment during permitting. Commitment: NovaGold proposes to complete the assessment and present a value as part of the *Mines Act* permitting process.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.18	Clarify the management and disposal criteria for upland waste disposal within the containment area above final flood level. In the EA Application, no values for paste pH and 'x' are provided in the following criterion, "NP/AP>2, and paste pH or Cu/S>x" (ref. p. 5-105, volume I). Also, the management criteria shown in Table 8.7-2 are different, please clarify (ref: 8-107, volume III).	See response for 3.1.1.18.	NRCan is satisfied with the response.
ARD	NRCan	3.1.1.19	Further, the Application describes a "small" winter run of mine ore stockpile that is planned to be located near the proposed truck shop to the west of a water retaining dam near the confluence of the East and West forks. What is meant by the descriptor "small" in terms of tonnage and area disturbance? What are the potential environmental effects	The size of the pile is dynamic, with a capacity of 500,000 tonnes. No drainage is expected under winter conditions. NovaGold is interested in minimizing oxidation in the ore stockpile in order to maximize mineral recovery in the process plant.	NRCan is satisfied with NovaGold's response.

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			(e.g., impacts of runoff to water quality) from this ore stockpile? Is there a mitigation plan developed? (ref. p. 8-52, volume III).	Commitment: NovaGold will monitor and manage the ore stockpile during operations.	
ARD	NRCan	3.1.1.20	G.1.6.3 - Tailings and Tailings Impoundment Area Over the proposed 20-year mine life, an estimated 1500 million tonnes of tailings and waste will be produced; of which 475 million tonnes will be tailings. What is the expected ratio between the mill's 'cleaner' tailings (PAG) and 'rougher' tailings (NPAG) classification that are combined to create the 'final combined' tails? Sub-aqueous deposition is not required for both, so can the different tailings products be separately managed and deposited to reduce the total tailings volume in the main facility requiring a perpetual water cover? (ref. p. 8-46, volume III).	NovaGold considers that management of a single tailings stream is most appropriate. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.21	In the Application it states that "preliminary acid base accounting testing of tailings suggest they will not be PAG" and that the tails have an appreciable excess of neutralization potential (ref. 5-199, volume I and again reiterated on p. 7-220, volume II), whereas the mill's 'cleaner' tails are expected to be PAG as reported in section 8.4.1 under Classification of the Tailings found on p. 8-46, volume I. Static testing of whole tailings for Phase 1 and Phase 2 also showed conflicting results for ML/ARD, due to differences in sulphide content between the rougher and cleaner tails tested (ref. p. 115 - 125, Appendix 5-A). Are there opportunities for selective disposal of the tails?	NovaGold considers that management of a single tailings stream is most appropriate. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.22	Based on pilot studies and the water balance model, the expected dissolved metal concentrations in the tailings supernatant will not be high and it is assumed that the tailings impoundment water (contact water) will not require treatment prior to release to the environment. If this assumption proves incorrect, what mitigation measures have been investigated to address the problem? (ref. p. 5-176 volume I).	In the event that water quality does not meet expectations, NovaGold will investigate the upstream source of the problem and manage it at the source. Commitment: NovaGold will conduct long term monitoring and will undertake adaptive management strategies to meet water quality objectives. NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.23	If pH = 8 is the expected pH of the tailings (as reported in the Application), could additional lime be added to the tails beyond the mill process to increase buffering capacity when flooding or saturation of tails deposited against PAG waste rock is not immediately undertaken? As per the Metal Mining Effluent Regulations, the maximum discharge	The comment is correct, the discharges will have different pH values as described in Volume XV, Appendix 7D. Commitment: None required.	NRCan is satisfied with NovaGold's response.

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			pH to the receiving environment would have to be 9.5 or less, however metal precipitation in the facility could be optimized if the pH of the tailings pond water was greater than pH=8 but less than pH=9.5 (ref. p. 7-287, volume II and Appendix 5-G). Additional lime may not be required however as it was noted in Appendix 5-G that the pH of the final tailings was shown as approximately 9.8 in the pilot plant process tests. Perhaps this issue of difference in reported pH for tails in the Application is simply the confusion between 1) the expected final tails pH deposited into the facility, and 2) the expected tailings pond supernatant pH being released to the receiving environment. Please clarify if this is the case.		
ARD	NRCan	3.1.1.24	With respect to the main tailings dam and potential downstream ML/ARD issues, the seepage analysis presents upper seepage estimates from the ultimate dam of 740 L/s (or almost 64,000 m^3/day), with potential reduction to 146 L/s (or about 12,600 m^3/day) by using grouting in the construction (ref. p. 5-171 and p. 5-173, volume I). Seepage of water from the tailings impoundment to the groundwater regime is expected since the K value of the underlying rock is estimated to be 10-5 m/s to 10-7 m/s. It's acknowledged that all dams seep, however the potential of groundwater contamination from the tailings impoundment could have a considerable effect if seepage below the impoundment dam is in fact carrying contaminants and the flow is not captured before discharging into the Galore Creek or the Scud River. Preferential travel paths may exist in any of the layers, such as in permeable fracture and fault zones (ref. p. 7-288, volume II). NRCan requests further information on the proposed seep collection and pump system that is to be located immediately downstream of the main tailings dam, during operation and post closure. An assessment is recommended of the closure options for the main dam seep collection system, taking into account expected changes in seepage water quality through time and consideration of whether long term collect, pump and treat is a potential long term management option.	NovaGold acknowledges that collect, pump and treat is a potential long term management option for seepage. Commitment: NovaGold is committed to long term monitoring of seepage water quality and collection/treatment of seepage if required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.25	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards The general development of the 3-D geological model used to calculate mineral resource and mineral reserve estimates is briefly described and utilizes generally accepted methodologies but could use more detail as to the uncertainties associated with it as the model also serves as the basis for the acid base accounting model and therefore is an important part of the metal leaching ML/ARD.	Details of the Galore Creek block model are provided in Volume IV, Appendix 5A. Commitment: The 3-D block model is continually being refined and will be updated.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
ARD	NRCan	3.1.1.26	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards The mineralogical and geochemical studies permit the proponent to precisely model the competing effects of potential ARD from pyrite-bearing rocks versus the natural buffering capacity of the bedrock based on the carbonate content derived from the alteration processes. Also, for example, volcanic eruption monitoring and mitigation of ash fall is anticipated and mitigation plans described. Similarly, this is done for avalanches (snow and rock fall). However, clearly the pyrite contents and the zoning of pyrite abundance in the Central Zone is well known, and some sort of zonation map could have been provided to show the potential hazard of the contribution of natural pyrite abundance in the rocks when ARD generation (i.e. the background ARD) is considered.	Appendix C.10 attached to Appendix 5-A of the Application provides maps and sections showing the modelled distribution of NP/AP which indicates ARD potential. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	NRCan	3.1.1.27	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards From the point of view of the regional geology, although the regional distribution of potential acid buffers (Paleozoic limestone units to the north of the project area) is known, there is no discussion whether the extraction of these rocks and use as a potential ARD buffer is part of any ARD mitigation plan.	NovaGold is not currently considering using the limestone units that occur to the north of the project area as ARD buffers. Use of those materials would require the construction of additional roads and the development of a new mine with related disturbances. Limestone units occurring along the access corridor may be used in small amounts for mitigation of ARD related to road construction. Commitment: None required.	NRCan is satisfied with NovaGold's response.
ARD	SOA	3.1.2.1	It is unclear what measures will be employed to identify, handle and manage PAG rock encountered during road construction. Figure 6.11-1 (Volume 1, page 6-139) identifies many segments of high and extreme ARD potential rock within the Porcupine River drainage. The effects of blasting residues and PAG upon the aquatic environment should be evaluated in more detail along with PAG rock management. It was noted that additional ARD sampling and geochemical test work will be performed in the summer of 2006 to confirm and quantify the extreme and high rankings.	Section 8.8 (Vol III) of the EA Application presented a preliminary management plan for ML/ARD materials generated from road construction, including identification, handling and management of potentially ARD generating rock. Management and mitigative measures of materials during construction, operations and closure/reclamation phases are provided. An overview of the management plan for construction includes: - Inspection of excavated materials by a professional geoscientist, environmental monitor, construction supervisor and/or equipment operators - Sampling and acid base accounting (ABA) analyses of selected excavated materials - Analyses to be conducted in a field laboratory for quick turnaround - Classification of rock based on ABA results - Management of rock based on ABA results A report	SOA is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				presenting the results of the ARD sampling and geochemical test work performed during the summer of 2006 is pending. Commitment: NovaGold will prepare a report containing the results of the ARD sampling and geochemical test work performed during the summer of 2006 which will be provided to MEMPR for distribution to government agencies.	
ARD	MEMPR	3.1.3.1	Management of the Tailings: Geochemical testing should be completed on the oxide ore. It is expected that this material would be lower in sulphide content than the hypogene ore but the chemistry of the supernatant could have different characteristics. Evaluation of this effect could be deferred to a permitting stage because it is expected that the loading effect will be small.	"Oxide ore" is more appropriately termed "weathered ore" at Galore Creek. The weathered ore was defined by recognition of oxide minerals in the drill core. It is estimated that in the Central, Junction and South West pits, the zones where oxide ore was modelled, less than 2% of the total reserve is weathered. Weathered material that is not ore will be sent to waste dumps and it can be easily segregated if further research indicates concerns with metal leaching. The pilot plant feed grade assayed 0.01% CuOx. This would represent about 1.4% of the copper contained in the ore. Commitment: NovaGold will address this comment during the *Mines Act* permitting process.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.2	Management of the Scotsimpson Tunnel: MEMPR accepts the management plan and planned contingences for the access tunnel. Ongoing assessment can be dealt with at permitting.	Comment noted. Commitment: Monitoring plan for the tunnel will be refined during permitting.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.3	Management of Road Access: MEMPR agrees with the proposed program. Ongoing assessment and monitoring and mitigations options will be discussed during construction.	Comment noted. Commitment: NovaGold will address this comment during permitting and construction.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.4	Drainage Chemistry Predictions & Impact Assessment: MEMPR did not attempt any of the calculations and believes responsibility for accuracy of the calculations and statements rests with the proponent's professionally-registered consultants. A requirement at permitting will be operational monitoring to verify premining predictions. It is expected that NovaGold will continue to refine predictions as leaching rates becomes available through ongoing test work.	Comment noted. Commitment: Predictions will be verified by monitoring during construction and operations.	

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
ARD	MEMPR	3.1.3.5	Drainage Chemistry Predictions & Impact Assessment: What effect on pit water drainage chemistry will the Scotsimpson tunnel drainage have since there is potential for the drainage to be acidic? Evaluation could be deferred to the operational stage because there is no material to test and it is expected that the effect will be small.	NovaGold will characterize water and manage as appropriate. Commitment: NovaGold will propose a plan for managing tunnel drainage during the permitting process.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.6	Metal Leaching and Acid Rock Drainage (Section 5.3.6): Specific ML/ARD predictions have not been made for the ore and marginal ore stockpile. Since the mine plan calls for up to 19 M/tonnes of ore (year 7) and x tonnes of marginal ore to be stockpiled on surface, a geochemical assessment of this material will need to be done. Evaluation of the leaching could be deferred to permitting as ample material will be available and it is expected that the metal loading will be small compared to other inputs into the impoundment.	Ore grade material was included in the overall predictions for waste rock drainage chemistry. The volume of marginal ore is insignificant relative to the overall volume of waste rock. Stockpile drainage will be monitored on an ongoing basis. Commitment: NovaGold will include development and monitoring plans as part of permitting.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.7	Management of the Waste Rock: The ML/ARD assessment used to develop the classification scheme is appropriate.	See response to 3.1.1.1.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.8	Management of the Waste Rock: MEMPR agrees with the overall classification scheme and accepts the conservative neutralization potential ratio criteria of 2.0 for segregation of NPAG and PAG material. (Preliminary estimates given for site specific criteria and time to deplete will be better refined with the addition of ongoing test results.)	Comment noted. Commitment: NovaGold is committed to long term ARD monitoring.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.9	Management of the Waste Rock: One aspect not addressed fully is the effect particle size separation and distribution will have on the overall waste rock geochemistry. However, this aspect is best dealt with during mining where and pre and post blast fines analyses can be performed. This information will be addressed during mine permitting as well as the requirement that pre-mine predictions will require verification throughout the operation of the construction, mining post closure phases of the operation.	Comment noted. This issue is discussed in Volume IV, Appendix 5-A. Commitment: This issue will be addressed during permitting.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.10	Management of the Waste Rock: The ML/ARD Prediction and Prevention Management Plan looks reasonable. Refinements to the plan can be done at permitting.	Comment noted. Commitment: Comment will be addressed during permitting.	MEMPR is satisfied with NovaGold's response.
ARD	MEMPR	3.1.3.11	Management of the Pit Walls: MEMPR agrees with the assumptions used and the calculations appear reasonable. A requirement at permitting will be the operational monitoring of pit water chemistry to verify pre-mining predictions. It is expected that the proponent will continue to refine their predictions as leaching rates becomes available	Comment noted. Commitment: NovaGold will develop a monitoring plan for permitting.	MEMPR is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			through ongoing test work.		
ARD	MEMPR	3.1.3.12	Management of the Tailings: The ML/ARD characterization program for Galore Creek tailings is appropriate for premining assessment. It is expected that the Proponent will continue to refine their predictions as leaching rates becomes available through ongoing test work.	Comment noted. Commitment: NovaGold will develop a monitoring plan for permitting.	MEMPR is satisfied with NovaGold's response.
ARD	MOE	3.1.3.13	Some specific comments and concerns with regards to the interpretations of the prediction program are provided below: Page 5-30 Mineralogy: This section states that the pyrite concentration peaks at 5% . It is unclear as to whether or not this is specific to the ore or also includes waste rock, nor does it indicate over what interval this value was being considered. The Application does appear to indicate that this is a property wide evaluation of the pyrite concentration. Visual inspection of diamond drill core during 2005 by this reviewer identified intervals that appeared to have significantly greater pyrite concentration than the 5% maximum observed. A request was put forth to the company pertaining to some specific data (Sep. 20/06). This information has yet to be received.	Comment noted. This section of the report was intended to provide an overview of typical pyrite contents as they vary spatially within the Central Zone. 5% is the maximum value broadly observed. More details of the sulfide distribution can be found in Table 3-3 and Section 3.3.1 of Appendix 5-A. As described in this section, 95th percentile and maximum sulfide contents indicate pyrite contents locally exceeding 5%. Volumetric pyrite content is about two times the sulfide sulfur content. Additional information , including two cross sections and logs of specific drill holes, was emailed to MOE on September 22, 2006. It appears that the file may have been rejected by the server because of size limitations. The material was re-sent on a CD by courier on October 27, 2006. Commitment: NovaGold is committed to long term ARD monitoring.	MOE is satisfied with NovaGold's response.
ARD	MOE	3.1.3.14	Page 8-111, section 8.7.7.5. The waste rock performance and additional testing outlined here was not included in the Table of Commitments. Refer to section 5.3 for further comments on the ML/ARD program. The various management guidelines provided in the plan appropriately consider the "uncertainties in distribution of minerals in size fractions and uncertainties about the availability and type of NP." As such there are differing criteria for materials to be deposited inside and outside of the impoundment, (NP/AP >3 outside)	Comment noted. Commitment: NovaGold is committed to long term monitoring of ARD and water quality in and about the impoundment.	MOE is satisfied with NovaGold's response.
ARD	MOE	3.1.3.15	Preliminary plan acceptable, although there will be questions regarding the encapsulation of PAG material in limestone units/limestone bearing colluvium. Certainly the most desirable option is transport to the tailings impoundment. Detailed assessment of the effectiveness of encapsulation of the strong PAG material exposed during road construction will be required during construction permitting.	NovaGold agrees that the best solution for PAG rock is disposal in the tailings pond, but the logistics for that solution may not always be feasible. Other solutions may be required. Commitment: NovaGold will address management of PAG rock along the access road corridor during	MOE is satisfied with NovaGold's response. MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				permitting and construction.	
ARD	MOE	3.1.3.16	Page 5.35: Potential for ARD. This section states that "the identification of a site-specific ratio of $IC_{Ca,Mg}$ to acid potential (AP) that defines PAG and NPAG rock. The relationship is $IC_{Ca,Mg}$ /AP=1.3". It also states that the delay to acid generation will be "conservatively estimated to be greater than 22 years for the large majority of rock on site. These two statements are the basis of a significant aspect of the mine plan, but are predicated on some major assumptions to which there are still some questions: 1. It is understood that one of the basic assumptions in the determination of a "site specific" ratio, is that sulphide and carbonate minerals are equally available (and therefore a presumption that they are equally available to react at the same rate). This basic premise is unlikely to be true given the heterogeneous geologic environment of the deposit, and the expected variability with which the various waste materials would physically weather. The proponent has recognized some of the vagaries of predictive work in the operational criteria provided, and has committed to on-going test work and field monitoring (Volume III, Section 8.7).	NovaGold acknowledges that there differences of opinion among regulators regarding a conservative NP/AP ratio. NovaGold therefore chose a NP/AP ratio of 2 and has included investigation of mineral exposure due to blasting in the ML/ARD Prediction and Prevention Plan (Volume III, Section 8.7) to better classify PAG materials. Commitment: NovaGold is committed to long term ARD and water quality monitoring in and about the impoundment.	MOE is satisfied with NovaGold's response.
ARD	MOE	3.1.3.17	The value of 1.3 is determined to be for discrete samples only, and only applicable to similar geology, however, it appears to be used in the document on a more universal scale: site-specific equating to site-wide. It would be unreasonable to assume that the value could be used in such a general manner.	NovaGold acknowledges that there are differences of opinion among regulators regarding a conservative NP/AP ratio. NovaGold therefore chose a NP/AP ratio of 2 which has included investigation of mineral exposure due to blasting in the ML/ARD Prediction and Prevention Plan (Volume III, Section 8.7) to better classify PAG materials. Commitment: NovaGold is committed to long term ARD and water quality monitoring in and about the impoundment.	MOE is satisfied with NovaGold's response.
ARD	MOE	3.1.3.18	The "22 years" conservative estimate to acid generation is primarily based on exposed diamond drill core from primarily the central zone. The vast majority of the core was from the low sulphide centre of the deposit, with ABA data analysis indicating sulphide sulphur to be very low (often less than 0.5%). A set of 75 samples collected from drill core over the years 1962/63/64/72/73/91/04 demonstrates this with 56 of 75 samples 0.8 with the highest being 1.81%. Visual inspection of a significant portion of the historic central zone core confirmed the very	Field observations were consistent with empirical test work which covered a wide range of sulphide concentrations. This test work indicated that the majority of waste rock would not become acidic in less than 22 years. Regardless, all PAG waste rock within the impoundment is scheduled to be submerged within 3 years. Operational monitoring will determine the ARD characteristics of tunnel rock and the time to ARD	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			low sulphide content and provided some insight as to why there was a general lack of acid generation within the drill core. Other environmental, mineralogical and physical reasons are also likely to contribute to the result. The conclusions that the time lag to acid onset is decades is perhaps premature and will be very dependant upon what mining actually produces in terms of waste rock. It was also noted that this "decades to ARD generation" has been applied universally to the project, as recently evidenced by its application to the waste rock to be generated during tunnel construction. Although the development of acidic drainage may very well take up to 22 years, the universal application of this number cannot be appropriately applied to all waste rock to be generated within the Galore Ck. deposit based on the evidence collected to date. On-going monitoring through the life of mine will provide a clearer assessment as to what may be expected over time. The common drainage into the tailings impoundment provides a contingency for the uncertainties of predictive work. (Permitting, Stewart)	onset. Commitment: NovaGold is committed to long term ARD and water quality monitoring in and about the impoundment.	
Closure	USDA FS	4.1.1.1	With the closure of all easy access to Galore Creek how will post monitoring take place? If a problem is found how will it be taken care of in a timely fashion?	Long-term maintenance will be undertaken through helicopter access. Heavy machinery will be held at site and used for maintenance activities. Commitment: NovaGold will store a small fleet of earthmoving equipment at the mine site, capable of carrying out maintenance and repair functions on the dam.	
Closure	MEMPR	4.1.2.1	An Operations, Maintenance and Surveillance (OMS) manual will be required as a condition of the *Mines Act* permit to cover mine closure activities.	Comment noted. Commitment: NovaGold will prepare an OMS manual for *Mines Act* permit for closure.	MEMPR is satisfied with NovaGold's response.
Closure	NRCan	4.2.1.1	F.1.2 - Waste Rock The rock dumps should be designed to accommodate placement of a "soil" cover thick enough to support vegetation of the benches and slopes. This is a normal requirement to limit erosion and remobilization of materials in the dump. The logistics of soil placement generally limit the slope of the outside face of the waste rock pile to between 2.5 - 3.0 (H): 1 (V). NRCan looks forward to viewing a conceptual reclamation drawing incorporating these waste management features together with calculations on the volume of soils needed to reclaim these areas.	NovaGold will limit erosion and remobilization of materials in the dumps. Calculations of required soil volumes are provided in Volume III, Table 14.3-4. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting.	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Closure	NRCan	4.2.1.2	F.1.2 - Waste Rock The bottom up construction method for waste rock dumps is advantageous as it allows reduced height between individual lifts with significant savings on resloping costs. The bottom lifts can be progressively reclaimed while the upper areas are still active. This is also advantageous as it can eliminate rehandling of salvaged soil. Soil salvage and placement can be scheduled as part of the mine planning process. This also provides the proponent with an opportunity to demonstrates early in the mine's life that the resloping and revegetation programs can be effectively implemented.	Comment noted. Commitment: NovaGold will implement progressive reclamation throughout the life of the mine.	NRCan is satisfied with NovaGold's response.
Closure	NRCan	4.2.1.3	F.1.4 - Topsoil Salvage or Storage The conceptual provisions for soil salvage and calculation of required soil volumes appears overly conservative. Revegetation of the faces of the waste rock dumps is a standard approach to control erosion and protect water quality. It appears the volume of soil required may be underestimated, based on the apparent lack of dump slope treatment indicated in the conceptual drawing of the post closure landscape. Soil storage in windrows along linear developments is actively discouraged. Stockpiles of this type tend to disappear long before closure. A lack of suitable materials for waste covers and revegetation purposes can have serious consequences on long term surface water quality.	NovaGold has calculated the volumes of soil required for reclamation and is developing a plan to salvage and store a sufficient volume of these materials. Soil to be stored in windrows along linear developments will be a very small part of the overall soil storage volumes and is intended only for reclamation of the immediate area. Commitment: NovaGold will salvage and store sufficient soil to fully reclaim disturbed areas.	NRCan is satisfied with NovaGold's response.
Closure	NRCan	4.2.1.4	G1.2 - Topsoil Salvage and Storage As per the Application, "no salvage (of topsoil) is anticipated in areas to be flooded for tailings or underwater waste rock placement, unless soil balance requirements (salvage: replacement) show a need for additional salvage volume from these areas." (ref: p. 5-106, volume I and section 14, volume III). NRCan recommends that there should be a greater commitment placed on salvaging valley bottom areas that contain better quality organic topsoil in order to provide sufficient quantities of non-amended material for the reclamation stage of the Project.	Comment noted. However, the logistics of salvaging and storing valley bottom soil materials in this steep, high rainfall area pose a significant challenge. Commitment: Salvage and storage of soils for reclamation will be part of the reclamation and closure plan to be developed during permitting.	NRCan is satisfied with NovaGold's response.
Closure	TC	4.2.1.5	7.3 Closure, Commissioning, and Reclamation, S14. *Navigable Waters Protection Act* (NWPA) approvals are for a 50-year period. If an approval is required for the tailings dam, NovaGold will need to show how they intend to uphold the conditions of the approval over that period.	Comment noted. Commitment: NovaGold will develop a plan to show how the conditions of the NWPA approval of the tailings dam will be upheld for the 50 year term of the approval.	TC is satisfied with NovaGold's response.
Closure	USDA	4.2.2.1	Invasive Plant Concern Reseeding of slopes I did not see any mention	Reclamation seed mixes will be purchased from	

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
	FS		of weed free seed.	reputable dealers, complete with Certificates of Analysis for all species that comprise the mix. Commitment: NovaGold will implement measures to avoid the introduction and spread of noxious weeds.	
Closure	MEMPR	4.2.3.1	Reclamation and Mine Closure: The overall reclamation plan appears compatible with the mine plan, biogeoclimatic conditions of the site and final end land use. Under the *Mines Act*, reclamation plans are reviewed every five years in order to re-evaluate the requirement and technical aspects of the program and update the financial security to reflect outstanding reclamation obligations, and long term costs associated with monitoring and maintenance. This will be addressed at the permit level.	Comment noted. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans for *Mines Act* permitting.	MEMPR is satisfied with NovaGold's response.
Closure	MEMPR	4.2.3.2	Reclamation and Mine Closure: In addition to operational receiving environment monitoring, MEMPR will require the proponent undertake monitoring to demonstrate that reclamation and environmental protection objectives, including the capability of detecting significant metal leaching and provide early warning about the onset of ARD and contaminate loadings, and stability of structures are being achieved during construction and operation. This will be addressed during permitting.	Comment noted. Commitment: NovaGold will ensure that the comments regarding requirements for monitoring will be addressed during permitting.	MEMPR is satisfied with NovaGold's response.
Closure	MOE	4.2.3.3	Page 8.8, section 8.2.2.5, Tailings and Waste Rock Disposal/storage progressive reclamation is being proposed as a mitigation strategy for NPAG waste rock fugitive dust. What is the timing for this reclamation and how does this fit into the timing of the pit development and waste rock dump construction? Provide details as to how the development of the various waste rock dumps will be linked to the development of the pits, the duration over which the waste rock will be exposed, and the monitoring program which will be implemented.	While progressive reclamation is in the best interests of NovaGold, progressive reclamation of valley bottom waste dumps will be problematic where they are being constructed from the bottom up and the lower reaches are slowly being inundated behind the dam. Valley side dumps will generally be built by end dumping - progressive reclamation will only be possible once dumping on a particular face has finished. Reclamation of both dump types is planned as soon as feasible once dump faces reach a final stable configuration. Pit development will be somewhat opportunistic depending upon commodity prices, ore grades, stripping requirements, weather conditions and mill feed demands. A monitoring program will be developed during the permitting process and adjusted over time to reflect new	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				information. Commitment: NovaGold will progressively reclaim waste dumps as soon as feasible once dumping has finished and faces become inactive. A monitoring program will be developed during the permitting process and adjusted over time to reflect new information.	
Cumulative Effects	EC	5.1.1.1	Section 9 of the Application mentions Copper Canyon only in passing. If this project is found to be viable and is developed, it could have a major impact on Galore infrastructure. If there is a reasonable likelihood of Copper Canyon proceeding, it should be included in the cumulative effects assessment.	Copper Canyon is not included in the Project at this time and has experienced only limited exploration. It has not been included in the feasibility study and its viability is not known. A total of 11 tailings locations were evaluated and these are summarized in section 11.5.1 of the Application. During the detailed design of tailings and waste placement sequencing for the chosen site T-3, the possibility of using the East Fork of the Galore Valley was considered. However geotechnical data and interpretation from the 2005 field season data indicated that it would be difficult to use the North East abutement of East Fork to construct an embankment that could store tailings and possibly PAG rock. This area would also require an uphill haul and additional power consumption for pumping and was not considered to be a viable alternative Commitment: NovaGold will provide all necessary information if and when Copper Canyon is proposed to become part of the ongoing operation.	EC is satisfied with NovaGold's response.
Cumulative Effects	TC	5.1.1.2	6.20 Cumulative Effects, S7.2 to 7.15, 8.18, 9.1 to 9.10. In S9.9 (Archaeological and Heritage Resources) was there any significance attached to the different artefacts, location and sites that were identified? All artefacts and sites are considered significant to First Nations. For the cumulative effects assessment (CEA), has this been taken into account in the assessment or should some artefacts (e.g.	NovaGold considers all archaeological and heritage sites to be significant. The *Heritage Conservation Act* protects all heritage sites equally. Commitment: NovaGold will make every effort to avoid all archaeological and heritage sites where	TC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			arrow heads) be considered less significant than some sites (e.g. cabin remains)? For example, in the CEA if everything is considered of significant value, then the loss of one site may not be a significant effect, however, if only a few sites are considered of significant value, then the loss of one of those sites could be a significant effect.	possible.	
Cumulative Effects	MOE	5.1.2.1	9.8 Wildlife and Wildlife Habitat Section 9.8.2 Mountain Goat: See comments under 10. Environmental effects monitoring and Follow-up Program. Potential effects on mountain goats are deemed to be significant by MOE and grizzly bears (Section 9.8.1) require re-assessment to include interior grizzly bears.	During the EA Application review, NovaGold prepared and submitted a report which re-assessed potential cumulative effects interior grizzly bears. Commitment: NovaGold will develop and implement a Wildlife Mitigation and Monitoring Plan.	The cumulative effects assessment report for interior grizzly bears is posted to the Environmental Assessment Office website. Measures to mitigate potential effects on grizzly bears will be identified in the Wildlife Mitigation and Monitoring Plan.
Emergencies	EC	6.1.1.1	As stated in the Spill Contingency and Emergency Response Plan (Chapter 11 of Application), the plan is at a conceptual stage and will be refined during the permitting and adaptive management process. Prior to construction activities an updated plan will be produced. The construction phase emergency response plan and future plan(s) should address all common components of emergency preparedness and responses to accidental releases of hazardous materials. Common components within comprehensive response plans include: identification of persons / agencies in the response plan; site by site risk profile (list of hazardous substances stored or in use, toxicity description and volumes at every storage and works site including 'temporary' sites); communications protocols (notification and reporting); initial response activities (procedures to protect human health, assess and secure areas, contain/stop hazardous substance flow without compromising responder safety); mitigation activities including product recovery and clean up; and impact assessment and environmental restoration. Additional sections of well developed response plans include documented records and frequency of exercising the plan. It is recommended that the facility have a paper copy of the spill response plan available at all petroleum and hazardous substance storage facilities. Operators, managers and named personnel should be aware of their roles in the plan. The scope of the plan can be in proportion to the risk presented by the facility. For relatively small storage areas,	Commitment: NovaGold will comply with the requirements of the Environmental Emergency Regulations in the development of spill contingency and emergency response plans.	NovaGold is advised that it is the responsibility of the Proponent to ensure that all work associated with the Project complies with the requirements of the *Fisheries Act* and the *Canadian Environmental Protection Act 1999* as well as any other applicable laws and regulations. With regard to the *Fisheries Act*, the Proponent is reminded of its ongoing responsibility to exercise due diligence at all times to prevent the introduction of deleterious substances into fish-bearing waters as prohibited under subsection 36(3) of the *Fisheries Act*. The Environmental Emergency Regulations, *Canadian Environmental Protection Act 1999* require those who own or

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			simple posted response instructions may be adequate. For larger facilities, a dedicated section of the emergency response plan specific to the site is recommended. The Application states all industry standards will be utilized for installation and prevention of releases. The emergency response plan should develop specific response strategies for spill scenarios. Personnel should be well trained in the event of a release, including reporting and initial site stabilization (assessment and containment if feasible). It is recommended the emergency response plan include identification of known sensitive habitats (specific stream crossings) or sensitive areas along pipeline/access roads? (as well as adjacent to mine infrastructure especially near hazardous liquid storage areas). A focus on listed or endangered species should be included in sensitive habitats and response strategies outlined. For the slurry pipeline, the copper concentrate is estimated to have a pH of ten. The emergency response plan should outline best strategies for neutralizing a spill that may reach surface waters. The Application addresses risk assessment, including a geohazards evaluation and methods or strategies for minimizing exposure to risks. It is recommended the proponent install weather stations along the pipeline route. Data collected along with other available weather data can be used within an overall geohazard risk management strategy. Identification and readiness for elevated risk periods for avalanches or debris flows should be addressed within the emergency response plan. For example, a start of heightened preparedness during high risk periods (for pipelines and trucks transiting along the access road) could be incorporated within the emergency response plan. Schedules for trucks transporting hazardous materials (reagents and other liquids) could also be planned around these anticipated events. The emergency response plan should establish response standards or timing for spill events from trucks hauling fuel and reagents. As stated in the proposal, regular training and awareness for truck operators and road maintenance personnel is required as they are the first responders.		manage specified toxic and hazardous substances at or above the specified thresholds to provide required information on the substance(s), their quantities and to prepare and implement environmental emergency plans. Please visit http://www.ec.gc.ca/CEPARegistry for more information. Adherence to any best practices or recommendations provided here does not relieve the Proponent of its obligation in this regard.
Emergencies	MEMPR	6.1.2.1	It appears that the source of water for fire protection will require a pump. While Nova Gold has a diesel pump for this purpose, gravity feed along with the pump would provide better coverage.	Comment noted. Commitment: NovaGold will take this suggestion into account during the detailed fire protection system design.	MEMPR is satisfied with NovaGold's response.
Explosives	NRCan	7.1.1.1	G1.1 - Explosives As stated in the Application, the explosives factory is	NovaGold has relocated the explosives factory site to	NRCan is satisfied with

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			to be located 800 m from the truck shop which, as shown in Figure 5.5-19, is the nearest building. Explosives storage or manufacturing locations must be a minimum prescribed distances from vulnerable buildings. The distances are based on the quantity of explosives involved. The distance required for the following total quantities are: Explosives (kg) Minimum distance (m) 40,000 760 50,000 820 60,000 870 70,000 920 80,000 960 For this requirement, the total quantity of explosives is equal to the maximum that may be present at any time. If ammonium nitrate (AN) is stored with (or immediately adjacent to) explosives, half the weight of AN is considered as explosive. AN solution is not subject to this requirement. The Application describes two 80 tonne bins that will feed dissolvers - thus, the AN prill alone would account for 80,000 kg of explosives. If the AN is sufficiently far away from the explosives, or separated by a barricade, then it is not regarded as explosive.	increase the distance from the truck shop to meet the requirements of the *Explosives Act*. Insurance underwriters require fire protection to be addressed. Gravity fed is preferred. Stand alone power is also required. Commitment: Explosives factory will be relocated further from the truck shop.	NovaGold's response.
Explosives	NRCan	7.1.1.2	It is not specifically mentioned in the Application, but one assumes that the plant will have storage tanks for the emulsion. If there are two such tanks, each 20,000 kg, for a total of 40,000 kg then, in order not to be considered in the explosive total, the AN would have to be at least 55 m from the explosives or at least 10 m away with a 35 inch thick barricade between them.	Commitment: NovaGold commits to ensuring that the explosives factory will meet all requirements of the *Explosives Act.*	NRCan is satisfied with NovaGold's response.
Explosives	NRCan	7.1.1.3	Another item in the Application that requires correction is Table 18.9-3 found in the "Environmental Management and Mitigation Measures" document. The information provided in the table about the Explosives-ANFO is not consistent with other descriptions. One way to improve the table would be to have a separate line for AN, one for AN solution, and one for explosives manufactured on site.	Commitment: NovaGold will submit a revised table in the application for an *Explosives Act* licence.	NRCan is satisfied with NovaGold's response.
Explosives	NRCan	7.1.1.4	In general, environmental effects pertaining to the proposed explosives factory and magazine are safety concerns, effluent management, waste handling and spill contingency. The detailed description and the mitigation of effects of the proposed explosives manufacturing (factory) and magazines (storage) are described in the Application in Sections 5.5.12, 7.6.3.2, 8.9, 8.12.3 and in Tables 5.5-12, 7-6.1, 7.6-3 and 8.9-2 and Figure 8.9-3.	Comment noted. Commitment: NovaGold's explosives management plan will address all potential air or water emissions from the facility.	NRCan is satisfied with NovaGold's response.
Explosives	NRCan	7.1.1.5	As described in the Application, to ensure that any potential leaching of ammonia salts from explosives storage areas into watercourses is	Comment noted.	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			mitigated, the Proponent plans to use baghouses, storage silos with non-corrosive liners, an impermeable apron with a sump at the loading/unloading area and a spill management plan. Further, the explosives factory and magazine facilities were recognized and incorporated into the Explosives Management Plan and the Spill Contingency and Emergency Response Plan in order to plan for, respond to, and manage the overall safety and environmental issues related to explosives at Galore Creek.	Commitment: None required.	
Explosives	MEMPR	7.1.2.1	There will be a bulk emulsion plant on site and four explosive magazines. With respect to the EA application, there are no items to address. However, at the *Mines Act* permitting stage the following items should be addressed: The explosive magazine locations are adjacent to or within snow avalanche areas as shown in Figure 8.9-3 and Figure 5.5-4 of the Application.	Comment noted. NovaGold has already recognized the issue and relocated the explosives magazine site out of the avalanche path. Commitment: NovaGold will locate the explosives magazine out of the avalanche path.	MEMPR is satisfied with NovaGold's response.
First Nations Consultation	TC	8.1.1.1	2.1 First Nations Consultation, S 2.1.4, 3.1,6.16, 15.2, 15.6, App 6-S, 6-T. NovaGold has done an exceptional job of engaging and consulting with the Tahltan.	Comment noted. Commitment: NovaGold is committed under its Participation Agreement to continue working closely with the Tahltan Nation.	TC Is satisfied with NovaGold's response.
Fish	DFO	9.1.1.1	Galore Creek: Fall (2006) sampling during low flows will be undertaken by MOE in Galore Creek to ascertain if the creek is truly non-fish bearing. Stream gradient, confined nature of the canyon and water velocities suggest that fish presence is unlikely.	Comment noted. Commitment: NovaGold will participate in the winter 2007 sampling program.	DFO supports the proposed sampling and will participate in future field sampling programs.
Fish	DFO	9.1.1.2	Porcupine River: Observations on site in August 2006 confirm that the aerodrome is situated in an area not presently useful as fish habitat. It is somewhat inconclusive if this is always going to be the case. In the event of high precipitation, high snowmelt, or a combination of other climatic events, this area could quickly become usable by fish that are present in the Porcupine.	During field investigations, federal fisheries representatives indicated the site is not fish habitat. The floodplain mapping performed in 2006 by NovaGold at the aerodrome site indicated that the 200-year flood event did not encroach on the proposed aerodrome site. A berm may be built to prevent fish habitat from being created. Commitment: NovaGold is committed to monitoring water levels in the Porcupine River.	DFO observed during a field visit in August 2006 that the proposed aerodrome site was dry and not considered fish habitat at that time. It was also noted that fish habitat surrounds the proposed aerodrome site. Groundwater contributions to the water table are not clear. DFO would like an ongoing commitment to monitor water levels which could affect the status of the aerodrome site as fish habitat.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Fish	DFO	9.1.1.3	Porcupine River: The regular use of de-icing chemicals on aircraft using the aerodrome could have potential toxic effects on fish or fish food organisms. A management plan for this operation needs to be developed.	NovaGold is developing a management plan for the aerodrome, which will include the handling of de-icing agents, for the permitting of the facility. Commitment: During the permitting stage, NovaGold will develop a hazardous materials management plan that will include management of de-icing fluids required for the aerodrome, and will consult DFO and EC on the management of de-icing fluids.	DFO is satisfied with NovaGold's response.
Fish	DFO	9.1.1.4	Stikine River: The connectivity of the project to the overall productivity of the Stikine River needs to be emphasized. This river has a fully developed commercial fishery albeit not large, for chinook, sockeye, and coho salmon.	NovaGold acknowledges the importance of the Stikine River fisheries and is planning to implement measures that will ensure the protection of the Stikine River commercial, sport and subsistence fisheries. Commitment: NovaGold will implement management and spill contingency plans that will include protection of the Stikine River fisheries.	DFO is satisfied with NovaGold's response.
Fish	DFO	9.1.1.5	Stikine River: The Stikine and Iskut rivers have important off-channel rearing and spawning areas for all species of Pacific salmon. Sport/recreational fishery exists particularly in the headwaters. An important First Nations food fishery exists.	Iskut River water hardness and conductivity data are presented in Appendix 6-E of the Application (see figures 3.1-13, 3.1-16 and 3.1-18) and in Appendix 3.1-1 A summary of water quality by watershed is also presented in Table 6.5-6 (Environmental and Socio-economic Setting Chapter) of Volume 1 of the Application. Sub-lethal toxicity testing will be conducted on the filter plant discharge as part of MMER requirements. Commitment: NovaGold is committed to environmental controls during the operation and closure of the Galore Creek project to minimize adverse impacts on the fisheries productivity of the Iskut and Stikine rivers.	DFO is satisfied with NovaGold's response.
Fish	DFO	9.1.1.6	Compensation Plans: The compensation plans for the identified harmful alteration, disruption or destruction (HADD) of the Project are presently lacking in sufficient detail for comment from DFO. Several options have been presented and many show promise. DFO looks forward to further details and discussion on this topic.	NovaGold has developed a conceptual habitat compensation plan. Commitment: NovaGold will develop a detailed fish habitat compensation plan.	DFO, MOE, the Tahltan Central Council will continue to review the fish habitat compensation plan.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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Fish	DFO	9.1.1.7	Galore Creek: More information is required to accurately account for reduced flows in lower Galore Creek as a result of the construction and operation of the tailings dam and water diversions. In particular, a reliable approximation of the actual habitat loss resulting from reduced flow volumes will be necessary to account for impacts to fish and fish habitat.	NovaGold understands that a reduction in winter low flow rates in the lower reaches of Galore Creek could constitute a HADD of fish habitat. As such, NovaGold will maintain low flow conditions. Commitment: NovaGold will investigate low flow conditions in the lower reaches of Galore Creek in 2007 – 2008 to establish mean flows and will supplement baseline flows in Galore Creek to maintain critical water levels for fish in extreme low flow periods.	DFO has concerns with maintaining adequate water quantity in the lower Galore Creek during winter low flow conditions. If minimum low flows cannot be achieved as planned then NovaGold will need to identify the area of fish habitat that will be impacted and a *Fisheries Act* section 35(2) authorization will be required.
Fish	DFO	9.1.1.8	More Creek: DFO considers the newly (2006) identified wetland area along More Creek as critical limiting habitat. Infilling should be minimized and it is strongly advised that the road be moved to a different location to avoid encroachment of the clear flow channel.	NovaGold has investigated the potential to realign the road and has determined that the area will be avoided. Commitment: NovaGold is re-engineering the alignment of the road to avoid critical limiting wetland habitat.	DFO would like to see details of this realignment to ensure the avoidance of fish habitat.
Fish	DFO	9.1.1.9	More Creek: The plans for the 9000 m^2 wetland area which is proposed to be infilled for road construction need to be clarified with DFO. This area contributes nutrients and water quality to important fish habitat. Disturbance to flow regimes need to be minimized through installation of drainage culverts. The mitigation plans presented result in a residual disturbance to fish habitat and compensation needs to be discussed and detailed.	NovaGold is currently developing a mitigation plan for the wetland and investigating and preparing a detailed fish habitat compensation plan. Commitment: NovaGold will prepare a wetlands mitigation plan and a fish habitat compensation plan.	Details will be reviewed as part of the fish habitat compensation plan.
Fish	EC	9.1.1.10	Aquatic Resources A great deal of baseline data was collected, and potential effects to valued ecosystem components were well considered and discussed. In short, primary (phytoplankton) and secondary (benthic invertebrates) production is naturally low or moderately low in the study area, though diversity is good. Many fish	NovaGold accepts the comment that there are different ways to interpret benthic community data. Since 2005, the number of stations (where composites of three benthic invertebrate subsamples are taken) has been increased from three to five in	EC is satisfied with NovaGold's response.

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			species are present, though populations are not large, nor habitat abundant. Galore Creek and the Skud River do not contribute unusually to regional fish resources, though the Stikine River is highly valued. The most significant potential impact on the aquatic environment in terms of water quality changes is probably that from sulphate. The Application asserts that sulphate toxicity is poorly understood and that the BC criteria (100 mg/L) may be overly cautious (p. 7-335). We concur with this, but suggest that the precautionary principle be applied. The proponent asserts that, given flow ratios of 5 and 200 to one in the Scud and Stikine Rivers respectively, sublethal effects will not extend beyond Galore Creek. Even though the flow ratio is closer to 8 and 150 to one (from Tables 6.5-4 and 6.5-5), this seems to be reasonable. With respect to benthic monitoring, three stations per reach (i.e., area) are not adequate to distinguish differences between areas with a high degree of confidence and power. Five stations would be better. However, three replicates "from distinct riffle habitats a minimum of 25 m apart or located on separate braids of the stream" were taken. Thus, the sub-samples are close to being stations in their own right. It would be interesting to re-analyse the data on the basis of nine stations per area instead of 3 x 3 to see if there are any changes in the results and interpretation. Richness appears to be an average of the three sub-samples from each station. It should be calculated as the total number of different species in the pool of sub-samples for each station. Results show most stations had less than 200 individuals per square metre, which is quite low. Charts, and the conclusions made from or implied by the charts, have low precision because of the low numbers, and need to be interpreted with caution. Conclusions about benthos parameters being higher or lower at some stations or reaches compared to others should be accompanied by a note about their statistical significance.	the receiving environment, as recommended by EC. Commitment: NovaGold will maintain a benthic community sampling methodology as recommended by EC.	
Fish	USDOI	9.1.2.1	Volume XV, Appendix 6-T, Section 3.3, Fish Tissue Concentrations, page. 3-7. While whole body juvenile salmon were analyzed for metals, these data were not included in the report as they were not considered relevant to 'country food' information. While we agree that juvenile whole fish metals data are not applicable for human consumption calculations, we believe these data are useful baseline for the aquatic environment data set. Therefore, we recommend that this data set be incorporated into the report appendices.	The requested data are located in Appendix 3.2-6 of Appendix 6-E in Volumes XI. Commitment: None required.	DOI appreciates the clarification from NovaGold that the requested data are located in Appendix 3.2-6 of Appendix 6-E in Volume XI. This information addresses DOI's comment.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Fish	MOE	9.1.3.1	7.10 Fish and Fish Habitat Effects Assessment comments only if time permits. Where compensation is required for char and/or trout species, MOE is to be consulted.	DFO has advised NovaGold that they will consult with MOE during the development of the fish habitat compensation plan. This commitment is consistent with the Canada - British Columbia Fish Habitat Management Agreement. Commitment: No action required	MOE is satisfied with the response
Fish	MOE	9.1.3.2	8.12 Fish and Fish Habitat Management Plan Comments if time permitted. MOE is to be consulted in respect to compensation requirements.	DFO has advised NovaGold that they will consult with MOE during the development of the fish habitat compensation plan. This commitment is consistent with the Canada - British Columbia Fish Habitat Management Agreement. Commitment: None required.	MOE is satisfied with NovaGold's response.
Fish	MOE	9.1.3.3	Page 2-13 It is stated that " MMER prohibits the discharge of deleterious substances in tailings impoundments frequented by fish. The proposed tailings impoundment at Galore Creek is exempted from this prohibition because of the presence of a natural fish migration barrier on the lower reaches of the creek." There is outstanding information required regarding the fish barrier. A full reach break analysis of the Galore Creek watershed is required along with the rational for the fish bearing status on a stream reach level. The other concern was that fish may potentially use sections of Galore Creek during low flow clear water periods. MOE, in conjunction with Novagold, is planning to conduct field work in the fall of 2006 to determine potential fish use during the low flow periods. If fish are found to inhabit the upstream reaches of Galore Creek (above the "barrier"), this may have implications on development and discharge aspects of the project.	Comment noted. Commitment: NovaGold will participate in the winter of 2007 fish sampling program in Galore Creek. A reach break analysis of the Galore Creek watershed will be conducted.	EAO notes this sampling was postponed due to weather conditions and is now scheduled to occur in the winter of 2007. The purpose of the sampling is to further characterize the canyon section (proposed barrier) on Galore Creek and confirm fish distribution in the upper reaches of Galore Creek in flow clear water periods.
Fish	MOE	9.1.3.4	Section 6.9 Fish Habitat and Community should include details regarding the modifications to the 2006 field sampling program. A fish population/abundance assessment was conducted on Galore Creek and Reference Creek the Application should outline this change in the fisheries resource assessment.	A fish population/abundance assessment was conducted on Galore Creek and Reference Creek in 2006. Commitment: Results of the fish population and abundance assessment will be included in the 2006	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Aquatic Baseline Report to be available in the first quarter of 2007.	
Fish	MOE	9.1.3.5	5.12 Road Access Page 5-223, 5.12.1.8 Fish Bearing Crossings: It is acknowledged that environmental objectives associated with construction at stream crossings are provided. A detailed fish and fish habitat management/sediment control plan for stream crossings during construction, operations and closure will be required.	NovaGold acknowledges the requirement of a detailed fish and fish habitat management/sediment control plan for stream crossings during construction, operations and closure. Commitment: NovaGold will prepare a detailed fish and fish habitat management/sediment control plan for stream crossings as part of the permitting stage.	MOE is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.1	C.2.2 - Project Description - Section 5.3.1.1: Permian strata would not "grade upward" into older (lower) Mississippian strata There needs to be more description of the "karst topography" seen in the Paleozoic limestone units as this is not a salient property of these limestones where ESS/GSC has mapped them.	The text should state: "The oldest stratigraphy in the area is known as the Stikine assemblage comprised of several subgroups, including Devonian and younger argillites, mafic to felsic flows and tuffs. These rocks grade upward into two distinctive Mississippian limestone members separated by intercalated volcanics and clastic sediments." Perhaps, rather than "karst topography," a more correct term in this situation is "solution channelling" as evidenced by field data in the Round Lake area where a surface stream is captured by a solution channel and disappears. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.2	C.2.3 - Project Description - Section 5.3.1.2: p. 5-12: it would be useful to provide orientations for the faults responsible for the "structurally-controlled" tertiary intrusive stocks and dykes as well as for the young post-mineral basalt and felsite dyke swarm(s) as these structures would be amongst the youngest in the area.	Small tertiary intrusive stocks and dykes are structurally controlled in their distribution. Steeply dipping N-NNW to S-SSE trending structures generally control their orientation and suggest east-west extension during that time. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.3	C.2.4 - Project Description - Figure 5.3-2: Unit V5 is called "Intermediate Volcanic", but, presumably is the "undifferentiated volcanic" unit in the text? Also volcanic units V4 and V6 (p. 5-15, in text) not shown on this figure. North Rim Creek (p. 5-16, in text) not shown on this figure. The "West Fork porphyry" is not described in the	V5, described as intermediate volcanic in the description, is part of the undifferentiated volcanics group V4-V6. It has been called intermediate based simply on color as a carry over from the Kennecott lithologic classification system. Since V4 and V6 are	NRCan is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			text. The major faults should be named in this map (as some of them are described in the text but their location on this Figure is unknown) The following mineralized zones are not shown on Figure 5.3-2: West Rim, Butte and South 110, Southwest, Opulent Vein, Saddle, North Rim zones.	not outcropping units they are not listed on the map legend. The West Fork Porphyry is a newly defined unit added to the classification in late 2005. The West Fork porphyry is a dark grey-green colour. Aligned orthoclase and hornblende phenocrysts give the rock its characteristic trachytic texture. The orthoclase phenocrysts range from 2-15 mm and comprise up to 5-10% of the rock. The hornblende content is absent-5%, and is often altered to chlorite and epidote. Fine-grained biotite comprises 15-20% of the groundmass, and is typically altered to chlorite. Fine-grained magnetite is common. A new map is being produced that will have more details. The map does not display the other mineralized areas mentioned as they do not have calculated resources. Commitment: NovaGold will provide and updated geology map during the permitting stage.	
Geology	NRCan	10.1.1.4	C.2.5 - Project Description -Section 5.3.2.1: p. 5-16: is "undifferentiated volcanic" presumably is the "Intermediate Volcanic" unit shown on Fig. 5.3-2? p. 5-16, - it would be useful to show the distribution of limestone unit S5 on Figure 5.3-2 as it has potential use as ARD buffer?	The intermediate volcanics in Figure 5.3-2 are part of the undifferentiated volcanic package described in the text in Section 5.3.2.1. The limestone occurs further north than the northern boundary of Figure 5.3-2. Its location is shown on the regional geology map. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.5	C.2.6 - Project Description -Section 5.3.2.4: p. 5-18: what is breccia "packaging"? p. 5-19: where are the Saddle Zone and West Fork breccias? (i.e., put on Figure 5.3-2)	The text should read "Diatreme (B1), Hydrothermal (B2), and Orthomagmatic (B3) Breccia's at Galore Creek are distinguished mainly by clast shape and lithology, matrix composition and distribution, alteration assemblage and mineralization presence." Both the West Fork and Saddle Breccias overprint host rocks of those mineralized areas shown in Figure 5.3-2. The Saddle zone and the Saddle breccia are located just off the map sheet to the southeast and were not shown because it has no calculated resources. The West Fork breccia is a small body, existing mainly in the subsurface and was not	NRCan is satisfied with NovaGold's response.

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				included on the surface geologic map in Figure 5.3-2 because the degree of brecciation does not affect the overall character of the host rock. Commitment: None required.	
Geology	NRCan	10.1.1.6	C.2.7 - Project Description -Section 5.3.3.1: p. 5-21: where are the East Fork or North Boundary faults? (i.e., put on Figure 5.3-2)	Comment noted. The East fault and North Boundary fault will be labelled on the revised Figure 5.3-2. Commitment: NovaGold will provide an updated geology map for permitting.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.7	C.2.8 - Project Description -Section 5.3.4.3: p. 5-29: almost certain the sheet fracture development controls the landform development, not mimics it. Also, this zone should be shown in Figure 5.3-2.	Comment noted. The sheet fracturing zone has not been studied in sufficient detail to explain its relationship to landform development with any more certainty. The extent of the sheet fracturing as part of the ubiquitous broken zone has not been defined. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.8	C.2.9 - Project Description -Section 5.3.5: p. 5-29: where are the East fault Butte area intrusive complex, and, the Dendritic Creek "east-west regional structure"? (i.e., put on Figure 5.3-2).	Comment noted. The text should have read "A north-trending mylonite zone, at least 100 m in thickness, is exposed in volcanic rocks along the western margin of the Galore Creek intrusive complex in the Butte area." The Butte area is about 1.5 km northwest of the Southwest Zone. The interpreted east-west regional structure is a subtle zone that parallels Dendritic Creek. There is no defined surface trace of this fault which is hypothesized from magnetic data and is rather a lineament than a defined fault. Commitment: NovaGold will provide an updated geology map for permitting.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.9	C.2.11 - Project Description -Section 5.3.6.3: p. 5-31: need to add native copper at Middle Creek to metal minerals list.	Comment noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.10	C.2.13 - Environmental and Socio-Economic Setting - Section 6.11 Landscape The impact of the SAC alteration (p. 5-28, 29) and	The sheet fractures are part of the "Broken zone". The features are indicated on other maps throughout	NRCan is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			resultant sub-horizontal fracture cleavage (so-called "sheet fracturing" (p. 5-29, -30) which is recognized to "mimic" the topography (more likely, these structures control the landforms which they underlie) is not assessed as to its effect on slope failure in the section 6.11 Landscape Also, since a large part of this section is a re-cap of Section 5.3, the same comments as listed above, apply. P. 6-127, Central Zone: again, this brittle fault which marks eastern margin of zone is not shown (or identified, if shown) in Figure 5.3-2 P. 6-129: physical features (e.g., lower and middle Galore Creek, Friendly and Bear creeks, More Creek Canyon, Scotsimpson Creek, Andrei Glacier, etc) and development features (e.g., Central, Southwest, North Junction, and West Fork pits) should be identified on a map.	the EA Application. They were not included on all maps as it was considered too cluttered and confusing to label everything. Commitment: NovaGold will provide an updated geology map during the permitting stage.	
Geology	NRCan	10.1.1.11	C.2.14 - Effects of the Environment on the Project - Section 12.6.1 Volcanic Hazards p.12-25: A statement relating to "The silica-rich compositions are similar to those associated with the most violent eruptions on Earth" is given but not annotated as to which eruptions are referred to, and how close an analogue those eruptions are compared with the setting and nature of peralkaline volcanoes in this part of the Cordillera.	The quote in the reviewer's comment is taken directly from the NRCan website (gsc.nrcan.gc.ca/volcanoes/cat/feature_edziza_e.php) and is with reference to the Track Bench pumice deposit at Mount Edziza. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.12	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards C.1.1 - Approach and studies undertaken for geoscience related impact assessment The approach and the studies are undertaken at a detailed scale to assess risks associated with the bedrock geology, namely mapping distribution of geological units and geochemical effects from bedrock, alteration and ore minerals composition and susceptibility to leaching. Volcanic hazards are assessed although more emphasis needs to be accorded the effects of sub-glacial eruptions as these have been the rule, not exception in this area. However their conclusions as to the effect of this on the project area are sound. There are some misunderstandings of regional geology and accepted presentation of the stratigraphy and these are listed below. The map used (Figure 5.3-1) is from a generally accepted source (BCGS MapPlace) but it is too general an illustration to support their geological description. For example, on this map there is no distinction between ancient (Triassic) and Recent (e.g. Iskut River) volcanic flow units which is important in assessing volcanic hazard potential from the geological record. However, none of these are	Comments noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			important to the environmental assessment of the project.		
Geology	NRCan	10.1.1.13	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards C.1.2 - Supporting baseline studies and their documentation The regional geology is taken from a generally accepted source (BCGS MapPlace) but note the comments above about this map (Map 5.3-1) and description of the geological background missing some key references. As well, as noted in detailed critique below, geological maps are missing critical labels or zones described in the text. The detailed map (Map 5.3-2) and sections generally support the description of the bedrock geology. The integration of the variety of alteration types with the calculation of sulphide and sulphate leaching is well done. The description of volcanic hazards (e.g. p. 12-25) minimizes the potential hazard of subglacial eruptions in the projection of hazards from debris torrents generated by melted glacial ice in craters of nearby volcanoes despite the fact that this type of eruption (sub-glacial) seems to have been the rule, not exception. However, given the location of the project area and drainages relative to known recent volcanoes, NRCan would agree with their assessment that there are no perceptible hazards from this volcano-induced effect. Overall, however, the illustrative material in this section generally supports the text description and the deficiencies described above (and, in detail below) do not seriously affect the environmental assessment of the project.	Comments noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geology	NRCan	10.1.1.14	C.2.1 - Project Description - Section 5.3.1 The Stikine Arch actually lies some 50 km to the north of the study area and is a geological feature transverse -- not "transcurrent"-- to the overall structure grain of this part of the Cordillera. Cretaceous to Eocene volcanic rocks would overlie (not intrude) the Mesozoic stratigraphy. Fig. 5.3-1 does not distinguish the ages of volcanic, intrusive, ultramafic, sedimentary and metamorphic rocks and so is of little use in illustrating the geology described in this and later regional geology sections. This is particularly pertinent when assessing the significance of recent volcanoes (e.g. Edziza and Hoodoo Mountain volcanoes) and volcanic fields (e.g. Iskut River flows) in terms of volcanic hazards	Comments noted. NovaGold notes that Cretaceous to Eocene volcanic and subvolcanic rocks overlie and intrude the Mesozoic stratigraphy respectively. NovaGold has referenced (through Logan, Alldrick and others) the full regional geology. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	EC	11.1.1.1	Seismic Hazard Assessment of Dam That Application (Appendix 5H, Section 5.3, by Lori-Ann Wilchek P.Eng. and others) explains that the dam's design criteria anticipate the very high consequences of its	Site specific seismic hazard assessment has been carried out, including probabilistic and deterministic methods. It is suggested that the reviewer contact	EC is satisfied with NovaGold's response and notes that NRCan has comprehensively reviewed

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			failure. For that reason the basis for the design is a maximum credible earthquake (MCE) with an acceleration of 0.25 g, and a "peak ground acceleration" of 0.22 g, based on a magnitude 7 earthquake at about 20 km from the site. The Canadian Dam Association Dam Safety Guidelines (draft, dated October 2005) advise a dam's designers to consider the consequences of dam failure, and perform a site-specific seismic hazard assessment for a specified annual exceedence probability. Appendix 5H provides these. The Geological Survey of Canada website (www.earthquakecanada.nrcan.gc.ca) provides National Building Code seismic hazard values, and appears to be the source of data used in sub-Appendix 1. The website calculates peak ground acceleration estimates for the Galore Creek area. These estimates can be compared with those for the Myra Falls mine site on Vancouver Island, and the City of Vancouver. For a 0.0021 probability (i.e. 10 percent chance in 50 years) the Galore value of 0.083 compares with 0.175 for Myra Falls, and 0.249 for Vancouver. It is recommended that the Galore seismic assessment justify its assertion that the seismic hazard is less than sites in the Lower Mainland.	NRCan for an explanation of comparative seismic risk and MEMPR for differences in the dam design criteria between Myra Falls and Galore Creek. Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	geohazard aspects of the project.
Geotechnical	EC	11.1.1.2	It is recommended that the Galore seismic assessment compare its design criteria to those approved in 1999 by the MEMPR for rebuilding Myra Falls mine tailings impoundment, a site which was assigned a "high" hazard assessment, and not "very high" like this one	Following cessation of an earthquake the safety factor returns to 1.57. The dam has been designed to withstand a 1 in 10,000 year return event, far more significant than the 1 in 1,000 quoted by the reviewer. Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	See response for 11.1.1.1.
Geotechnical	EC	11.1.1.3	It is recommended that the Galore seismic assessment state whether the geotextile sealing membrane within the dam will be preserved during the maximum credible earthquake, so that the risk of piping through the dam will not increase.	The use of the membrane in dam construction is an interim measure for risk mitigation during construction and does not form part of the long term seepage control and integrity of the dam. Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	See response for 11.1.1.1.
Geotechnical	EC	11.1.1.4	It is recommended that the Galore seismic assessment estimate the maximum lateral displacement for the dam's toe berm for a given earthquake probability and magnitude.	Maximum calculated displacement, based on a 1 in 10,000 maximum credible event, using the methodology of Makdisi and Seed (1978), is less than 0.3 m.	See response for 11.1.1.1.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	
Geotechnical	EC	11.1.1.5	Dam spillway during operations and closure The conceptual design in the EA Application includes a permanent spillway excavated in rock at the northeast or right abutment of the tailings dam to connect with the main diversion channel of Galore Creek. Throughout the mine's operating life, the main diversion will convey water around the tailings and waste rock impoundment. As the dam height increases, shorter connecting spillways will be built every two years, leading from the top of the dam to connect with the main diversion (page 5-166, section 5.9.4.4). On closure the spillway's final elevation would control and maintain water in the impoundment. The key issue for temporary or final closure of the operation is stated: "The spillway must be kept clean via regular maintenance to ensure water can pass through year round." (page 8-67, section 8.4.10). If this is not done, the entire flow from a 125 km2 catchment area could evade the excavated diversion channel and its outlet channel section (page 8-37, section 8.3.4.3). The flow could erode the dam's right abutment, and threaten its stability. The Application estimates the risks posed by landslides and snow avalanches to the dam, diversions and spillways during operations but does not describe how those spillways and diversions will be maintained, "for as long as the dam exists." (page 8-67, section 8.4.10). Maintaining these in perpetuity, in an isolated location subject to landslides and snow avalanches, suggests a need to maintain heavy equipment and facilities (e.g. excavator, bulldozer, covered shelter, fuel storage, even accommodation for operators) at a location up to 13 km from the access tunnel portal. That would require maintenance of the tunnel and the access road from Highway 37. Instead, the Application states that road access will be decommissioned (page 8-245, section 8.1.3.4.5; page 14-35, section 14.4.1). Section 14.4.1.4 appears to discuss this point (page 14-36), "the spillway will be kept clean through regular maintenance" without saying how that would be done. The Application lacks a concept for maintaining the dam and the spillways upon closure.	Commitment: During the course of operations, NovaGold will develop and implement a long term maintenance and mitigation strategy for the spillway at the dam for both the operations and closure periods. NovaGold will consider the creation of a formal external review panel to monitor the dam once it is in operation.	See response for 11.1.1.1.
Geotechnical	NRCan	11.1.1.6	A.2.1 - Seismic Design Criteria (Volume 1, Section 5.9.3.3, 3rd paragraph Volume 3, section 12.5.1) Nomenclature: "Maximum Design Earthquake" versus "Maximum Credible Earthquake" versus 1:10000	NovaGold used the more conservative value of 0.25g as the design earthquake.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			year Probabilistic peak ground acceleration... The proponents should be consistent in their use of terminology, specifically "Maximum Design Earthquake" (e.g., section 5.9.3.3 - maximum design earthquake ... 0.25g...") vs. "Maximum Credible Earthquake" (e.g. section 12.5.3 - "...will be designed for the Maximum Credible Earthquake" (which from the calculations shown in Appendix 5I is 0.22g)). The peak ground acceleration value of 0.25g is from the Probabilistic analysis (note this is for Soil class C (Vs=360-750 m/s upper 30 m), the MCE (from deterministic analysis) yields 0.22g at 84th percentile for bedrock - see section 5.9.3.3). It appears that the "maximum design earthquake" which is quoted in section 12.5.1 (page 12-23) combines the largest PGA value from probabilistic with the M=7 strike-slip earthquake from deterministic - is this correct? This is fine, as within uncertainties the MCE value and probabilistic values are the same - and the proponents have chosen the higher (more conservative value) for PGA.	Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	
Geotechnical	NRCan	11.1.1.7	A.2.1 Seismic Design Criteria (Volume 1, Section 5.9.3.3, 3rd paragraph, Volume 3, section 12.5.1) Consider Potential Site Response for Overburden: The PGA values computed in this analysis are as follows: - deterministic - PGA is for bedrock - probabilistic - PGA is for soil class C (Vs=360-750 m/s upper 30 m) As the proponents recognize, they should consider potential site effects (amplification) in areas of thick overburden (as described in section 12.5.1 - last paragraph of this section).	NovaGold considered amplification for dam design using Harder (1990) chart. The amplified crest acceleration was 0.57g (Volume VII, Appendix 5-I. Appendix 6, Table 4). An amplification used for soils in not applicable because the dam is primarily on bedrock. Problematic soils will be removed prior to dam construction. Commitment: NovaGold will ensure that the dam is designed to an acceptable seismic standard.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.8	E.2.2.3 - Tailings Dam A tailings dam will be built in the lower section of the Galore Creek valley (Section 5.9.4). The location of the tailings dams is characterized by peculiar ground conditions, e.g. karstic Permina carbonates underlying the foot print of the dam and artesian groundwater conditions. The following comments/questions address the main NRCan concerns regarding this main component of tailing/waste containment structure: Considering that karstic limestone underlies a portion of the downstream footprint of the dam, has the proponent envisaged carrying out further investigations to better define the geological contact with the limestone formation, as well as better define the presence of karst features?	NovaGold completed fieldwork in the summer of 2006 directed at locating the limestone under the dam and locating karstic features if they exist. Analysis of field data is still underway. A preliminary memo on the geologic conditions under the tailings dam is being prepared and will be available prior to the November 15, 2006 working group meeting on geotechnical issues. This work has determined that there is no karstic limestone under the core of the dam. Design memoranda revising dam seepage and stability analyses will be available prior to permitting of the tailings dam.	NRCan is satisfied with NovaGold's response.

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				Commitment: A preliminary memo on the geologic conditions under the tailings dam is being prepared and will be available prior to the November 15, 2006 working group meeting on geotechnical issues. Design memoranda revising dam seepage and stability analyses will be available prior to permitting of the tailings dam.	
Geotechnical	NRCan	11.1.1.9	Is there any additional investigation beneath the right abutment of the dam to further study the mylonitic thrust fault?	Additional work in 2006 has further characterized the mylonite zone and has determined that it will not affect the intended function of the dam. Additional information was provided by BGC Engineering at the Nov. 15, 2006 Technical Working Group meeting. Commitment: Confirmation information to be provided during the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.10	It is NRCan's understanding that the high hydraulic conductivity of the valley bottom overburden should be better studied with respect to the dam foundation integrity problem. In Section 8.4.3.2-Types of Surveillance, the proponent suggests carrying out visual inspections at the tailings dam. However, NRCan's consider that more detailed monitoring program of the dam should be implemented, e.g. geotechnical monitoring.	Inspections will also include monitoring of the geotechnical instrumentation. Commitment: As intended, geotechnical instrumentation will be installed and monitored.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.11	It is understood that further stability and seepage analyses are required as the design of the tailings dam is not finalised yet. However, is there any monitoring program planned to monitor pore pressure within the foundation, dam settlement and displacement, and response to loading during and after construction?	Pore pressure within the foundation, dam settlement and displacement, and response to loading will be monitored during and after construction using piezometers, slope inclinometers and settlement gauges. Technical details on type of instruments was provided by NovaGold at the Nov. 15, 2006 Technical Working Group meeting. Commitment: Geotechnical instrumentation will be included in the final dam design.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.12	Although a snow avalanche-generated wave is unlikely to reach the crest of the tailings dam, can this affect the integrity and stability of the dam?	Effects of snow avalanche on the dam was addressed in Volume VI, Appendix 5-E, Appendix VII and concluded that there would be no effect.	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: NovaGold will ensure that the dam is designed to withstand an avalanche generated wave.	
Geotechnical	NRCan	11.1.1.13	In Figure 5.2-2, one can observe some sagging features on the east walls of the Galore Creek valley. What is the hazard posed by these features above the main tailings dam? Do they correspond to a deep-seated slope failure?	The features shown on Figure 5.2 are mapped as sites of potential slow slope deformation. Research conducted over the past 20 years mostly in the southern Coast Mountains has demonstrated that these features are widespread, particularly in recently deglaciated terrain (Bovis, 1982, 1990, Evans and Clague, 1994, Bovis and Evans, 1996, Bovis and Stewart, 1998). Research has not been able to identify measurable characteristics that would allow a firm conclusion as to the potential for slow sagging to evolve into rock avalanches. Air photo interpretation and helicopter traverses have not identified any signs of active movement such as open tension cracks. Commitment: NovaGold is committed to continue monitoring the sagging features on the east wall of the Galore Creek valley.	NRCan is satisfied with NovaGold's response. Commitment to continue monitoring is satisfactory as investigations haven't identified any signs of active movements.
Geotechnical	NRCan	11.1.1.14	The Proponent has clearly identified the main geohazards and avalanches hazards that can impact construction of the dam. However, NRCan did not clearly see how the rockfall hazards will be mitigated during construction of the main tailings dam.	Rock scaling will be part of the standard construction practices and safety procedures. Commitment: Appropriate safety procedures will be developed and implemented.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.15	E.2.3 - Tunnel The 3.8 km tunnel, which gives access to the Galore Creek valley and the mine site from the Scotsimpson Creek (Section 5.12.1.10), is a key structure within the project and NRCan understands that this is a challenging component of the project. Figure 5.12-9 illustrates the tunnel plan and profile, including the geological profile along the tunnel alignment. NRCan would like to raise the following concerns and questions:	See responses below.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.16	It appears premature to conclude on the geology in the tunnel since the geology profile seems to have been based solely from surface mapping and not from the results of a drilling program along the tunnel alignment.	A comprehensive evaluation of the geology of the project site and in particular the tunnel alignment has been undertaken by reviewing existing information from past exploration and detailed research	NRCan is satisfied with NovaGold's response.

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				activities/information provided by Dr. Jim Logan of the BC Geological Survey who has undertaken extensive field work in the project area. In addition, detailed surface mapping along the tunnel alignment was carried out to verify work by Logan and has allowed for an interpretative profile of the tunnel geology given the fairly simple volcanic geology present in the project area. From the evaluation of all existing information and the detailed field mapping there are no indications or plausible expectations of any adverse geological conditions to be present along the tunnel alignment. Commitment: NovaGold is committed to conducting probe drilling in advance of the tunnel face development to obtain geological and geotechnical information for tunnel design.	
Geotechnical	NRCan	11.1.1.17	NRCan understands that similar tunnels were built around the world, but were they all built without any drilling program?	Many rock tunnels have been constructed around the world and the extent and scope of pre-construction investigations for most tunnel projects typically varies based on the complexity of the geological environments. Commitment: NovaGold is committed to conducting probe drilling in advance of the tunnel face development to obtain geological and geotechnical information for tunnel design.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.18	It is NRCan's understanding that the exact profile of the substratum beneath the glaciers near both the South and North portals should be obtained before deciding on the final tunnel alignment. Are the groundwater inflows in the tunnel calculated through modelling or simply estimated based on theoretical values of hydraulic conductivities?	The tunnel portals have been sited in terms of construction issues regarding road access grade and to facilitate early tunnel excavation without having to complete extensive excavation of glacial overburden along the slopes where the portals are located and the selected portal locations have therefore defined the overall tunnel alignment. The groundwater inflows into the tunnel have been calculated based on a theoretical analytical approach	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
				by Heuer (1985, 2005) assuming typical rock mass permeabilities along the tunnel alignment that vary with overburden as testing data from past projects suggests. This approach has been verified to be in good agreement with observed findings from constructed tunnels. Commitment: NovaGold is committed to conducting probe drilling in advance of the tunnel face development to obtain hydrogeological information for tunnel water management design.	
Geotechnical	NRCan	11.1.1.19	Thus, NRCan recommends that further detailed geological and geotechnical investigation should be undertaken to obtain a more realistic portrait of the geological conditions (bedrock and structural geology) along the tunnel alignment. Is such an investigation program envisaged by the proponent?	No such investigation program is envisaged prior to the start of tunnel excavation. Provisions have been made in the contract documents that require probe drilling ahead of the advancing tunnel faces and equipment and materials for pre-excavation grouting in the event that unmanageable groundwater inflows may be encountered. Commitment: NovaGold is committed to conducting probe drilling in advance of the tunnel face development to obtain geological and geotechnical information for tunnel design.	NRCan is satisfied with NovaGold's response. Technique used (probe drilling) is standard for such tunnel and provisions for unmanageable groundwater inflows have been made in the contract.
Geotechnical	NRCan	11.1.1.20	F1.1 - Tailings Management Facility (TMF) The risk assessments appear thorough. The TMF is a very large structure with a lot of inherent uncertainty in its operation. It is 285 m high, has a very long (>500 m) and steep face (~36 degree slope) intersected by flat berms every 50 m vertical. The face of the dam extends about 75 ha and the flat crest of the dam is about 4 ha. There are concerns regarding the dam and the seepage volumes to downstream areas. For example: The dam is a large example of its kind. It is about 1.3 km wide at the crest and about 1.4 km from the upstream toe to the downstream toe. It supports an 8 km long water impoundment that is subject to potential large wave development (water hammer?) from wind, land slides or debris torrents, particularly post closure. Is information available on the track record of similarly designed structures?	The clear water impoundment is less than 3 km in length to the waste rock divider separating the tailings from the waste rock. Track record information is available on the dams in the Columbia River system that have considerably longer fetch and similar geohazards. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.21	Exposure of the steep dam face to erosion: will this require repair and	The downstream face of the dam will be constructed	NRCan is satisfied with

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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			maintenance in perpetuity? dam?	of appropriately sized rock to prevent erosion. Commitment: Appropriately sized rock will protect the downstream face from erosion. No further action required.	NovaGold's response.
Geotechnical	NRCan	11.1.1.22	Can a self sustaining vegetation cover be established on the steep face of the dam to help mitigate erosion? Erosion on long steep faces can be eliminated by implementing appropriate design criteria. Has this been considered as an alternative to long term care and maintenance? The concern relates to erosion affecting downstream water quality and ultimately dam integrity. Will the dam face tolerate the eventual growth and wind-throw from trees without impacting its integrity? Put another way, is the planned thickness of growth media on the face sufficient to accommodate root structures and prevent root penetration into the structural portions of the	There is no intent to revegetate the downstream face of the dam, it will be adequately protected from erosion by the use of large rock facing. Commitment: NovaGold does not intend to re-vegetate the downstream face of the dam.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.23	What effect will rock falls, avalanches and debris torrents discharging to the face of the dam from the left and right abutment areas have on the structure and durability of the dam?	Mitigation for any geohazards that could impact the dam will be developed at final design. Commitment: Geohazards mitigation near the dam to be provided during the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.24	Recent experience elsewhere has shown that some "conventional" tailings dam facilities between 50 and 150 m high, constructed and operated within the Canadian Dam Safety Guidelines (1999), had to undergo extensive retrofitting at closure in order to protect the structure from the long term effects of weathering and encroachment by natural successional vegetation. The face of the dams required re-designs for erosion and wind-throw of trees with construction of a toe buttress to improve geotechnical stability. This in turn reduced the overall slope of the downstream dam face to less than 3H:1V which substantially improves the opportunity to develop a sustainable vegetation cover. These were very expensive undertakings to implement after closure. How will this be avoided at Galore Creek?	There is no intent to revegetate the downstream face of the dam, it will be adequately protected from erosion by the use of large rock facing. Furthermore, NovaGold's geotechnical consultants recommend that vegetation growth not be permitted on the face of the dam because it is important for dam monitoring to be able to observe the surface to detect bulges, cracks and other indicators of instability. MEMPR, has suggested that the dam could be overbuilt by placing additional non-PAG rock on the downstream slope. While the option of overbuilding may be feasible and may provide additional security for the dam, it has not been considered in the EA Application and the related environmental effects have not been assessed. The overbuilding could be initiated at a later date through a *Mines Act* permit	NRCan is satisfied with NovaGold's response.

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				amendment process if deemed necessary and if the environmental effects are manageable.	
Geotechnical	NRCan	11.1.1.25	Has an assessment of the avalanche hazard from the face of the dam been considered?	The slope angle of the upslope face of the main tailings dam of 2.5:1 is too low for avalanche initiation as previously noted by BGC. The downslope face is steep enough for avalanche initiation (1.7:1). During operations, there will be an Operations and Maintenance manual in place that will describe avalanche management. The downstream face of the dam will be included in the avalanche management plan. Commitment: During operations, there will be an Operations and Maintenance manual in place that will describe avalanche management. The downstream face of the dam will be included in the avalanche management plan.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.26	NRCan strongly recommends additional work that will demonstrate that the indicated high hydraulic conductivity under the impoundment and dam area is not actually higher than discussed. Additional methods to reduce the seepage are strongly recommended. The calculated volumes of effluent seepage downstream of the dam (12,000 to 64,000 cubic meters/day) seem high from a receiving environment perspective, given the unknown quality of the seepage. Perpetual pumping is not a preferred method of protecting the environment. The area to be flooded and the area under the dam footprint are characterized by faults and "highly" fractured bedrock. The entire impoundment area is characterized as hydraulically variable and needs to be fully assessed before the dam receives final approval.	Additional work in 2006, including packer testing, was completed to improve our estimates of hydraulic conductivity of the dam foundations. Commitment: Confirmation information to be provided during the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.27	It is unclear if the free board during operations and through closure are sufficient to withstand the large wave action from the impact of land slides, avalanche and debris flows. During the operation period overtopping damage can be repaired. How will this be mitigated on closure? The impoundment will also accumulate solids as it acts as a settling pond, not far from the toe of a glacier, as noted in the report. How long will it take for the accumulation of solids in the impoundment to impact on the freeboard of the dam?	The effects of a snow avalanche impacting the tailings impoundment and generating a wave was addressed in Volume VI, Appendix 5-E. This analysis showed the free board is sufficient to withstand snow-avalanche generated waves. Based on existing sediment loading in the Galore Creek valley, the time required to infill the tailings impoundment area to the spillway invert elevation is estimated to be hundreds of years,	NRCan is satisfied with NovaGold's response.

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				assuming that all sediments are trapped. Commitment: NovaGold will continuously measure the water level elevation of the impoundment and will be able to monitor the effects of avalanches and debris flows on the pond.	
Geotechnical	NRCan	11.1.1.28	Will the road and tunnel have to be left in place and maintained, essentially in perpetuity, in order to address the long term stability and seepage issues raised above?	Large equipment will be left in a covered area on the right abutment and personnel will be flown in via helicopter for dam inspections, monitoring and maintenance. This will be developed in the closure plan. Commitment: The closure plan will address access for inspections / monitoring / maintenance.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.29	F.1.2 - Waste Rock The rock dumps should be designed to accommodate placement of a "soil" cover thick enough to support vegetation of the benches and slopes. This is a normal requirement to limit erosion and remobilization of materials in the dump. The logistics of soil placement generally limit the slope of the outside face of the waste rock pile to between 2.5 - 3.0 (H): 1 (V). NRCan looks forward to viewing a conceptual reclamation drawing incorporating these waste management features together with calculations on the volume of soils needed to reclaim these areas.	Comment noted. Commitment: A reclamation plan will be completed during permitting.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.30	F.1.2 - Waste Rock The bottom up construction method for waste rock dumps is advantageous as it allows reduced height between individual lifts with significant savings on resloping costs. The bottom lifts can be progressively reclaimed while the upper areas are still active. This is also advantageous as it can eliminate rehandling of salvaged soil. Soil salvage and placement can be scheduled as part of the mine planning process. This also provides the proponent with an opportunity to demonstrates early in the mine's life that the resloping and revegetation programs can be effectively implemented.	Comment noted. Commitment: NovaGold is committed to design the waste rock dumps and ongoing reclamation as outlined in the EA Application.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.31	F.1.3 - Surface and groundwater quality The diversion ditches have been designed to a 1:200, 24 hr event however the design does not include consideration of a significant rain-on-snow event. The design is for "average flows from a 1:200 year event with some allowance	Wording on page 5-180 in the EA Application should have noted that the design is for a peak flow from a 200 year event with allowance for snow melt. The spillway is designed for a PMF which is much more	NRCan is satisfied with NovaGold's response.

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			(emphasis added) for snow melt". (Ref: page 5-181, Volume 1). Failure to consider the very rapid increase and sustained flow that accompanies a rain-on-snow event, particularly with permanent ice on three sides of the location in a high snowfall area, doesn't ensure adequate waste management and diversion facility design. The risk assessment reviews the consequences of a breach in the diversion ditches; however, the failure to consider a significant rain on snow event is likely to have resulted in an underestimate of both the risk and the consequences. It needs to be demonstrated that the integrity of the tailings management facility (TMF) can be maintained through such an event during all operational stages and the years of closure.	extreme than a 1 in 200 year event. Commitment: NovaGold is committed to design and operate the TMF according to the design outlined in the Application.	
Geotechnical	NRCan	11.1.1.32	G.1.5 - Geological and Geotechnical Engineering According to the Application, the main tailings dam is designed for the maximum credible earthquake or the 1:10,000 year return period earthquake, with a minimum safety factor of 1.5 under steady-state seepage and maximum water level for the downstream slope (ref. 8-33, volume III). As part of the risk assessment effort for the main dam, NRCan recommends that NovaGold provide comparative information on any dams constructed in the world that would have similar characteristics to the proposed main tailings dam in the Galore Creek valley.	Dams in the Columbia River system have similar seismic environments. Commitment: NovaGold will continue to research dam structures with similar characteristics and seismic zones.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.33	The proposed main tailings dam will have an ultimate height of approximately 275 m (683 masl) and be 1.2 km wide at the base. The final crest width varies in the Application, from 30 m reported on p. 5-165 in volume I, to 160 m reported on p. 8-53 in volume III. Please clarify the design width of the final crest of the ultimate main dam.	Wording on page 8-53 (Volume 1 of the EA Application) should have read -- The starter dam crest width is 160 m and the final dam crest width is 30 m. The approximate height of the tailings dam is 265 m. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.34	With respect to geologic structure beneath the proposed main tailings dam, three faults have been identified. However, hydraulic conductivity values have not been obtained by packer testing or by permeability (slug) testing using piezometers of the Main fault zone in order to verify conclusively that no high hydraulic conductivity flow paths are present (ref. p. 5-164, volume I). NRCan recommends that hydraulic conductivity testing of the Main fault zone be undertaken expeditiously in order to address this information deficiency regarding any potential high hydraulic flow paths under the proposed main tailings dam.	Additional work in 2006, including packer testing, was completed which addressed the hydraulic conductivity associated with the identified faults. Commitment: NovaGold will provide additional information at the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.35	To ensure that adequate geotechnical and hydrogeological information	Additional work in 2006 completed all of the	NRCan is satisfied with

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			is acquired for this Project, NRCan recommends that NovaGold implement the list of work recommendations found on pgs. 131-134 in section 12.2 of the Waste and Water Management Feasibility Geotechnical Report - Final, prepared by BGC Engineering dated April 21, 2006.	recommended actions. Commitment: NovaGold will provide additional information at the permitting stage.	NovaGold's response.
Geotechnical	NRCan	11.1.1.36	NRCan expects that NovaGold will commit to implementing the mitigation measures that are proposed to reduce geotechnical risks for the Project, as outlined in the Summary Risk Evaluation, pgs 46-48 in section 6 of Geotechnical Risk Assessment for Galore Creek (FMEA) - Report 097003, prepared by BGC Engineering and Robertson GeoConsultants, March 2006.	Commitment: Recommendations in the FMEA report will be implemented.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.37	As per the conceptual Mine Closure and Reclamation plan presented in Section 14 of volume III of the Application, it's apparent that the access road and tunnel are eventually planned to be decommissioned. However, how will access be gained to the site if heavy maintenance or emergency response to a tailings dam accident is required?	Large equipment will be left in a covered area on the right abutment and personnel will be flown in via helicopter for dam maintenance and emergency response. This will be addressed in the closure plan. Commitment: The closure plan will confirm areas for maintenance and emergency response.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.1.1.38	The largest conceivable negative impact that this project could have would be a tailings dam failure either during the 20 year active life of the mine or in the centuries or millennia following. As the proponents are well aware, the Stikine River is an ecological asset of the first magnitude for British Columbia and Alaska. Failure of the tailings dam during the life of the mine is very unlikely due to the short time span involved and the presence of technicians who will be monitoring the dam. However, in the long term, a 1 in 10,000 chance becomes a certainty. Simulations carried out as a part of this EA indicate that the river would be catastrophically impacted to its mouth in the case of a dam failure. Whether or not required by this stage of the permitting process, NRCan recommends that the long term fate of the tailings dam be investigated. For example, the practical lifetime of the impervious membrane is not stated nor is the life of grout curtains and other measures to control seepage and potential piping once the dam is abandoned. NRCan has been involved with the contentious Tulsequah Chief Project and can say from experience that the United States Environmental Protection Agency takes a multi-millennial view on such matters.	The design of the tailings dam is consistent with all design standards and, as with any major structure, there is an inherent risk. The dam is not intended to be abandoned, but will be subject to long term care and maintenance. The impervious geomembrane liner is not intended for long term seepage control. The grout curtain will have the same life span as the dam. Commitment: NovaGold will continue to monitor and maintain the dam post-closure.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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Geotechnical	SOA	11.1.2.1	At 905 feet tall, the proposed Galore Creek tailings dam would currently rank as the 5th tallest dam in the world. Clearly a failure of the tailings dam represents the greatest potential negative impact to Alaska from the Galore Creek project. The SOA acknowledges that the detailed engineering designs of the tailings dam are still being determined and is gratified that Drs. Andy Robertson and Norbert Morgenstern, two highly regarded experts, have been retained as geotechnical consultants. Nevertheless, the SOA requests the opportunity to participate in the dam design review process and to provide comment as detailed designs are submitted.	Commitment: NovaGold will establish an ongoing initiative with the Tahltan Central Council and relevant Canadian and U.S. federal and B.C. and Alaska state agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects.	SOA is satisfied with NovaGold's response. MEMPR notes that U.S. federal and Alaska State government agencies will have an opportunity to review and comment on the *Mines Act* permit and post-closure plan.
Geotechnical	SOA	11.1.2.2	Sections 11.6.4 and 11.6.5 contemplate the disposal of mine waste in one or more of the different pits that will comprise the project. Since the consequences of a dam failure are related amount of material impounded behind the dam, the SOA supports a careful and thorough consideration of mine sequencing and the backfilling of pits in order to minimize the long term hazards associated with the disposal of mine wastes.	Commitment: NovaGold is committed to minimizing long term hazards associated with the disposal of mine waste rock and tailings.	SOA is satisfied with NovaGold's response.
Geotechnical	SOA	11.1.2.3	Section 14 addresses Mine Closure and Reclamation. The SOA is very interested in the post-closure monitoring and maintenance plan and funding, particularly in relation to the tailings dam since its long-term integrity is a major concern. The SOA understands that Nova Gold will be submitting a more detailed closure and monitoring plan and cost estimate and expects that the currently estimated $19.75 million Canadian dollars cost estimate will likely increase. Again, because the consequences of a dam failure would be so severe to Alaska, the SOA is concerned that adequate measures, including adequate and secure long term funding for monitoring and maintenance, be in place to assure the integrity of the dam. Therefore, the SOA would appreciate the opportunity to review the post-closure monitoring and maintenance plan and funding when it becomes available.	Under the *Mines Act*, NovaGold will be required to develop a detailed post closure monitoring and maintenance plan.	MEMPR notes that U.S. federal and Alaska State government agencies will have an opportunity to review and comment on the *Mines Act* permit and post-closure plan. SOA is satisfied with the responses.
Geotechnical	MEMPR	11.1.3.1	At the mine permitting stage, further refinement of the plan will be required, including: providing cross-sections of the pits.	Comment noted. Commitment: NovaGold is committed to providing the additional information during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.2	3.1. Scotsimpson Tunnel The geotechnical information provided by Nova Gold regarding the Scotsimpson Tunnel is very preliminary, with	The proponent will use appropriate underground mining methods and safety provisions to protect	MEMPR is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			no detailed geotechnical work presented. Additional geotechnical information and operational plans may be required from Nova Gold prior to issuing a permit and beginning construction The plan for tunnel development, tunnel design, ground control measures and safety procedures will be assessed as part of the *Mines Act* permit review. Nova Gold has assumed that they will be able to come up with solutions to ground condition problems as they are encountered. During the permitting phase the company should provide additional information and contingency plans to ensure the safety of the workers and the protection of the environment.	workers. Probe drilling will be used to characterize conditions prior to excavation. Unstable ground conditions will be mitigated with rock bolts, wire mesh, slope mesh, steel sets and shotcrete as required. Re-alignment of the tunnel will be considered if other methods are not successful. Commitment: Additional information and contingency plans will be provided during the permitting stage.	
Geotechnical	MEMPR	11.1.3.3	Tailings/Waste Rock Storage Facility: Long-term storage of waste rock and tailings in the Galore Creek Impoundment will require the construction of the main tailings dam at the north end of the impoundment. The main tailings dam is anticipated to be 275 m high, constructed with mined rock fill and with an impervious till core. A starter dam is to be constructed to a height of 152 m comprising mined waste rock with a bituminous geomembrane liner on the upstream face. The proposed dam design consists of an upstream slope of 2.5H: 1V and a downstream slope of 1.7H: 1V with a final crest width of 30 m. After the starter dam is constructed the dam is to be raised in a downstream direction. For final reclamation purposes a downstream slope of 2H: 1V may be more appropriate.	There is no intent to revegetate the downstream face of the dam so a more shallow slope of 2H:1V is not required. Commitment: NovaGold is committed to designing the tailings and waste rock storage facility according to best engineering practices.	MEMPR supports this approach because it is easier to monitor the dam.
Geotechnical	MEMPR	11.1.3.4	The main tailings dam has been appropriately classified as very high consequence. The conceptual design for the dam structure and flood control spillway during mine operation and after mine closure have been developed based on guidelines provided by the Canadian Dam Association, Dam Safety Guidelines (1999). The dam will be designed based on suitable seismic and flood criteria. The impoundment is designed to store a 1:200 wet year runoff volume. Freeboard will vary from 12m initially to 9 m at the end of mine life. Plans for dam raises, periodic raises of the emergency flood control spillway and changes to the geotechnical instrument monitoring program will be reviewed by the MEMPR and subject to *Mines Act* permit amendments.	Comment noted. Commitment: NovaGold is committed to work within the Canadian Dam Association, Dam Safety Guidelines Guidelines (1999) and *Mines Act* requirements.	MEMPR notes that dam raises are addressed as amendments to the *Mines Act* permit.
Geotechnical	MEMPR	11.1.3.5	Based on the site investigation completed to the end of 2005 and the geotechnical parameters selected for the feasibility level design, the impoundment dam proposed is expected to meet dam safety guidelines with adequate static and seismic stability. The results of the	Additional drilling and mapping in 2006 has confirmed that there is no karst topography under the dam core or in the upstream shell. Additional drilling and mapping has showed that there are some localized	MEMPR is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			drilling, test pitting, geophysical survey and field testing program are considered adequate to characterize the geotechnical and hydrogeological conditions of the area for the purpose of the environmental assessment. The results of the 2006 drilling program are, however, required to confirm that the proposed dam site is not underlain by limestone bedrock or significant weak glaciolacustrine deposits. It is understood that additional geotechnical field investigation is being undertaken during 2006 in the area of the main tailings dam. This additional information will be reviewed by MEMPR as part of the *Mines Act* permit application review.	glaciolacustrine soils at the upstream toe of the dam. Commitment: Additional slope stability analyses will be conducted at final design. Any soft glaciolacustrine soils may have to be removed or the dam slopes flattened accordingly. This information will be provided during the permitting stage.	
Geotechnical	MEMPR	11.1.3.6	Borrow areas have been identified to supply construction materials for the impervious core and filter zones. It is not clear if sufficient volumes of acceptable core material have been identified for dam construction. Moisture content test results indicate that a significant amount of the potential borrow material could exceed the allowable optimum moisture content for compaction and therefore be unsuitable for dam construction. Confirmation that sufficient volumes of suitable dam core material will be available for construction is required. Specifications for dam construction will be reviewed during the *Mines Act* permit review.	Additional drilling and mapping in 2006 has confirmed there is suitable borrow material for construction of the core of the tailings dam. Suitable borrow material is available from prestripping in the proposed Central pit area. Commitment: Information regarding borrow material for dam construction will be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.7	A bituminous geomembrane liner has been proposed to provide an impermeable cover on the upstream face of the starter dam. A 5 m deep grout blanket is proposed where bedrock is located below the liner anchor (Fig. 5.9-3 shows a grout curtain 50 m deep in this area). Laboratory tests have been carried out to assess the durability of the liner under hydraulic load. The ability of the liner to withstand ice loading during periods of tailings pond freezing and the integrity of the liner in the event of differential settlement in the underlying rock fill do not appear to have been considered. These issues require further study or discussion as part of the EA review.	The bituminous geomembrane is considered a temporary seepage control measure for the tailings dam; it will not be relied on for the long-term. The liner will be in place while the starter dam is constructed which will take about two years to construct. Commitment: NovaGold is committed to construct the tailings impoundment dam according to all requirements of the Canadian Dam Safety Association Guidelines and the *Mines Act* requirements.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.8	Suitable conceptual flood control and erosion control plans have been presented for the main tailings dam during mine operation and after mine closure. The proposed pond water control measures rely on regulatory approval to discharge surplus water from the impoundment on an annual basis if water quality is acceptable for discharge. Detailed designs for spillways and associated inlet and outlet channels	Comment noted. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			will be required for mine permit review.		
Geotechnical	MEMPR	11.1.3.9	The OMS manual should also include details of a geotechnical monitoring program developed to provide an effective method of monitoring dam performance. Monitoring results should provide adequate data to assist in the design of the annual dam raises. Annual dam safety inspections and inspection reports will be completed by the design engineer as a *Mines Act* permit condition. In addition, an independent dam safety committee may be established to review dam design and performance.	Comment noted. Commitment: Confirmation information will be provided during the permitting stage.	MEMPR notes the external dam review panel would be formed when the dam reaches a certain height. The costs of the panel are cost-shared with the Proponent.
Geotechnical	MEMPR	11.1.3.10	Open Pits A feasibility level design has been presented for the proposed open pits. An appropriate design factor of safety for pit slopes has been considered. More details will be required in the application for a *Mines Act* permit including detailed pit slope design, supporting geologic and geotechnical data, typical pit cross-sections and proposed plans for controlled blasting and groundwater depressurization. It is recognized that detailed designs will be developed during the course of pit development as mining proceeds and the impact of geological, geotechnical and hydrogeological conditions are assessed. A pit wall stability monitoring program will be required as a condition of the *Mines Act* permit.	Comment noted. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.11	The potential impact of debris flows on the development of the Central Pit has been considered and the need for mitigation measures identified. Details of debris flow structures and associated monitoring plans will be subject to *Mines Act* permit review.	Based on 2006 field investigations, mitigation and monitoring plans for potential geohazards around the Central Pit have been developed. Commitment: Confirmation information to be provided at permitting.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.12	The need for surface water diversion around the pits has been identified.	Comment noted. Commitment: None required.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.13	Waste Rock Dumps and Soil Stockpiles Mined waste rock that is not destined for construction of the Main Tailings Dam, cofferdams, aqueducts, diversion structures and mine roads is proposed to be stored within the tailings/waste rock impoundment, on the valley slope located directly above the impoundment, and on the west side of Galore Creek valley in the vicinity of the open pits.	Comment noted. Commitment: None required.	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Geotechnical	MEMPR	11.1.3.14	A Waste Dump Divider is to be constructed in the Galore Creek valley with a starter embankment 99 m high. Weak glaciolacustrine deposits have been identified in the foundation and embankment slopes of 4H: 1V have been selected based on preliminary stability analyses. The rate of embankment construction will likely be controlled by foundation performance (pore pressures and displacement) therefore a suitable instrumentation monitoring program will be required and will be reviewed at permitting.	Comment noted Commitment: Monitoring program for the Waste Dump Divider to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.15	Geotechnical information presented in support of the EA Application is not sufficient to adequately assess foundation conditions of the valley slope dumps (i.e. dumps in the vicinity of the open pits). Geotechnical information obtained from drill holes and/or test pits are required to provide a better understanding of foundation conditions and to provide parameters for stability analyses. Additional geotechnical information on foundation conditions and stability analyses will be required for the dump designs to meet permitting requirements. High risk dumps and stockpiles will have to be identified and appropriate construction and monitoring programs developed as part of the application for a *Mines Act* permit.	Based on 2006 field work, NovaGold has carried out the necessary geotechnical studies to understand foundation conditions and to provide stability analysis for the dump designs. Commitment: NovaGold will provide additional information for permitting.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.16	The use of wireline extensometers are appropriate to monitor surface deformation of waste dumps but may not be appropriate to monitor foundation stability in high risk areas where glaciolacustrine or other potentially weak foundations are present.	NovaGold will use appropriate methodology for monitoring stability of waste dumps. Commitment: NovaGold will provide appropriate monitoring methodology during permitting.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.17	Water Management Structures Many of the proposed water management structures are classified as major dams as defined by the Mines Act. All water management structures require a Mines Act permit prior to construction.	Comment noted. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.18	The primary coffer dam, to be constructed to a height of 71 m, and the associated Temporary Cofferdam, to be constructed to a height of approximately 10 m, are required for temporary diversion of Galore Creek into a temporary diversion channel to enable construction of the Main Tailings Dam. The dams are to be built using waste rock. A geomembrane liner is proposed to be installed on the upstream face of the Primary Cofferdam. The conceptual design is not supported by adequate information on foundation conditions or stability analyses.	Drilling and geologic mapping has been completed in 2006 to better define the foundation conditions for the proposed Primary Cofferdam. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Geotechnical	MEMPR	11.1.3.19	The East Fork dam, to be constructed to a height of 18 m, is required to divert Galore Creek into the main diversion channel and is required for the duration of mine life. The dam, constructed with waste rock, will have a geomembrane lined settling pond. Foundation conditions are indicated by one drillhole. No stability analyses are presented. The proposed East Fork Diversion Dam appears to be located in proximity to a large rock slide (ref. Site B in Appendix 5-E). The results of the rock slope stability analysis are required for *Mines Act* permit review.	Additional drilling and geologic mapping has been completed in 2006 to better define the foundation conditions for the proposed East Fork dam. Stability analyses will be completed for the dam slopes at final design. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.20	The East Fork Aqueduct, to be constructed to a height of 84 m, is required to carry surface water in the West Fork diversion to the main diversion channel. The embankment is to be constructed with waste rock. The aqueduct channel is to be built with a bituminous liner covered with riprap. Several drillholes provide information on foundation conditions. No stability analyses have been presented in support of the conceptual design.	Assuming waste rock will be used as construction material for the Aqueduct, 2H:1V slopes were proposed. Slope stability analyses were conducted for the downstream shell of the tailings dam at a slope of 1.7H:1V. The downstream shell is assumed to be constructed with the same waste rock as the East Fork aqueduct. Based on the stability results for the downstream dam shell, the recommended Aqueduct slopes are appropriate. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.21	The West Fork dam, to be constructed to a height of 10 m, is to be constructed using waste rock with a compacted clay liner or bituminous liner covered with riprap. The conceptual design is not supported by adequate information on foundation conditions or by stability analyses.	Drilling and geologic mapping has been completed in 2006 to better define the foundation conditions for the proposed West Fork dam. Commitment: Confirmation information on the West Fork Dam foundation conditions to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.22	The design footprint of the main tailings dam could be subject to change based on the exact location of the inferred limestone fault contact. Therefore, the limestone fault contact location needs be determined, as this contact is important to the proposed main tailings dam design (ref. 5-165, volume I).	NovaGold completed fieldwork in the summer of 2006 directed at locating the limestone under the dam and characterizing the contact. Analysis of field data is still underway. A preliminary memo on the geologic conditions under the tailings dam was reviewed and discussed with the Technical Working Group at the November 15, 2006 meeting. Design memoranda revising dam seepage and stability analyses will be available prior to permitting of the tailings dam.	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: Design memoranda revising dam seepage and stability analyses will be available prior to permitting of the tailings dam.	
Geotechnical	MEMPR	11.1.3.23	The Bear Creek and Friendly Creek crossings involve the construction of fill embankments to a height of 40 m at each location. Information on foundation conditions is not provided and stability analyses are required in support of the designs.	Geologic mapping has been completed in 2006 to better define the foundation conditions for the Bear and Friendly Creek crossings. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.24	The conceptual design of the Central pit seepage control structure is not supported by stability analyses.	Stability analyses will be completed for these slopes at final design. Commitment: Stability analyses for the Central pit seepage control structure to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.25	The design criteria for surface water diversion channels appear to be appropriate, including designs based on 200 year return event, the requirement for installing a liner on steeper slopes where bedrock and impervious soils are not present and provision of a perforated subdrain to lower the groundwater uphill of the channel to prevent liner uplift. The FMEA risk evaluation has identified channel erosion leading to an increase in total suspended solids as a high risk during construction and operation. The evaluation identifies that slope erosion and stability control measures are required to mitigate the risk. Construction of protection berms or basins will likely be required where debris flow, debris flood or rock fall hazards are identified along the water diversion channels and water management structures.	Comment noted. Commitment: None required.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.26	A series of surface water ditches and associated sediment control ponds will be required to control sediment from various ground disturbances and waste dumps. Sediment pond dam spillway design based on a 1:200 year return event is appropriate. The location and design of sediment pond dams will be required for *Mines Act* permit review.	Comment noted. Commitment: Confirmation information to be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.27	An OMS manual will be required for all water management structures and diversion channels as a condition of the *Mines Act* permit and	Commitment: NovaGold will provide an OMS manual for all water management structures and diversion	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			should include landslide and avalanche monitoring procedures.	channels during the permitting process.	
Geotechnical	MEMPR	11.1.3.28	Plantsite An assessment of the foundation support conditions in the area of the proposed plantsite is not presented in the documents reviewed. Geotechnical information regarding bearing capacity and settlement characteristics of the foundation soils is required for the EA review to demonstrate that the proposed plantsite area is suitable for construction of the mill buildings and associated infrastructure.	During the EA Application review, NovaGold submitted a feasibility-level plantsite design report and geotechnical foundation report which was provided to the Technical Working Group for review and comment. Commitment: Additional final designs will be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.29	Tunnel Geotechnical information for the 3.8 km tunnel access to Galore Creek is limited and is based on surface inspection of adjacent areas of similar rock types. Rock bolts and/or shotcrete are expected to form the tunnel support. Design of the ground support measures will be based on rock mass quality and the location and characteristics of discontinuities (faults, joints, etc.) obtained by probe drilling ahead of the tunnel face.	Comment noted. Mitigation measures for poor ground conditions may include rock bolts, wire mesh, slope mesh, steel sets and shotcrete or in extreme cases re-routing of the tunnel alignment. The tunnel alignment at the south portal has been slightly modified since the Application was submitted to address geotechnical issues. The new south portal alignment was provided to the Technical Working Group during the review of the EA Application. Commitment: Design of the ground support measures will be based on rock mass quality and the location and characteristics of discontinuities (faults, joints, etc.) obtained by probe drilling ahead of the tunnel face. Appropriate mitigation will be applied to manage poor ground conditions.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.30	The plan for tunnel development, tunnel design, ground control measures and safety procedures will be assessed as part of the *Mines Act* permit review.	Commitment: NovaGold will provide additional information on tunnel development and design, ground control measures and safety procedures as part of the *Mines Act* permit process.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.1.3.31	Mine Closure One of the main objectives at mine closure is to ensure that the tailings impoundment and main tailings dam are maintained in a stable condition to prevent the release of tailings and water. Galore Creek Impoundment will remain an active facility requiring ongoing maintenance and monitoring, as well as annual dam safety inspections, long after the flood control spillway is constructed and the mine closes. Vehicle/equipment access to areas of the impoundment	Commitment: Post-closure monitoring and inspection schedules and resources will be determined prior to closure. Equipment will be stationed near the dam to support ongoing maintenance requirements. An OMS manual will be prepared as required by the *Mines Act* permit.	MEMPR is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			and dam will be required along with construction equipment, materials and supplies for dam maintenance. An OMS manual will be required as a condition of the *Mines Act* permit to cover mine closure activities.		
Geotechnical	MEMPR	11.1.3.32	It is proposed that the north slope of the valley dump located above the tailings impoundment be resloped to a final slope of 4H: 1H and all other waste dumps be resloped to a minimum slope of 2H: 1V. These final slopes are expected to provide long-term stability.	Comment noted. Commitment: NovaGold will construct final waste dump slope angles to a stable configuration.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MOE	11.1.3.33	Section 5.9.6 : "West Fork Diversion Structure". It is not clear what the proposed volume or design criteria are for this impoundment. More information is required with respect to the impoundment design criteria and details required for Environmental Management Planning (expected maintenance schedule, sediment management, etc).	The purpose of the West Fork Diversion Structure is to direct water from the West Fork of Galore Creek into the West Fork Diversion Channel. Final design for the West Fork Diversion Structure will clearly state the volume or design criteria. Commitment: Confirmation information will be provided during the permitting stage.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.1.3.34	Page 5-170, Tailings Dam Construction. Discharges from the tailings starter dam and the secondary earthfill dam, will require assessment during permitting. Will the starter dam be constructed of PAG material? If so, how long before it would be flooded?	The upstream shell of the starter dam may be constructed of either PAG or NPAG material. If PAG is used in the upstream shell, it will be flooded in less than 3 years. Commitment: NovaGold will adhere to the tailings dam construction design as outlined in the application.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.1.3.35	Section 5.9.6 :" West Fork Diversion Structure". It is not clear what the proposed volume or design criteria are for this impoundment. More information is required with respect to the impoundment design criteria and details required for Environmental Management Planning (expected maintenance schedule, sediment management, etc).	The purpose of the West Fork diversion structure is to direct water from the West Fork of Galore Creek into the West Fork diversion channel. Final design for the West Fork diversion structure will clearly state the volume or design criteria. Commitment: Confirmation information will be provided during the permitting stage.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.1.3.36	This section has a comprehensive list of construction and operational phase risks but there is no long term post-closure assessment of risk. What are the extreme long term risks of catastrophic dam failure and what are the potential post-closure failure modes? See comments with	The 'end-of-life' model predictions within the Dam Break Analysis report (Appendix 13-C) can be considered as providing estimates of the impact of dam failure during closure. During closure on-going	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			regard to Appendix 13C Galore Creek Dam Failure Analysis.	inspection and maintenance of the dam will be undertaken consistent with Canadian dam standards. NovaGold will establish an ongoing initiative with the Tahltan and others to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects. Commitment: NovaGold will undertake on-going inspection and maintenance of the dam consistent with Canadian dam standards. NovaGold will establish an ongoing initiative with the Tahltan Central Council and Canadian and U.S. federal and B.C. and Alaska State agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects.	
Geotechnical	MOE	11.1.3.37	Appendix 13-C Galore Creek Dam Failure Analysis The dam failure analysis conducted is consistent with typical practices for modelling dam failures for large hydropower dams. As a result the analysis fails to consider a number of factors relevant to the modes and consequences of tailings dam failure. Key among these factors is the dispersion of tailings along the channel and overbank areas of the floodplain along the flood route. This is key since the dispersed tailings have the potential to generate long term Metal Leachate and Acid Rock Drainage conditions along the outflow route. There needs to be some strategic level consideration of how a dam failure and tailings dispersion would affect the local aboriginal and non-aboriginal populations in particular with respect to in-river and delta food production. A preferred approach would be to model the dispersion of the tailings based on estimates of the areal extent of overbank inundation for a range of failure scenarios. Only then can there be an open discussion with respect potential mitigation of tailings dispersal. Modelling a range of base flow parameters is critical as the sensitivity analysis in the Baird report indicated that a base flow of approximately 1.1 year return period resulted in a flood level equivalent to a ten year return period (according to the flow frequency curve provided in the report), however, a 5 year return period baseflow parameter combined with the TSF volume produced a flood wave at the lower Stikine	Although additional dam break modelling might refine predictions of the downstream effects of a dam failure, it would not change the overall conclusion that the failure of the main dam of the TSF would result in a major environmental effect. As with any major infrastructure project, there will be inherent risks associated with the project. However, the dam has been designed to all relevant Canadian standards and using best engineering practice. As a result a dam failure has a very low probability of occurrence. Commitment: NovaGold acknowledges the potential environmental effects of a dam failure and is committed to design and construction using best engineering practices recommended using relevant Canadian Dam Safety Guidelines. NovaGold will establish an ongoing initiative with the Tahltan Central Council and Canadian and U.S. federal and B.C. and Alaska State agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			equivalent to a 50 year event. The area of inundation of the 50 year event would be considerably larger than for the 10 year event modelled. Assuming that the likelihood of dam failure is random it would seem appropriate to model a range of baseflow parameters across a reasonably foreseeable range of potential flows. Including tailings and entrained solids transport would enable a more realistic representation of the fate of tailings in the unlikely event of TSF failure.		
Geotechnical	DFO	11.2.1.1	Tailings Dam: DFO has concerns about the risk of failure of the proposed dam. This is a very large structure and a catastrophic breaching would result in a huge destruction of aquatic habitat and life. This is an earthquake zone and DFO requests a plan for addressing such an event.	The dam has been designed conservatively for the appropriate earthquake zone and to pass a PMF. Commitment: NovaGold acknowledges the potential environmental effects of a dam failure and is committed to design and construction using best engineering practices recommended using relevant Canadian Dam Safety Guidelines. NovaGold will establish an ongoing initiative with the Tahltan Central Council and Canadian and U.S. federal and B.C. and Alaska State agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects.	DFO has provided NovaGold with references to recent catastrophic dam failures and some of the possible environmental consequences. DFO will participate in the ongoing initiative.
Geotechnical	EC	11.2.1.2	Geohazard Assessment Appendix 5E by Kris Holm GIT and Mattias Jakob P.Geo assesses risks to the project from debris flows, and rock and snow slides. This comprehensive, well-presented study estimates chances of geohazards causing, among other things: shutdown of the concentrate pipeline (and, presumably, breakage of the associated high pressure fuel pipeline); snowslides which may delay normal use of the access tunnel; blockage of surface water diversion channels; and wave run up in the lake impounded behind the tailings dam on closure of the operation. Appendix 5E, sub Appendix VII makes the significant recommendation that final water depth in the tailings impoundment lake should be kept to 20 metres or less, to prevent a slide causing a wave which could overtop the dam. The appendix does not assess the risk and consequences of seiche in this planned lake, meaning oscillating surges in lake levels caused by seismic events.	NovaGold considers a seiche to be a significantly lesser hazard than the impact of a Class 5 snow avalanche from the Bear Creek drainage basin. The tailings dam has been designed to meet and exceed the effects of Class 5 snow avalanche. Commitment: NovaGold design and construct the tailings dam to accommodate the effects of a Class 5 snow avalanche.	EC is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.3	General Comments: The proponents have done a very good job of examining earthquake hazard at this site. They have utilized both	Comment noted.	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			probabilistic hazard methodology (using the 1995 and 2005 National Building Code of Canada (NBCC) earthquake provisions) and deterministic hazard methodology. They have considered a range of earthquake scenarios, based on the most-up-to-date understanding of the regional seismicity. Their chosen Maximum Credible Earthquake (MCE), a Magnitude 7 strike-slip event at a distance of 20 km, yields a peak ground acceleration (PGA) nearly identical to the estimated 1/10000 probabilistic value extrapolated from the 2005 NBCC seismic provisions. The proponents have identified (as they should!) the main tailings dam as having the highest consequences in the event of failure, and propose to design that dam (and also the seepage recovery dam) using the Canadian Dam Association 1999 guidelines (which is the ground motion with the 1/10000 year per annum probability of exceedence or the deterministically determined MCE). This all looks fine.	Commitment: None required.	
Geotechnical	NRCan	11.2.1.4	General Comments: The following comments are based of the review of parts of Volumes I, III and Appendix 5-E included in the June 2006 Galore Creek Application and listed above. The area of expertise and topics covered include: geology, geohazards assessment, natural and engineered slope stability analysis, road access, and foundation of structures. The comments provided below are organized in sections corresponding to the main structures of the project, i.e. the road access, the tunnel, and the mine site. This latter is subdivided into its main structures or development areas. The project Proponent submitted Application documents of high quality, both in terms of presentation and content, for the topics discussed below by this reviewer. In general, all the topics covered by this expert, have been subjected to detailed analyses. The proponent has especially done an excellent work in assessing the geohazards and the snow avalanche hazards, as well as proposing mitigation measures to reduce the hazards and the associated risks. However, certain aspects of the Application have not totally satisfied NRCan expectations. These missing elements and concerns that should be addressed are summarized in the following paragraphs.	Comment noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.5	NRCan would like to underline the excellent work by BGC of identifying, mapping and assessing the landslides and snow avalanches hazards assessment. The information/documentation	The cross sections shown in Figure 5.12-4 are typical sections. Actual mitigation will be tailored to the specific site. Excavations into bedrock may and will	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			provided is of very high quality and describes in a very complete and detailed manner the road design, the potential geohazards (as well as snow avalanche), mitigation measures and risk assessment. However, some technical details appear to be missing: In the proposed road design for full bench road in bedrock (Section 5.12.1.5), as illustrated in typical cross section in Figure 5.12-4, can one assume that high road side barriers will be installed along road? These barriers are illustrated for typical section of partial bench in rock, but not for full bench in rock. Is there any other safety protection that is envisaged but not illustrated in this figure?	uncover a variety of rock structures, some of which will be prone to failure. Mitigation will be commensurate to the conditions encountered. Commitment: Additional rockfall protection will be designed during construction.	
Geotechnical	NRCan	11.2.1.6	The geohazards assessment performed along the road corridor indicates multiple zones prone to landslide and snow avalanche hazards (Section 5.12.1.7 and Appendix 5-E). Figure 5.12.-5 illustrates the location of these critical zones and the results of the landslide hazards assessment. At location 1, a large toppling rock failure is likely to occur during the life of the mine, causing a road closure up to a week in duration. Considering the likelihood of this event and the potential consequences, and although that hazard mitigation measure can be difficult to undertake, Has the proponent envisaged monitoring the rock slope in order to reduce the risk and to prevent any catastrophic consequences, such as the death of travellers on the road.	The probability of impact of the toppling failure at location 1 to a moving vehicle is extremely low. Geotechnical instrumentation installation and monitoring would go well beyond standard practice for a low traffic volume industrial road. Commitment: NovaGold will monitor safety of the access road in order to protect the safety of workers.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.7	E.2.1.2 Pipelines The geohazards assessment performed along the road corridor shows multiple zones potentially subject to landslide and snow avalanche hazards and a series of mitigation measures has been proposed to reduce the associated risk (Section 5.12.1.7 and Appendix 5-E). It has also been recognized by BGC that the proposed burial depth of 1.6 m is not sufficient at some locations along the road alignment to prevent potential failure of the concentrate pipeline by geohazards. Thus, BGC indicated that a greater burial depth would reduce the risk of pipeline failure by 99%, but the proponent does not indicate this appropriate depth. Therefore, what would be the appropriate depth of burial for the pipeline along these critical sections of the transportation corridor?	Depth of burial of the pipeline will vary from site to site along the alignment to afford an appropriate level of protection from site specific geohazards. There is no permafrost within the project footprint outside of the glaciers. Proposed pipeline burial depth is reported in the table in BGC's geohazard report (Volume VI, Appendix 5E, Appendix VIII). Commitment: NovaGold will ensure that the pipeline burial depth is according to PSI and BGC's recommendations to protect the integrity of the pipeline.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.8	Along its alignment between the Highway 37 and the mine site, the transportation corridor reaches high altitudes and may encounter permafrost zones. If this is the case, the concentrate pipeline might be	Proposed pipeline burial depth is reported in BGC's geohazard report (Volume VI, Appendix 5E, Appendix VIII). Permafrost is not encountered anywhere along	NRCan is satisfied with NovaGold's response as well as details provided at the November

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			subject to frost heave effects and potential settlement. A warm pipeline in a frozen ground may also exacerbate these effects. Does the concentrate pipeline cross permafrost zones? If yes, have any measures have been considered to reduce the impact of a warm pipeline in frozen ground?	the pipeline route alignment. The lower limit of discontinuous or possible alpine permafrost is estimated to be 1,600 m (400 m above the highest pipeline sections).	15, 2006 Technical Working Group meeting.
Geotechnical	NRCan	11.2.1.9	E.2.1.3 Glacier Road A temporary tunnel bypass route could possibly be developed on a glacier between Scotsimpson Creek and Copper Canyon in the Galore Creek valley (Section 5.12.1.11). However, very little information is available on this glacier route. Considering the potential danger associated with such a route, NRCan recommends that: The proponent should provide more details on the design of such a road, as well as clearly identify the hazards and the risk of building such a road.	The short term glacier route is no longer being considered. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.10	E.2.2.1 Open pits The open pits will be located in the vicinity of steep slopes and therefore subject to landslide and snow avalanche hazards. Some catchments and diversion structures have been planned and designed to reduce the hazards at the open pits. However, did the proponent carry out any rockfall calculations, including rock fall simulation estimating runout and block size, and take this into account of the design of those structures? At the North Junction Pit, do the low-magnitude rockfalls and debris flows present a real risk for workers in and near the pit?	Rockfall simulations were carried out for the Southwest pit in 2006. The Central Pit has the significant remote-source rockfall. Field work in August 2006 showed that there is no debris flow hazard upslope and affecting the North Junction pit footprint. Commitment: NovaGold will continue to monitor rockfall hazards in the valley.	NRCan is satisfied with NovaGold's response. MEMPR notes this issues is considered during *Mines Act* permitting.
Geotechnical	NRCan	11.2.1.11	E.2.2.2 - East Fork Galore Valley A diversion structure will be built in the East Fork Galore Creek valley. However, this area is subject to important hazards, including rockfalls, rockslides, debris flows, as well as sagging features. The likelihood that these events could occur in the life span of the mine is great. Therefore, considering these elements, the following concerns should be addressed: Considering that sagging features may turn into a catastrophic failure with devastating effects (e.g. rock avalanche with high mobility since debris would travel on a glacier), such a scenario should be simulated/modelled to obtain an evaluation of the debris distribution, velocity and runout.	BGC observed only one sagging feature that is considered active 10 km upstream from the East Fork diversion structure. Its farboschung (5°) lies outside documented case studies. Other mapped lineaments are considered inactive and not signs of potential catastrophic release. Commitment: NovaGold completed these observations in 2006 and will provide the additional information during the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.12	Is there any potential for glacier outburst or jökulhlaup that can impact directly or indirectly the mine facilities?	BGC did not observe any moraine-dammed lakes, supraglacial lakes or ice-dammed lakes that could become a hazard. Subglacial lake outbursts are	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				considered very unlikely. Commitment: NovaGold is committed to a glacial monitoring program.	
Geotechnical	NRCan	11.2.1.13	Although not subject directly to debris flows, the East Fork diversion structure is subject to Size 3-4 avalanches. Therefore, are there any analyses performed to study the impact of snow avalanches on integrity/stability of the structure?	A review of the literature and interviews with an avalanche expert suggests that impact damage from avalanches on earthfill berms is very unlikely. Commitment: NovaGold is designing an avalanche control program.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.14	Please note that in the Appendix 5-E (BGC Report), there is some discrepancies in the identification of sites in Figures 5.3, 5.4, and description in the text.	Comment noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.15	E.2.4.1- Environmental Training awareness An adequate environmental training and awareness program for personnel (Section 8.5.5) should also include information/documentation regarding geohazards, not just key elements on the avalanche control program. For instance, workers at the mine site and along the access road should be aware of indicators of slope movement and must show a higher vigilance during and after severe rainstorms.	Comment noted. Commitment: NovaGold will ensure that the environmental training and awareness program will include geohazard awareness information.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.16	E.2.4.2 - Glacier retreat The proponent has identified the impacts of glacier retreat (Section 6.11.2). However, are those impacts taken into account in the geohazards assessment at the mine site and along the transportation corridor? How can these impacts modify the frequency and amplitude of geohazards events?	Frequency and/or magnitude of rockfall or other geohazards as a consequence of glacial retreat have been discussed in BGC's geohazard report (Volume VI, Appendix 5E). Potential consequences have been taken into account. Commitment: NovaGold will ensure that frequency and magnitude of rockfalls are recorded and form part of the geohazards monitoring report.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.17	E.2.4.3 - Climate change In section 12.1.3, the proponent has identified the impacts of the extreme temperatures on the project. Nevertheless, although the main project structures are located below the permafrost zone, could they be subjected to indirect consequences of thawing of permafrost zones? For example, a slope failure may be initiated due to the thawing of frozen ground and the debris may	BGC has mapped all hazardous areas with the potential to affect the main project structure areas and has concluded that none is currently a cause for concern. Climate change is a slow process and NovaGold will remain alert to the possibility that new hazards may eventually develop.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			consequently reach any structures down slope.	Commitment: NovaGold will monitor hazardous areas.	
Geotechnical	NRCan	11.2.1.18	B.1 - General Comments NRCan has reviewed the sections of the report, listed above, from the perspective of the areas of expertise indicated above. Some of these sections contain plans, designs and analyses by Professional Engineers and NRCan did not comment on these. NRCan has only commented where the engineering assumptions are based upon geological observations that are debatable. This being said, NRCan can report that the methodologies that were used to explore, map and evaluate surficial deposits as a part of this EA are standard and appear to be more than adequately carried out. The same can be said for the identification and evaluation of natural hazards such as landslides, debris flow-prone mountain streams, snow avalanching and rockfall. NRCan sees no obvious problems here. Given the rugged terrain and heavy rain and snow fall that characterize the area, the choice of the southern road access via a tunnel is the best choice but local hazards exist as the proponent recognizes. The assumptions listed in the risk analyses appear complete from the standpoints of surficial geology and contemporary hazardous surficial processes.	Comment noted. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.19	G.1.3 - Natural Hazards Development of the Central Pit will require removal of thick overburden deposits that may be subject to instability during or after excavation (ref. p. 5-83, volume I). Please describe proposed mitigation measures that will alleviate such potential instability.	Cut and fill slopes are engineered to address short and long term stability of the material being excavated and stored. Commitment: NovaGold will ensure that short and long term stability of stored waste material.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.20	With respect to the North Junction Pit, "Further geohazards assessment will be conducted at this location as part of the 2006 program to establish detailed information for permitting" (ref. p.5-84, volume I). Please provide this if it is available.	Additional work on geohazard assessments was completed during the 2006 field season. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.21	With respect to the main tailings dam, "The slopes above the northwest side of the dam include a gully potentially subject to debris flows. Further investigation is required of this gully and scour protection measures may be required on the dam" (ref. p. 5-84,	Debris flow hazards at this location have been significantly downgraded following a field visit in August 2006.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			volume I). Also, the main dam's abutment slopes are subject to shallow rock fall during dam construction and operations. What are the effects of a shallow rock fall and what are the proposed mitigation measures? (ref. 8-66, volume III).	Commitment: NovaGold will develop a construction and maintenance strategy for rockfall during the construction phase.	
Geotechnical	NRCan	11.2.1.22	Approximately 40% of the access route is subject to geohazards (ref. Table 8.15-2, volume III). With respect to the avalanche hazard assessment and the Galore Mine Avalanche Atlas, "Uncertainty of location at this stage of the planning means uncertainty with respect to frequency of effect, magnitude, elements at risk from avalanches and mitigation required" (p. 5-88, volume I). What adaptive management mitigation measures are proposed to address this issue of uncertainty?	Any changes in the alignment of the access road triggers additional avalanche hazard assessments in areas affected by avalanches. Commitment: Assessments by Chris Stethem & Associates Ltd. are on-going and will continue until no further alignment changes are considered.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.23	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards C.1.3 - Adequacy of data to support conclusions - other conclusions or impacts not considered or assessed Generally the data presented by the Proponent support their conclusions. However the impact of the sericite-anhydrite-carbonate (SAC) alteration (p. 5-28, 29) and resultant sub-horizontal fracture cleavage (so-called "sheet fracturing" (p. 5-29, -30) which is recognized to "mimic" the topography (more likely, these structures control the landforms which they underlie) is not assessed as to its effect on slope failure in the section 6.11 Landscape nor its effects on open porosity/permeability in funnelling potential acid rock drainage (ARD) to susceptible streams; this despite the effect of these structures on reducing the rock quality designation (RQD) (p. 5-29).	Additional drilling and geologic mapping has been completed in 2006. Refinements to the feasibility level designs will be based on the results of these investigations. Commitment: Confirmation information to be provided at the permitting stage.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.24	Section 5.3 Geology, section 6.11 Landscape and 12.6.1 Volcanic Hazards Have the effects of snow avalanche on the integrity of the dam structure (not simply over-topping it) been considered (e.g., p. 6-132)?	The effects of snow avalanche on the dam (i.e. considering over-topping failure mechanism) was addressed in Volume VI, Appendix 5-E, Appendix VII. It is not envisioned that a snow avalanche will affect the dam integrity. Commitment: None required.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.2.1.25	P. 6-132: have the effects of snow avalanche on the integrity of the dam structure (not simply over-cresting it) been considered?	The effects of snow avalanche on the dam (i.e. considering over-topping failure mechanism) was addressed in Volume VI, Appendix 5-E, Appendix VII. It is not envisioned that a snow avalanche will affect the integrity dam.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: None required.	
Geotechnical	USDA FS	11.2.2.1	Map at the end of chapter 6.19 section pg 6-270 Bridges along access routes, specifically the steep headwater channels, are designed for high flow 200 year storms. Will there be some sort of diversion structures built to disperse large debris flows that could potentially knock out the bridge and the associated pipeline?	A geohazards assessment has identified potential debris flow runout zones. Bridges have been designed to meet all relevant standards. Bridges across major rivers are designed for the 1 in 200 year peak flow, consistent with highway design requirements. Bridges on smaller creeks have been designed at a minimum to pass the 1 in 100 year peak flow, consistent with design standards for forestry roads. The bridges have also been designed with a minimum 1.5 m freeboard for debris accumulation. Bridge abutments will be protected by riprap, but additional energy dispersion structures will not be constructed along the access corridor. The pipelines will be equipped with leak detection systems to permit rapid detection and response to leaks or ruptures in the event that a debris flow of greater than anticipated size damages a pipe. Shutdown procedures, a spill response plan and an emergency drainage sump near the mid-point of the pipeline corridor will minimize the extent and consequence of any spillage from the pipeline following a breach to the line. Commitment: Bridges along the access corridor will be designed with sufficient freeboard to permit passage of debris flows.	
Geotechnical	MEMPR	11.2.3.1	Rock fall, avalanche and debris flow hazards have been identified above the east dam abutment and along the sides of the impoundment. An evaluation of debris flow potential in the gully near the west dam abutment is required. Designs for the mitigation measures required to protect the main tailings dam, roads, and drainage channels and for worker safety, will be assessed during the *Mines Act* permit review. Tailings management plans will have to be developed that include control of snow avalanches and debris flows. These plans should be included in an OMS manual that will be	Comment noted. Commitment: Confirmation information will be provided during the permitting stage.	MEMPR is satisfied with NovaGold's response.

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			required as a condition of the *Mines Act* permit.		
Geotechnical	MEMPR	11.2.3.2	Rock fall and avalanche hazards above the proposed Southwest Pit and North Junction Pit have been identified and more work is proposed to assess these hazards. Mitigation measures will be reviewed as part of the *Mines Act* permit review.	Rockfall simulations and mapping were carried out in 2006 for the SW pit. Rockfall hazards at the N Junction pit exist within the boundaries of the proposed pit; therefore this hazard will be removed once mining commences in Junction pit. Commitment: Confirmation information to be provided at permitting.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.2.3.3	The FMEA risk evaluation has identified rock fall leading to a fatality during construction as a high risk requiring probe drilling ahead of the tunnel face. Rock fall and avalanche hazards have also been identified at the proposed tunnel portals and mitigation measures have been considered to reduce the risks.	Comment noted. Commitment: None required.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MOE	11.2.3.4	What is the risk associated with ice dam outburst floods from Porcupine Lake? What is the recurrence interval of ice dam formation? What would be the magnitude of an outburst flood and what mitigative measures can be taken at the aerodrome to prevent fuel contamination, bridge failure or other adverse effects in the unlikely event of outburst flooding?	A Flood Risk Assessment will be undertaken during the final design for the Porcupine aerodrome. This will include an assessment of risk from mass flow events originating from Sphaler Creek, ice dam flooding from Porcupine Lake and rainfall/snowmelt flooding from the Porcupine River. Commitment: NovaGold will complete a flood risk assessment during the final design for the Porcupine aerodrome, including an assessment of risk from mass flow events originating from Sphaler Creek, ice dam flooding from Porcupine Lake and rainfall/snowmelt flooding from the Porcupine River.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.2.3.5	What are the climate change implications of ice dam recurrence in Porcupine Lake?	This is a complex question to answer. In the short-term climate warming might tend to increase the likelihood of ice calving from the glaciers, however, in the medium term glacier retreat might decrease the amount of floating ice within Porcupine Lake. A flood risk assessment will be undertaken during the final design for the Porcupine aerodrome. Some consideration of the impact of climate change will be made, but given the uncertainties associated with ice	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				dam formation, quantification of the risk may not be possible. Commitment: A flood risk assessment will be undertaken during the final design for the Porcupine aerodrome.	
Geotechnical	NRCan	11.3.1.1	D.1.5 - Comment no. 5 Terms of Reference (ToR) section(s): 6.6-III; 6.6-VII AEAC section(s): Vol.II - 7.7; BGC (2006), Appendix IV Issue: Post-closure groundwater flow regime Proponent's conclusion: The proponent has conducted 3D groundwater flow modelling in order to predict pit dewatering requirements and design dewatering systems (BGC 2006, Appendix IV). This modelling has yielded figures showing the expected groundwater flow patterns in the Galore Creek watershed for year 21, at the end of mining operations (Vol. II, sec. 7.7.2, Fig. 7.7-4; BGC 2006, Appendix IV). Boundary conditions for the modelling did not consider the presence of impounded water behind the tailings dam. NRCan conclusion: The proponent has not adequately addressed ToR requirements (6.6-III, VII) to characterize residual project effects on the groundwater flow regime and the hydrology of the Galore Creek watershed in the post-closure period. NRCan rationale: In NRCan's opinion, an assessment of residual effects on the groundwater flow regime in the Galore Creek watershed during the post-closure period must account for the presence of the open pits, the tailings dam and the tailings/waste rock impoundment. The presence of the impoundment may be expected to have a profound effect on groundwater flow patterns in the watershed. NRCan's concerns specifically relate to seepage from the impoundment and the ability to maintain in perpetuity the water cover over the tailings, which the proponent is proposing as a measure for mitigating ARD potential in the tailings (Vol.I, sec. 5.11.1.4, p. 5-199). In NRCan's opinion, the proponent should demonstrate the claim (Vol. II, sec. 7.7.2, p.7.282) that complete hydraulic containment of the impoundment is expected throughout the life of mine, at closure and post closure. NRCan recommendation(s): NRCan recommends that the proponent develop a 3D MODFLOW model of the groundwater flow regime in the Galore Creek watershed for the post-closure period. The model should account for the presence of the open pits, the tailings dam and the tailings/waste rock impoundment. Modelling results should be used	During the Application review, NovaGold provided additional information related to the post closure groundwater regime: ▪ BGC Engineering Inc., Galore Creek Project Memorandum: Response to NRCan EIA Question: Post Closure Groundwater Flow Regime, November 18, 2006. ▪ BGC Engineering Inc., E-Mail from Lori-Ann Wilchek (BGC) to Andrew McAllister (NRCan) in regards BGC response to NRCan comment 11.3.1.1, November 23, 2006. The difference in hydraulic conductivities used in the EA Application is a function of the different rock units that are involved. Field testing has been used as the basis for the estimation of hydraulic conductivities of the specific unique rock units. Commitment: NovaGold will modify the current 3D MODFLOW regional model used for pit dewatering predictions so as to account for the presence of the tailings dam and impoundment to accurately represent long term post-closure conditions in the groundwater flow system. The main purpose of this modelling is to establish groundwater inflow and outflow components of the water balance for the Galore Creek impoundment at the regional scale. The deliverable will be a technical memorandum to NRCan presenting the methodology, assumptions, and modelling results. The memorandum will contain details on preliminary model calibration to piezometric heads and baseflow in Galore Creek under pre-	NRCan is satisfied with NovaGold's response and commitment for additional 3D modelling to be performed during the permitting state.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			along with other hydrological information to develop a water balance for the tailings impoundment during the post-closure period.	mining conditions. The memorandum will contain a monthly water balance for the impoundment featuring all relevant fluxes including groundwater seepage. The memorandum will also contain a sensitivity analysis on hydraulic conductivities. Finally, the memorandum will document residual impacts to baseflow in the lower reaches of Galore Creek. The requested modelling will be conducted in a timely manner during the permitting stage but is not required prior to an EA decision.	
Geotechnical	NRCan	11.3.1.2	D1.1 - Comment no. 1 ToR section(s): 5-IV AEAC section(s): Vol. I - 6.6.1; Vol. XIII - Appendix 6-G; BGC (2006) Issue: Groundwater baseline conditions Proponent's conclusion: The proponent estimates the hydraulic conductivities of the overburden, broken rock and "stick" rock layers at 4 x10-7, 1.0 x10-6 and 1.0 x10-8 m/s, respectively (Vol.I, sec. 6.6.1, p.6-53; Appendix 6-G, sec. 2.1.1). Elsewhere (BGC 2006, Appendix IV, p.7) these parameters are reported as 8 x10-7, 1.0 x10-6 and 5.0 x10-8 m/s, respectively. Recharge is estimated at 82% of annual precipitation (Vol.I, sec. 6.6.1p. 6-56, Appendix 6-G, sec. 2.2). Elsewhere (BGC 2006, p.28 and Appendix IV, p.6), it is reported as 13% of precipitation. NRCan conclusion: NRCan concludes that the proponent is reporting conflicting values for key groundwater parameters that are used in open pit dewatering and dam seepage analyses. NRCan rationale: NRCan is concerned that the proponent's groundwater modelling efforts are still on-going at this late stage of the EA process when key groundwater parameters should be stated more definitively. NRCan recommendation(s): NRCan recommends that the proponent report consistent and up-to-date values for key groundwater parameters.	During the Application review, NovaGold provided additional information related to geolgic conditions for the tailings dam: ▪ BGC Engineering Inc., Galore Creek Project Memorandum: Galore Creek – Tailings Dam Geologic Conditions – Update, November 14, 2006. ▪ BGC Engineering Inc., Galore Creek Project Memorandum: Response to NRCan Question: Calibrated Numerical Groundwater Flow Model Recharge Values, November 18, 2006. Commitment: NovaGold will use appropriate hydraulic conductivity values.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.3.1.3	D1.2 - Comment no. 2 ToR section(s): 5-IV AEAC section(s): Vol. I - 5.9.4, 6.6.1; Vol. VII - Appendix 5-I, sec. 8.4; Vol. XIII - Appendix 6-G; Vol. XVI - Appendix 14-A Issue: Hydraulic conductivity of major faults and bedrock discontinuities. Proponent's conclusion: The proponent has identified the presence of two important faults in the mine area	The additional field work, recommended by the consultant, was completed in 2006 and the requested additional information was provided in: BGC Engineering Inc., Galore Creek Project	NRCan is satisfied with NovaGold's response.

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			(Vol.I, p.6-52), including one under the main tailings dam (Vol.I, p. 5-164, Appendix 5-I, p.88-89). Hydraulic conductivity measurements for these structures have not yet been obtained (Vol.I, p.5-164; Appendix 5-I, p.14). The proponent has concluded that high-conductivity flow paths in these features could be present although they are considered unlikely (Vol.I, p.5-164, Appendix 5-I, p.89). Referring to the major fault beneath the main tailings dam (Appendix 5-I, p.ii), the proponent concludes that "The fault is narrow, appears relatively impervious and not considered a significant detriment to the dam integrity". NRCan conclusion: The proponent's conclusions regarding the hydraulic significance of major fault zones and other bedrock discontinuities seem premature in the absence of field data. The proponent must obtain measurements of hydraulic conductivity for these features. NRCan rationale: NRCan believes that measurements of hydraulic conductivities of major faults and bedrock discontinuities are a critical part of baseline groundwater characterization studies. Such discontinuities have a considerable potential to form high-conductivity, preferential groundwater flow paths which could significantly alter seepage estimates, and related effects assessments, if unrecognized. NRCan recommendation(s): NRCan recommends that the proponent follow-up on its own consultants' recommendation to characterize the hydraulic conductivities of fault zones and other bedrock discontinuities (BGC 2006, p.59). If the conductivities of these features contrast significantly from those of surrounding bedrock, the features should be represented in groundwater flow models used for seepage calculations (main tailings dam) and effects assessments.	Memorandum: Galore Creek – Tailings Dam Geologic Conditions – Update, November 14, 2006.	
Geotechnical	NRCan	11.3.1.4	D1.3 - Comment no. 3 ToR section(s): 3.3-XIV; 6.6-III; 6.6-IV AEAC section(s): Vol. VII - Appendix 5-I, sec. 7.7; App. III Issue: Diversion channel seepage assessment. Proponent's conclusion: In order to identify drain requirements to lower the water table and stabilize cut slopes for the main diversion channel, the proponent has performed groundwater seepage analyses using the two-dimensional finite element code SEEP/W. A cross-sectional model is used to represent seepage faces developing on the eastern slope of Galore Creek valley, above the proposed diversion channel. Constant-head boundary conditions are applied on the uphill and downhill vertical boundaries of the model (Appendix 5-I, appendix III, sec. 4.2). NRCan conclusion: A downhill constant-head boundary condition is not the	Additional geotechnical work was completed in 2006 to characterize the eastern slope of the Galore Creek valley parallel to the impoundment The requested additional information provided in: ▪ BGC Engineering Inc., Galore Creek Project Memorandum: Main Diversion Channel Seepage Analysis Update to Downhill Boundary Condition, November 20, 2006. This report outlines the results of revised modelling of drainage requirements and channel design using the	NRCan is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			most appropriate for reaches of the diversion channel adjacent to ponded water in the tailings and waste-rock management facilities. The choice of boundary condition used by the proponent may affect the determination of requirements for drains needed to ensure the stability of cut slopes above the channel. NRCan rationale: As Galore Creek valley is filled with tailings and waste rock, the water level in the impoundment behind the main tailings dam will rise accordingly. Topographically-driven groundwater flow from the surrounding uplands will converge to a discharge zone in the valley. The central longitudinal axis of this discharge zone represents a groundwater flow divide or, in modelling terms, a vertical no-flow boundary. The water level in the impoundment represents a horizontal constant-head boundary. In NRCan's opinion, incorporating these more realistic downhill boundary conditions in the numerical model may reveal greater than anticipated development of seepage faces on the eastern slope of Galore Creek valley. NRCan recommendation(s): NRCan recommends that the proponent confirm the drain requirements and channel design by performing additional seepage modelling using the downhill boundary conditions proposed herein.	recommended downhill boundary conditions. The revisions do not change the stability analyses for the slopes or the drain capacity required to generate stable water table conditions that will result in stable slopes.	
Geotechnical	NRCan	11.3.1.5	D.1.4 - Comment no. 4 ToR section(s): 3.3-XIV; 6.6-III AEAC section(s): Vol. I - 5.9.4.10; Vol. VII - Appendix 5-I, sec. 8.6; App. VII Issue: Main tailings dam seepage assessment. Proponent's conclusion: Using the SEEP/W code, the proponent has conducted two-dimensional seepage analyses for the main tailings dam in order to estimate seepages fluxes below the dam, through the foundation. Analyses were performed for the starter dam (with and without tailings) and for the final dam, on cross-sections representing the dam centerline and the east and west abutments (Appendix 5-1, sec. 8.6, p.95). The proponent did not model seepage through the valley walls "because hydrodynamic containment of the reservoir is expected to be preserved by high groundwater levels in the surrounding slopes and ridges. This will maintain a hydraulic gradient into the tailings pond" (Appendix 5-I, sec. 8.6, p.96). According to the proponent's two-dimensional model, unmitigated seepage losses through the final dam are expected to range between 7 and 740 L/s, with 74 L/s being the best estimate (Vol. II, sec. 7.7.2, p.7-274; Appendix 5-I, sec. 8.6, p.98). NRCan conclusion: The proponent's two-dimensional seepage model does not adequately represent the three-dimensional nature of the	Additional information was provided in: • BGC Engineering Inc., Galore Creek Project Memorandum: Response to NRCan Question: 2D versus 3D Seepage Modelling for Proposed Tailings Impoundment, November 18, 2006. The topography and geology of the Galore Creek valley suggest that a 2-D model for assessment of seepage through the dam is appropriate. This methodology is supported by the senior external reviewers for the project, Dr. Andy Robertson and Dr. Nordie Morgenstern. NovaGold did not do 3-D modelling. Commitment: NovaGold will conduct revised local-scale numerical modelling for the specific purpose of	NRCan is satisfied with NovaGold's response and commitment for additional 3D modelling to be performed during the permitting state.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			groundwater flow regime in the vicinity of the impoundment and the tailings dam. As a result, seepage flows from the impoundment may be significantly understated. NRCan rationale: As the proponent has stated (Appendix 5-I, sec.8.6, p.96; App. VII, p.3), the surrounding topography will ensure a hydraulic gradient into the tailings pond. It follows that there will be a corresponding groundwater flux into the tailings pond, perpendicular to the plane of seepage model cross-sections. However, use of a two-dimensional "profile" model assumes that all flow occurs parallel to and in the plane of the profile (Anderson and Woessner, 1992, p.172). Therefore, in NRCan's opinion, the proponent's use of a 2-D cross-sectional model is clearly not appropriate for the purpose intended, namely to assess seepage from the main tailings dam. Accurate estimates of seepage losses from the tailings dam are critical for the design of the seepage collection system (Vol. II, sec. 7.6.4.3, p.7-267; sec.7.7.5, p.7-291; Vol. III, sec. 8.4.5, p.8-59), the tailings impoundment water balance (Vol.III, sec. 8.3.3, p.8-19; Appendix 5-I, sec. 6.4, p.8), and ensuring that a 16m water cover (Vol. I, sec. 5.11.1.4, p.5-199; Appendix 5-I, sec. 8.6, p.95) is maintained over the tailings in the post-closure period. Although the proponent has recognized that there will be groundwater seepage into the impoundment, NRCan notes that seepages fluxes into (or out of) the impoundment are not considered in the Galore Creek Storage Facility water quality modelling (Appendix 7-D, sec. 4.2.3, p.4-26). NRCan recommendation(s): NRCan recommends that the proponent use a three-dimensional numerical model to estimate seepage flows to and from the tailings impoundment. Alternatively, the proponent could modify the current 3D MODFLOW model used for pit dewatering predictions so as to account for the presence of the tailings dam and impoundment. Although unlikely, it may then be possible to identify more appropriate profiles through the tailings dam verifying the assumptions implicitly required in order to use 2D cross-sectional flow models such as SEEP/W for predictive purposes. References Anderson, M.P. and W.W. Woessner, 1992. Applied Groundwater Modelling, Simulation of Flow and Advective Transport, Academic Press, Inc., San Diego, CA. pp. 381.	predicting seepage from the Galore Creek impoundment. This modelling will accurately represent the 3-D nature of groundwater flow toward the impoundment and in the vicinity of the dam and its abutments. The modelling will feature an updated representation of subsurface conditions (from the 2006 geotechnical campaign) including the major bedrock discontinuities. The deliverable will be a technical memorandum to NRCan presenting the methodology, assumptions, and modelling results. This memorandum will include an analysis of the sensitivity of seepage predictions to hydraulic conductivities. It will also include an analysis of the effectiveness of the proposed capture well seepage mitigation strategy. The requested modelling will be conducted in a timely manner during the permitting stage but is not required prior to an EA decision.	
Geotechnical	NRCan	11.3.1.6	G.1.4 - Hydrogeology With respect to hydrogeological investigations of the proposed tailings and waste and open pit areas, and because not all of the drill holes were packer tested, please validate that the packer	Additional testing was completed in 2006 results and will be provided during the permitting process.	NRCan is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			tests conducted for hydraulic conductivity of the highly fractured bedrock were sufficient in number and spaced appropriately for adequate characterization (ref. p. 5-155, volume I).	Commitment: Additional data will be provided during the permitting process.	
Geotechnical	NRCan	11.3.1.7	Again, at some point, the long term problem (long after mine abandonment) of water quality during drought conditions will have to be addressed. Rates of seepage may well increase in the future following the eventual failure of the membrane. To what extent would enhanced seepage impact receiving waters during periods of low flow centuries from now? How far down stream would it be detected?	The impervious geomembrane is not intended for long term seepage control. All seepage calculations were completed on the assumption that the geomembrane was not present. Commitment: NovaGold will monitor rates of seepage.	NRCan is satisfied with NovaGold's response.
Geotechnical	MEMPR	11.3.2.1	Seepage losses from the tailings impoundment are to be minimized by the construction of an impervious till core and a 100 m deep grout curtain (Fig 5.9-3 shows grout curtain 50 m deep) in the highly fractured bedrock foundation. The spigotting of a tailings beach from the upstream dam crest will assist in reducing seepage. The till is described as sandy gravel with a trace of silt and clay and has been assigned a hydraulic conductivity of 1x10-7 m/s. This material would provide a core with poor drainage characteristics rather than an "impervious core". It is understood that seepage analyses will be checked based on the additional information gained from the 2006 geotechnical investigation program.	Additional investigations have been completed in 2006. Based on the results of these investigations, the seepage analyses through the dam and foundations will be modified (if required). Commitment: Confirmation information on revisions to the dam seepage analyses will be provided during the permitting stage.	MEMPR notes the material proposed for the dam core would not be impervious given hydraulic conductivities.
Geotechnical	MOE	11.3.2.2	Section 5.9.4.10: indicates that a seepage impoundment will be built below the main dam but does not indicate the impoundment volume or design criteria. This information will be required for EA and permitting purposes. (Permitting, Hudson)	Revisions to the proposed seepage collection system will be completed at final design; these revisions will include the design volume/criteria. Commitment: Confirmation information to be provided at permitting.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.3.2.3	Section 5.9.4.10 "Seepage Analysis" states "A 10 m. wide, 100m deep grout curtain was modelled assuming the curtain extends along the dam alignment. The results of these analyses showed that this cutoff reduced seepage to 146 L/s or 67%." Section 7.7.2.1 "Mitigation for High Seepage Rates" states "...a grout curtain directly under the till core of the dam is proposed with dimensions of 50 m by 10 m. across the Galore Creek valley....The grout curtain reduced seepage by approximately 66%..." A 50% reduction in depth of the grout curtain seems to have had a negligible effect on the modelled seepage rates, this seems suspect.	Additional drilling and permeability testing has been completed by NovaGold in 2006. Revisions to the seepage analyses will be completed based on the results of these investigations. Final design for the tailings dam will consider these analyses. Commitment: NovaGold will provide a detailed design as part of permitting.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Geotechnical	MOE	11.3.2.4	Page 5-164, Geologic Structure, Main Tailings Dam (5.9.4) It is noted that "hydraulic conductivity values have not been obtained for the fault zone, however, and although it is unlikely, high hydraulic conductivity flow paths could be present. Additional angled boreholes are planned to study the nature and extent of possible high flows beneath the dam as well as possible influence faulting may have on excavated slopes for the abutments." The potential influence of the fault structures related to the tailings impoundment are significant issues regarding geotechnical stability (MEMPR concern) and hydraulic conductivity, seepage control, mitigation capabilities and impacts to the downstream environment (MOE concern). As faults are often well-known for their elevated hydraulic conductivity relative to country rock, what is the rationale behind the statement that "...it is unlikely that high hydraulic conductivity flow paths are present"? Note that for discussions regarding the access tunnel hydrology, it was stated on page 5-242, that "minor groundwater inflows are expected... except at the intersection of fault zones where moderate to high inflows could be encountered," and discusses "...individual higher permeability features such as fault zones."	See response for 11.3.1.3. Commitment: Confirmation information to be provided at permitting.	MOE notes this comment is intended as a “heads-up”.
Geotechnical	MOE	11.3.2.5	It is recognized that the mylonitic thrust fault is considered to have low conductivity due to the clay fault gouge, but this cannot be assumed for all faults in the area. Note that a fault associated with a limestone contact may have originally been of low conductivity, but with dissolution of the limestone due to seepage, the conductivity may have greatly increased. The report indicates that further assessment of faults will be occurring. What is the time frame for the detailed assessment of the fault zones to occur? Groundwater monitoring wells will need to be sited within the fault structure along strike to assess whether or not seepage is utilizing the fault zones as a conduit.. Mitigation strategies in the event that this is occurring will need to be developed. The limestone fault contact was identified as a particularly important structure (page 5-165), and given the capacity for karst development within limestone, the characterization of the limestone contact fault as a seepage conduit is important.	During the EA Application review, NovaGold provided additional information improving the characterization of faults under the dam footprint based on the results of additional drilling and geologic mapping completed in 2006. Additional information was also provided on the geologic conditions under the tailings dam. Commitment: Design memorandums revising dam seepage and stability analyses will be available prior to permitting of the tailings dam.	MOE is satisfied with NovaGold’s response.
Geotechnical	MOE	11.3.2.6	It is stated that due to the parallel nature of this fault, seepage will not be an issue. It was also stated that for the Main fault that "...this fault strikes roughly perpendicular to the dam alignment. The steep dip and	During the EA Application review, NovaGold provided additional information improving the characterization of faults under the dam footprint based on the results	MOE is satisfied with NovaGold’s response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			orthogonal strike of the fault offer the minimal possible cross sectional area for seepage along a potential high conductivity conduit." As the limetone contact is thought to have a vertical dip and runs parallel to the dam orientation, the limestone fault would then present a high cross sectional area for potential seepage intersection. The interpretation for the Main fault and the limestone fault to provide a seepage conduit appear to be at odds with one another. Clarification is required as to the relative seepage potential of these two structures.	of additional drilling and geologic mapping completed in 2006. Commitment: Confirmation information to be provided at permitting.	
Geotechnical	MOE	11.3.2.7	Section 5.9.4.10: indicates that a seepage impoundment will be built but does not indicate the impoundment volume or design criteria. This information will be required for EA and permitting purposes.	Design of the seepage collection system downstream presented in NovaGold's feasibility Waste and Water Management report was based on 'base' case seepage out of the tailings dam and foundations. This design will be revised based on the 2006 field investigations and analyses. Commitment: Confirmation information will be provided during the permitting stage.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.3.2.8	How is the increase in hydrostatic pressure from the filling of the tailings impoundment likely to affect the groundwater flow rates in the radius of influence of the pit drawdown cone? Does the pit drawdown cone radius of influence intersect the radius of influence of the TSF groundwater potentiometric surface?	The increase in hydrostatic pressure from the filling of the tailings impoundment is predicted to have minimal impact on groundwater flow rates in the vicinity of the pits. Results of a sensitivity simulation that incorporated the tailings filled to their maximum level showed that predicted pit inflows and perimeter well extraction rates were not found to increase significantly as compared to simulations that did not incorporate the tailings (Appendix IV, pages 13-14). Plots of pit inflows can be found in Appendix V and VI within Appendix IV of the open pit report. Commitment: None required.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.3.2.9	Does the water balance model include a component of groundwater inflow to the TSF? Shallow soil and broken rock aquifer return flows will report to the TSF throughout the life of the mine and into closure. How were these inputs estimated or modelled and is it certain that they are not significant water balance components? It would seem that the groundwater return flows reporting to the TSF could be in an order of magnitude sense similar to the TSF impoundment evaporation or	The water balance model does include groundwater inflows to the TSF. Watershed inputs to the model are based on monthly runoff estimates calculated from analysis of baseline and WSC stream flow data. As the estimates are based on stream flow data they are assumed to account for all upstream watershed processes that produce flow, including surface runoff,	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			diversion channel seepage volumes.	groundwater inflows, glacier melt, etc. However, where there were changes in groundwater inflows during operations (e.g., dewatering wells around pits, runoff from the tunnel) these were considered separately in water balance calculations A full description of the derivation of key hydrological parameters is provided in Appendix 6-C and details of water balance calculations are given in Volume II, Section 7.5 and Appendix 7-D. It should be noted that UBC Watershed Models were also developed for Galore Creek and More Creek. The UBC Model is a physically based model and is able to predict the relative contributions of many runoff generating processes to the stream flow hydrograph (e.g., glacier melt water, surface runoff, snowmelt, groundwater). The models were used to provide insight into the key hydrological processes in the study area and to estimate the impact of development for certain hydrological conditions (e.g. impact of climate change, impact of road construction on stream flows in More Creek). Commitment: None required.	
Geotechnical	MOE	11.3.2.10	Page 8-59, Seepage Management Shallow/deep seepage collection and localized surface run-off are to be collected and if necessary pumped-back to the tailings impoundment. Due to the fractured nature of the bedrock (150-200m) and the location of 3 major faults within and at the toe of the main tailings dam; the potential for substantial, difficult to control seepage is a concern. Refer to comments for section 5.9.4 regarding the fault structures.	Revisions to the proposed seepage collection system will be completed at final design. Commitment: Confirmation information to be provided at permitting.	MOE is satisfied with NovaGold's response.
Geotechnical	EC	11.4.1.1	Generally speaking, the water management scheme proposes to divert runoff from offsite areas in the Galore Creek valley around the mine so that natural flows are retained to the extent possible. According to the proposal, 20 km2 (14%) of the Galore Creek watershed is below the proposed site of the main dam, 38 km2 (26%) would drain to the main impoundment, and 87 km2 (60%) would be diverted around the mine.	NovaGold considered that the adverse slopes and avalanche hazards to make the construction and operation of this channel not feasible. Commitment: None required.	EC is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			The Application should discuss why there is no diversion channel proposed for the slopes above the western side of the impoundment.		
Geotechnical	EC	11.4.1.2	The project is expected to generate a water surplus. The impoundment is designed to retain water during fall and winter and the first part of freshet if necessary due to poor water quality. The proponent proposes to discharge the excess water during freshet high flows between May 15 and October 15 (or after June if necessary), with no discharge during fall and winter low flows. This will reverse the usual effect of a mining impoundment in a watershed: instead of lower high flows and higher low flows, Galore Creek will experience higher highs and lower lows during mine operations. Peak discharge from the facility is projected to reach 20 m3/s (almost two million cubic meters per day) if discharge is delayed to July. Consequently, freshet flows at the mouth of Galore Creek are predicted to increase by 36%, and flows to the Skud River at its confluence with the Stikine River by 10%. The wet year/dry year baseline data suggests this increase is within the range of natural variability, but baseline data is not interpreted in a way that supports this. Also, there is no information in the Application regarding effects of this increased flow on erosion and potential channel morphology changes in lower Galore Creek. This should be addressed.	Volume II, Section 7.5.1.4 provides a discussion of the project approach to assessing impacts to surface water quantity. The predicted changes in hydrological conditions in the Scud River, post-development, will be within the range of natural variability. In terms of changes in erosion and channel morphology downstream of the main dam, it is predicted that peak flow rates will be lower than baseline conditions during operations, closure and post-closure due to the retention and/or attenuation of storm runoff within the storage facility. Hence, erosion rates in the channel downstream of the dam may be lower than baseline. However, as the dam will act to trap sediment from the headwaters of the creek, it is likely that over time the amount of bedload in the channel of Galore Creek downstream of the dam will decrease as sediment is transported out of the reach while less sediment is supplied to the reach from upstream. Despite the presence of the dam, fresh sediment will still enter Galore Creek from the diversion channel as well as the hillslopes and tributaries downstream of the main dam. Hence, although bedload is likely to decrease close to the dam site, it is thought that changes would not be obvious near the mouth of Galore Creek, due to these other sources of sediment. Such channel morphology changes are often seen downstream of large dams and reservoirs. Quantitative predictions of bedload transport rates and sediment supply in mountain watersheds are notoriously difficult and open to large uncertainties (i.e., many orders of magnitude in predictions). See the December 5, 2006 memorandum from Rescan Environmental Services Ltd. titled “Estimate of bed load and sediment infilling rate for the Galore Creek Storage Facility” for details. NovaGold notes that it is clear that there is limited	EC is satisfied with NovaGold’s response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
				historical data (meteorological and hydrological) for northern B.C. For the purposes of the EA, estimates of extreme climatic conditions (e.g., 1 in 200 wet year, 1 in 100 year flood flows, PMF conditions) were made using available data and standard engineering practice. Commitment: NovaGold will conduct glacier mass balance monitoring starting in 2007 and will adjust the glacial model input based on the monitoring. NovaGold will monitor sediment transport in Galore Creek.	
Hydrology	EC	11.4.1.3	Winter flows in lower Galore Creek are projected to be 30 to 80% lower. Dolly Varden are found in lower Galore Creek. Lower flows may impact fish if the reach is used for overwintering and/or spawning. The proposal asserts that stage (water depth) will decrease less than flows (6 to 30%). This is probably the more important factor impacting fish use. Low flow impacts in the Scud River are not projected to be significant. Tables 6.5-4 and 6.5-5 in the Application present flows at the mouths of various project area rivers. However, Environment Canada could not find flows in the Stikine at the mouth of the Scud River. This should be included in the Application.	To respond to EC comments, Stikine River flows at the Scud River confluence were re-calculated using data from the Stikine-Butterfly WSC gauging station and estimating runoff from the ungauged portion of the watershed downstream of the gauge using estimates for the Scud River, presented in Appendix 6-C of the EA Application. The Scud River is located close to the ungauged area and has a similar watershed area (1,107 km^2). The updated monthly flow estimates for the Stikine River are higher than the original values and those used in the EA Application. Using the new flow rates, the calculated percentage changes in monthly Stikine River flows due to the project would decrease by around one-tenth of one-percent, e.g. a change of 0.4 % would now become a change in 0.3 % (See Table 7.5-10 in Volume II of the EA Application). As a result this would not affect the conclusions of the environmental impact assessment. The impact of operations on monthly flows in the Stikine is estimated to be < 1 % of baseline conditions. The impact is considered as being not significant.	EC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: None required.	
Hydrology	EC	11.4.1.4	There is inadequate data and analysis to verify the assumptions implicit in the hydrological modelling and in the determination of design flows estimates.	Long-term glacier mass balance calculations were not undertaken as part of the EA process. Typically, mass balance calculations based on field data require multiple years of data that could not have been collected during the baseline studies. Attempts to undertake glacier surveys during the baseline studies were not successful due to adverse weather conditions and concerns over field safety. However, a glacier monitoring program has been proposed as part of monitoring plan in Section 10.2, Volume III of the EA Application. Mass balance calculations will be possible once multiple years of data have been collected. Commitment: NovaGold will conduct glacier mass balance monitoring starting in 2007 and will adjust the glacial model input based on the monitoring. NovaGold will monitor sediment transport in Galore Creek.	EC is satisfied with NovaGold's response. Please provide EC with opportunity to review monitoring program.
Hydrology	EC	11.4.1.5	In particular, we need to know if the glacier mass balance in the region is changing and if so, whether this change is resulting in an increase or decrease of discharge in the affected watersheds.	NovaGold agrees with EC that glacier mass balance studies can help with the understanding of the long-term evolution of glaciers in northern British Columbia. NovaGold has proposed a glacier monitoring program as part of their Environmental Effects Monitoring plan (Section 10.2, Volume III of the EA Application). Commitment: NovaGold will conduct glacier mass balance monitoring starting in 2007. NovaGold will adjust the glacial model input based on the monitoring. NovaGold will monitor sediment transport	EC is satisfied with NovaGold's response. Please provide EC with opportunity to review monitoring program.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				in Galore Creek.	
Hydrology	EC	11.4.1.6	The Application shows three "typical" annual hydrographs to represent: A) "high freshet/low fall" flows; B) "high freshet/high fall" flows; and C) "low freshet/high fall" flows (see, for example, Fig. 6.5-4 or Fig 2.3 in Appendix 6-C). The figures show More Creek only. It is unclear if this pattern is assumed for Galore Creek, the Scud River and others, or if these creeks/rivers have been measured. In the same figure, the difference between graphs B) and C) is a single storm event implying either freshet flows do not vary as much as fall flows, or the chart selected is not representative. Finally, there is no hydrograph for "low freshet/low fall flows." This would be interesting for contrast. Data collection and interpretation for project basins are well done (Appendix 6-C). Estimates are made for flows in the Scud River just above Galore Creek and at the mouth (e.g., Tables 3.6-7, 3.6-8, and 3.6-9). The same estimates are needed for the Stikine River just above the Scud River. The WSC station above Butterfly Creek (about 40 km upstream of the Scud) showed average annual flows of 656 m3/s between 1971 and 1995.	In response to EC comments, Stikine River flows at the Scud River confluence were re-calculated using data from the Stikine-Butterfly Water Survey Canada gauging station and estimating runoff from the ungauged portion of the watershed downstream of the gauge using estimates for the Scud River, presented in Appendix 6-C of the EA. The Scud River is located close to the ungauged area and has a similar watershed area (1,107 km^2). The updated monthly flow estimates for the Stikine River are higher than the original values and those used in the EA. Using the new flow rates, the calculated percentage changes in monthly Stikine River flows due to the project would decrease by around one-tenth of one-percent, e.g. a change of 0.4 % would now become a change in 0.3 % (See Table 7.5-10 in Volume II of the EA submission). As a result this would not affect the conclusions of the Environmental Impact Assessment. The impact of operations on monthly flows in the Stikine is estimated to be < 1 % of baseline conditions. The impact is considered as being not significant. Commitment: None required.	EC is satisfied with NovaGold's response.
Hydrology	EC	11.4.1.7	Flows are given for the mouths of various river basins, but not for rivers at the point at which major tributaries enter. The latter is necessary to assess potential water quality changes, especially for the Stikine River where the Scud River enters. Data from the WSC station on the Stikine above Butterfly Creek should be summarized, with an extrapolation to estimate Stikine flows at the Scud River.	Following comments by Environment Canada Stikine River flows at the Scud River confluence were re-calculated using data from the Stikine-Butterfly WSC gauging station and estimating runoff from the ungauged portion of the watershed downstream of the gauge using estimates for the Scud River, presented in Appendix 6-C of the EA. The Scud River is located close to the ungauged area and has a	EC is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				similar watershed area (1,107 km2). The updated monthly flow estimates for the Stikine River are higher than the original values and those used in the EA. Using the new flow rates, the calculated percentage changes in monthly Stikine River flows due to the project would decrease by around one-tenth of one-percent, e.g. a change of 0.4 % would now become a change in 0.3 % (See Table 7.5-10 in Volume II of the EA submission). As a result this would not affect the conclusions of the Environmental Impact Assessment. The impact of operations on monthly flows in the Stikine is estimated to be < 1 % of baseline conditions. The impact is considered as being not significant. Commitment: None required.	
Geotechnical	NRCan	11.4.1.8	The Proponent also recognized the problem of low flow in streams receiving leachate from tailings. The suggested mitigative measure (Table 7.5-16) 'Discharges from storage facility under low flow conditions, as long as water quality in facility allows' raises the question "what is the likelihood of there being water of sufficient quality in storage facilities at these times?". NRCan suggests that provisions be made so that water can be stored or treated so that there is always sufficient water to supplement low flows when required during the life of the mine.	NovaGold's assessments to date suggest that sufficient appropriate water will be available to supplement low flow downstream at the mouth of Galore Creek if it becomes a problem. If surface water flows are not sufficient, NovaGold will provide additional water such as by pumping from groundwater wells. Commitment: NovaGold will ensure that sufficient water volume is available during extreme winter low flow.	NRCan is satisfied with NovaGold's response.
Geotechnical	NRCan	11.4.1.9	The other comment concerns the evaluation of future hazards in and around the mine. The terrain above the mine is currently extensively covered by glaciers. These are rapidly receding as result of climatic warming. The trend is likely to continue and accelerate if climate change predictions are realized. Glacier outburst floods are commonly associated with such conditions. Such events could exceed the capacity of engineered channels. NRCan suggests that monitoring of changes in the glaciers with an eye to these hazards be added to overall monitoring.	Glacier monitoring is already included in the EA in the monitoring plan (Volume III, Chapter 10.2). Commitment: NovaGold will conduct glacier monitoring.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Geotechnical	MEMPR	11.4.2.1	At mine closure, the tailings and potentially acid generating (PAG) waste rock contained within the impoundment are to be maintained in a saturated condition under a permanent water cover. Seepage analyses, based on estimates of hydraulic conductivity, indicate that seepage water reporting to the downstream seepage collection pond could be significant and may require constant pump back to the tailings impoundment if the water quality does not meet discharge criteria.	Comment noted. Commitment: NovaGold will monitor seepage on an on-going basis.	MEMPR is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.2	Section 5.9.3.2 point 3 "Diversion Channels: " states that an allowance will be made for snowmelt. How is the snowmelt allowance being calculated? Given the probability that some of the largest discharge events will be extreme rain on snow events more information is required on the expected or probable magnitude and frequency of rain on snow discharges. Large discharge variation can be expected from rain on snow events generated from different snowpack depths and saturation levels.	The value for the PMF was calculated using standard engineering practice. It is standard practice to consider an additional 1 mm/hour runoff to account for snowmelt. As the design storm event was a 24-hour PMP, the additional runoff for snowmelt was 24 mm (our previous response contained a typographic error). It should be noted that the PMF was calculated considering a high runoff coefficient (SCS curve CN80 was used), that would approximate rain falling on saturated ground. Commitment: Will retain an independent consultant to determine the PMF snow depth for the Galore Creek basin, the PMF hydrograph using a defensible snow-melt rate, and, by the end of January 2007, prepare a technical report that summarizes the assessment and provides a recommended PMF hydrograph.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.3	Page 1-158, section 5.9.3.2 It is stated that the emergency spillway is designed to pass the Probable Maximum Flood (PMF), assuming that all diversion channels fail, with the exception of those that directly discharge into the open pits. Is this discussion also regarding post closure concerns? It would be expected that the handling of a PMF during operation would be different from the post-closure PMF event once the open piots had filled to there individual pour-over elevations. At that point inflow will equal outflow and the volume of water that flows to the open pits would have to be handled by the TMF and the emergency spillway.	The spillway will be sized to handle the PMF applied over the entire catchment upstream of the dam. Commitment: Confirmation information to be provided at permitting.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Geotechnical	MOE	11.4.2.4	If the discussion is restricted to PMF during operations, then would pumping out of the pits not be occurring? Presumably, during the actual event, the pit dewatering would not be occurring and it would only happen once the event passed, but are there pit operational concerns what would require pumping of the pits to occur during a PMF event? One aspect of permitting is the compilation of a mine operations guideline which discusses the various scenarios and how they are to be addressed; (e.g. During a PMF event, in-pit equipment moved to higher ground, in-pit access restricted, pumping to occur once the TMF has returned to a specific elevation. It would appear that the manner in which an emergency was handled would very much be dependant upon the stage of mine life.	Inflows from a short term PMF would overwhelm pit pumping rates. Any inflows to the TMF from pit pumping would be very small in comparison to inflows from the PMF. An OMS manual will be developed in the future. This manual will include steps on how to respond during an PMF. Commitment: Confirmation information to be provided at permitting.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.5	Prior to tailings deposition all of the pond water will be pumped out of the impoundment. This initial pumping will need to be included in the Environmental Management Plan. impoundments are to be included within the construction permitting.	Comment noted. Commitment: Confirmation information to be provided at permitting.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.6	Given the high level of reliance being placed on the ability to predict water balance components (1in 200 year discharges, impoundment storage, etc.) to schedule dam raises and design water management structures, the ongoing modelling of watershed processes becomes a high priority. While the current hydrology program makes use of the best available information and has collected some good baseline data the short length of hydrologic records is problematic. (see comments under Appendix 6-C Galore Creek Surface Hydrology Assessment Baseline Report)	NovaGold is continuing to collect hydrological data within the study area and will collect data through the lifetime of the project. These data will be used to update the water balance and hydrological models. NovaGold would also encourage government agencies to continue and to expand their existing hydrological monitoring network in Northern British Columbia. Commitment: NovaGold will continue to collect hydrological data within the study area throughout the life of the project to update the water balance and hydrological models.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.7	The hydrological monitoring program will have to be resolved in light of the needs of the effluent permits for the site. This may require the installation of additional continuous monitoring stations. (Permitting, Hudson)	The hydrological monitoring program will be finalized during permitting. Commitment: NovaGold is committed to develop an appropriate long term hydrological monitoring program in the Galore Creek valley.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.8	Page 8-61 As pumped outflows from the tailings impoundment will be	Pumped outflow rates will be closely monitored during	MOE is satisfied with NovaGold's

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			simulating the natural flow hydrograph, it will be very important to have an exacting flow monitoring program. During permitting, the effluent discharge application will require a detailed flow monitoring program to be included. A computerized link to the discharge pump system may be considered depending upon the complexity of the pumping requirements and the release rate sensitivity.	operations. Commitment: Full details of the monitoring systems to be installed at the site will be confirmed during final engineering design.	response.
Geotechnical	MOE	11.4.2.9	Have you considered the effects of the impoundment (at or near the final volume) on the local microclimate and the potential for effects on the frequency and magnitude of rain on snow events or other hydro-meteorological processes (fog, icing, etc)?	There is brief comment on likely impacts of evaporation on annual flow volumes during closure in Volume II, Section 7.5.2.2. In addition, NovaGold does not feel that a water surface area of approximately 900 ha would have a measurable effect on the micro-climate of Galore Creek valley. Commitment: None required.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.10	Table 14.4-1, Estimated Time to Fill Open Pits. The exposed pit walls and their influence on the pit water quality will remain as one of the long term liabilities at the mine site, and as such will require on-going monitoring to assess changes to site conditions; specifically ML/ARD concerns in conjunction with pit wall stability. The table is useful in illustrating the time to maximum pit infill, and that the time periods are relatively short following pit closure. In order to further understand the complexity of the long term pit closure scenarios and to assist in the development of a comprehensive monitoring program, a refinement of the table would be useful. During permitting, NovaGold will be required to provide a more comprehensive table which would include: - total projected pit volume, - % of each pit filled with water, - projected total area of pit walls, - % of wall area within each pit which will remain exposed following flooding, - years of exposure prior to closure/flooding for each pit, - information already provided in the table. The above will be used in conjunction with the on-going ML/ARD/aquatic chemistry prediction and monitoring programs to assess the long term issues associated with the pit walls.	Comment noted. Commitment: Information to be provided at permitting.	MOE is satisfied with NovaGold's response.
Geotechnical	MOE	11.4.2.11	Appendix 6-C Galore Creek Surface Hydrology Assessment Baseline Report The surface hydrology report represents the use of the best available information and combined with the hydrometrics and analysis likely represent a major improvement in the process hydrology understanding of the project area. The period of hydrologic record is	We agree that the period of record and the extent of the Water Survey of Canada network in BC are limited. However, as noted by MOE, NovaGold used the best available data, and installed an extensive baseline hydrology monitoring network (25 monitoring	MOE is satisfied with NovaGold's response.

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			however, quite short and is problematic. This is particularly evident with respect to small watersheds (< 200 km^2). While the use of regional regressions and modelling adds some strength to the synthetic flood curves, design discharges are being extrapolated far beyond the period of record. Perhaps some consideration could be given to extending the peak flow series through the use of hydraulic geometry relations, dendrochronology surveys, high water mark indicators or other methods. Incorporation of ongoing monitoring data and improved modelling based prediction are essential to overcoming predictive limitations imposed by a short hydrologic period of record. (Strategic, Hudson)	stations) within the study area. The stream flow data set will be updated through the lifetime of the Project as part of the proposed Aquatic Effects Monitoring Program. NovaGold would also encourage government agencies to maintain and expand their existing hydrological monitoring network in Northern B.C. NovaGold notes MOE's comments on high flow assessments. During the Application review, NovaGold provided a report which included a dendrochrology assessment of flood flow conditions on the Porcupine River to the Technical Working Group. Commitment: The stream flow data set will be updated through the lifetime of the project as part of the proposed Aquatic Effects Monitoring Program.	
Geotechnical	MOE	11.4.2.12	The Porcupine River Floodplain Inference document is a useful initial assessment of potential floodplain processes and delineation. I can provide the following comments, questions and observations with respect to the assessment: The assessment does not extend to the apex of the Sphaler fan. It would appear from the photos included in the report that there is an area of fan surface (river left of the apex and south to the confluence with the Porcupine River) that has a surface vegetation height roughly similar to PFP-D. It appears that this unit was subject to overbank flows and sediment deposition at approximately the same time as the lower PFP-D unit. This suggests that the two events may be related or at least that they formed at the same relative time. From a process geomorphology perspective the floodplain development on the Sphaler fan and the outwash plain (PFP-D) are largely driven by sediment supply from Sphaler Creek. Overbank deposition implied by the dendrochronology of the fan and PFP-D would seem to indicate that the main floodplain formative event was an episodic sediment discharge or sustained increase of sediment production from Sphaler Creek (a debris flow or hyperconcentrated flow or perhaps a rapid increase in sediment supply related to glacial retreat higher up in the watershed) . This is complicated by the finer textured sediment emanating from Porcupine Lake and the coalescing of these two sources. Given the lack of evidence to suggest channel	A flood risk assessment will be undertaken during the final design for the Porcupine aerodrome. This will include an assessment of risk from mass flow events originating from Sphaler Creek, ice dam flooding from Porcupine Lake and rainfall/snowmelt flooding from the Porcupine River. The final design will also include provisions for monitoring at the aerodrome site. Field observations suggested that this overflow channel was around 5 - 8 m above the elevation of the current outlet from Porcupine Lake. The potential for this outlet to be used as an overflow channel will be considered during final design of the aerodrome facility. Predicting rates of channel aggradation over a decadal timescale is difficult and open to very high uncertainties. NovaGold will monitor changes to the channel bed at the Porcupine River crossing and if there is evidence of aggradation will asses its impact on the bridge crossing. Upper Sphaler Creek contains several recently exposed (past ~150 years) glacial forefields located close to the main Sphaler Creek channel. These are shown on the terrain map, including material types and erosion potential ratings,	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			migration across PFP-D (scrolling or channel remnants from channel lateral migration) and the appearance of channel braiding forms at the distal end of PFP-D it is reasonable to assume that the floodplain was formed by an aggradation phase driven by sediment supply from Spahaler Creek and, to a lesser degree, from Porcupine River. A decline in the sediment supply may have resulted in channel degradation (downcutting) and dissection of the original deposit. The question then becomes; What is the recurrence interval, magnitude and duration of sediment pulses from Sphaler Creek? Since downcutting has largely alienated the Porcupine River from PFP-D, the expected sediment supply becomes an important factor in deciding what frequency of inundation PFP-D will experience. Should the channel return to an aggrading habit the elevation of the channel will rise and the 200 year inundation area will then increase in extent across unit PFP-D. If the Porcupine River channel is downcutting and the sediment regime stays stable the likelihood of overbank flows to PFP-D will diminish or at least not increase. Should Porcupine River aggrade the likelihood of overbank flooding and sedimentation to PFP-D will increase and floodplain infrastructure investments will be at risk. The north west corner of Porcupine Lake appears to have evidence of a former overflow channel. What is the relative elevation between PL-A and this overflow channel on river right? If this turns out to be the most likely breakout point for ice dam flooding (i.e., the elevation is lower) it would indicate a reduction in the risk of ice dam flood routing across PL-A, PFP-B, PFP-C and PFP-D. Should Porcupine River return to an aggrading habit what are the potential channel aggradation effects to the proposed bridge crossing? The 200 year inundation elevation is not likely static but relies on the sediment supply from Sphaler Creek and its effect on channel aggradation. What is the likely sediment delivery potential for Sphaler Creek? Are there any terrain stability maps or sediment source assessments that could be used to estimate the debris flow potential or potential sediment sourcing of the upper watershed? What is the lateral channel migration rate of Porcupine River? Are there any plans to conduct any bank retreat surveys (erosion pins or benchmarking) in order to monitor the rate of bank retreat and judge the need for aerodrome revetments? Is there any floodplain area that is subject to perirheic flooding (subsurface seepage into depressed floodplain areas) that may be affected by or have adverse effects on aerodrome construction and flood plain	and are sources of sediment to Sphaler Creek. However, the Sphaler Creek channel itself is too low gradient to sustain debris flows. The potential for landslide dam outbreak flood potential is discussed in the geohazard report (Volume VI, Appendix 5-E). Commitment: A flood risk assessment will be undertaken during the final design for the Porcupine aerodrome. The final design will also include provisions for monitoring at the aerodrome site.	

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			revetment? Are there any fish habitats downstream of PFP-D that are directly fed by perirheic flood zones?		
Mine Plan	NRCan	12.1.1.1	E. 2.1.1 - Road Access A 128 km access road from Highway 37, following More and Sphaler creeks to the Porcupine River and up to Scotsimpson Creek to the southern entrance of a 3.8 km long tunnel into Galore Creek valley will be built in the framework of this project. Another 3 km will also be built through the mine site to the process plant.	Comment noted. Commitment: None required.	No further comment.
Mine Plan	USDA FS	12.1.2.1	Pg. 7-182 The maintenance of bridges and culverts are discussed in a very general way. A more detailed discussion is suggested that would spell out when this maintenance and inspection will take place.	Comment noted. These issues will be addressed during the permitting phase. Commitment: NovaGold will develop and implement an inspection and maintenance program for the road and related structures before completion of the road.	No further comment provided.
Mine Plan	USSOA	12.1.2.2	Section 8.4.1 states, "Rougher tailings are expected to have lower reactivity and could be disposed sub-aerially." However, it goes on to say, "All tailings will be treated as though they were acid generating, therefore they will be disposed subaqueously." If, indeed, the rougher tailings are non-PAG, they could be disposed of as paste tails or as a dry stack, thereby decreasing the size of the tailings impoundment and the long term hazard associated with it.	Operations of a paste system given the freezing winter conditions at Galore is considered to be problematic. There will likely be ice encapsulated in the paste tails that may never melt, the system may therefore consume a larger volume than expected and possibly larger than conventional tailings deposition. Operations of a dry stack filter system in Alaska has proven to be extremely difficult to operate due to freezing conditions as the tailings leave the mill. Lastly, there is no procedure of using paste or dry stacking for NovaGold's proposed mill feed. Commitment: None required.	SOA is satisfied with NovaGold's response.
Mine Plan	MEMPR	12.1.3.1	A minor error was noted in the EA application. Nova Gold states that the two way haulage road will be three time the width of the trucks and then incorrectly in Figure 5.5-18 shows the space between the trucks and the side of the road to be 2.93m when 3.25m is required.	NovaGold acknowledges the error. Roads will be constructed to the proper width as required by the *Mines Act* and the Health, Safety and Reclamation Code for Mines in BC. Commitment: Roads will be constructed to the proper width as required by the Mines Act and the Health, Safety and Reclamation Code for Mines in BC.	MEMPR is satisfied with NovaGold's response.
Mine Plan	MEMPR	12.1.3.2	There will be a bulk emulsion plant on site and four explosive	Comment noted. NovaGold will ensure that safety	MEMPR is satisfied with

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			magazines. With respect to the EA Application, there are no items to address. However, at the mine permitting stage the following items should be addressed: The access road to the plant site will be downhill of the waste dump adjacent to the Central pit. Provisions will be required to ensure the safety of this road and to guard against a possible dump failure or material rolling downhill from the dump.	procedures are developed and followed respecting construction of the dump and use of the access road. Commitment: NovaGold will ensure that safety procedures are developed and followed respecting construction of the dump and use of the access road.	NovaGold's response.
Mine Plan	MOE	12.1.3.3	Given the uncertainty of land tenure in the area of the tailings impoundment, what are the possible implications to the development of the project as designed if the expected land base is unavailable? Provide an update on the implications to the project design in the event that land required for the tailings impoundment and related infrastructure is unavailable. This would include a map with the planned mine infrastructure relative to land tenure. Rationale: Land use restrictions relative to current design may interfere with certain site facilities such as the tailings impoundment construction, associated infrastructure (e.g. settling pond, diversion channel, groundwater/pumpback wells) as well as discharge/monitoring locations. Relocation of these facilities would require a degree of reassessment, which would be based upon the extent of design change.	MEMPR has indicated that NovaGold has adequately tested the tailings impoundment area with its condemnation drilling program. Commitment: None required.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.4	8.15 Access Road Management Plan Page 8-276, Introduction: Why and what will Tahltan Nation Community Members be doing on the road? How will this be managed for safety of all?	Under the NovaGold-Tahltan Participation Agreement, a road access policy will be developed. This policy will define conditions of use of the road by Tahltans and those conditions may be restricted for safety purposes. As part of the Special Use Permit for the road, the Ministry of Forests and Range requires an access management plan.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.5	Project Rationale Page 1-37, first bullet: This bullet discusses "a glacier crossing route" during the construction of the tunnel. Are there any details around this construction procedure? Will the Special Use Permit address this aspect? What standards for use/construction exist? This proposal has not been discussed and there is not adequate detail in the application to provide comments relating to impacts.	NovaGold is no longer considering the glacier crossing route to access the Galore Creek valley for construction. Commitment: None required.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.6	8.15 Access Road Management Plan Page 8-310, Glacier Access: There is not enough detail provided in this section to adequately address environmental impact.	The glacier access route is no longer being considered.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: None required.	
Mine Plan	MOE	12.1.3.7	Page 5-262, 5.13.2.2 Tank Farm: Due to the volume of precipitation, (approximately 65% of which is snowfall), open sided roof coverage of the various fuel storage areas may be a necessity to minimize the amount of snow/water removal required from the containment areas, and to ensure that there is effective containment capacity within the tank containment area. Refer to comments for section 8.6.	NovaGold will design fuel containment structures that will take into account the volume of precipitation in the area and minimize the amount of snow/water removal from the containment structures. It is in NovaGold's best interest to ensure that there is effective containment capacity within the tank storage areas. Commitment: NovaGold will comply with all applicable regulations pertaining to fuel storage and containment structures. NovaGold will ensure that fuel containment areas are adequately protected from excessive precipitation and will design these structures to minimize the amount of snow/water removal required.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.8	Page 8-84 Fuel Storage: (Filter plant and elsewhere). Recommended that open air roofed structures be constructed over the fuel tanks and berms to ensure that the spill containment capacity is not depleted due to snow and rain, physical clean-out is not required and there is minimal contaminated water to deal with.	NovaGold will design fuel containment structures that will take into account the volume of precipitation in the area and minimize the amount of snow/water removal from the containment structures. It is in NovaGold's best interest to ensure that there is effective containment capacity within the tank storage areas. Commitment: NovaGold will comply with all applicable regulations pertaining to fuel storage and containment structures. NovaGold will ensure that fuel containment areas are adequately protected from excessive precipitation and will design these structures to minimize the amount of snow/water removal required.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.9	8.9 Materials Management Pn: Primarily permitting issues within this section. Table 8.9-2 provides a good summary of the major consumables at site. This will be a useful compilation for permitting. Note that Diesel Fuel was missing from the Filter Plant site list of materials. As described in the text, the filter plant will have holding tanks and an off-loading system for diesel as it is the starting point for the diesel pipeline.	Comment noted. The filter plant site will have a single tank to supply diesel to the diesel pipeline. Commitment: None required.	MOE is satisfied with NovaGold's response.
Mine Plan	MOE	12.1.3.10	5.12 Road Access Page 5-243, 5.12.2.1 Access Control: It is expected that NovaGold will have a written road use policy that prohibits use of	See response for 12.1.3.4.	MOE is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			the road by the general public, the discharge of a firearm or undertaking recreational activity (includes fishing).		
Miscellaneous	HC	13.1.1.1	The health impact assessment focuses on health determinants that are related to the physical environment, i.e., air, drinking water, noise, and country foods. Rescan Environmental Services Ltd. (Rescan) is to be commended for the generally high quality of the health impact assessment and the studies that were undertaken to support it. The conclusions drawn are generally well supported by the studies that were carried out and by the discussions in the report. Based on the information provided, it is HC's view that, in general, the project is not likely to be responsible for significant adverse human health impacts. However, with respect to country foods, we are unable to draw any conclusions on the likelihood of significant adverse impacts to human health due to the paucity of information regarding potential impacts of the project.	With the exception of surface water, scientifically defensible predictions on specific concentration changes in other environmental media cannot be made. Thus, the future exposure concentrations are unknown. Commitment: NovaGold will monitor, with Tahltan Central Council participation, surface water, soil and vegetation throughout mine development and operation. A quantitative screening level risk assessment for country foods will be conducted if the quality of these environmental media is shown to decrease and should a specific country food appear vulnerable, monitoring of contaminant levels, if feasible, will be undertaken. In the case that fish tissue quality data obtained from monitoring indicates an increase in contamination levels, potential impacts to human health from fish consumption will be assessed. NovaGold will re-evaluate contaminants of potential concern (COPC) with respect to country food.	See response in 13.1.1.2
Miscellaneous	HC	13.1.1.2	Country Foods A baseline assessment of country foods was carried out. This is particularly useful information for future country foods assessments if the development and operation of the mine were to cause changes in the environment that could affect the quality of country foods. However, little information is provided on the anticipated future potential risks to country foods due to the project. A screening level risk assessment would be required to fill this information gap. HC recommends that, at a minimum, there should be a qualitative assessment that includes the following components: - screening and identification of COPCs; - identification and description of potential receptors; - identification of operable exposure pathways;	NovaGold asserts that human receptors have already been adequately identified (Volume XV, Appendix 6-T, Section 1.1) and described (Section 2.5) and operable exposure pathways have been adequately identified (Section 2.6, in particular - Figures 2.6-1 and 2.6-2). A more detailed description of the operable exposure pathways into country foods will not facilitate in assessing country foods uptake of the COPCs. The biggest data gap is that future exposure concentrations during normal operations are largely unknown. Likewise, the exposure duration and magnitude from an accident or malfunction cannot accurately be predicted. Commitment: NovaGold will monitor, with Tahltan Central Council participation, surface water, soil and	HC is satisfied with NovaGold's response. I

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				vegetation throughout mine development and operation. A quantitative screening level risk assessment for country foods will be conducted if the quality of these environmental media is shown to decrease and should a specific country food appear vulnerable, monitoring of contaminant levels, if feasible, will be undertaken. In the case that fish tissue quality data obtained from monitoring indicates an increase in contamination levels, potential impacts to human health from fish consumption will be assessed. NovaGold will re-evaluate contaminants of potential concern (COPC) with respect to country food However, animals will not be sacrificed for the sole purpose of tissue analysis. Animal tissue will be collect only from country foods harvesters that have harvested the animals for consumptive purposes. In the case that fish tissue quality data obtained from monitoring indicates an increase in contamination levels, potential impacts to human health from fish consumption will be assessed.	
Miscellaneous	HC	13.1.1.3	Some information is provided on identification of COPCs and potential receptors in the baseline country foods assessment. However, discussion of operable exposure pathways during the operations phase of the project are particularly lacking. Without this information, it is difficult to assess the vulnerability of country foods to contamination and the potential for exposure of human receptors to contaminated country foods during normal operations, or in the event of accidents or malfunctions., e.g., breech of the tailings impoundment dam.	Monitoring programs to assess the impacts on country foods after the mine becomes operational will be developed during the permitting phase and include: a. Surface water monitoring downstream of the tailings impoundment and filter plant diffuser (Volume III, Section 10.6.2). b. Soil and plant monitoring (Volume II, Section 7.13.7.2 and Volume III, Section 10.54.5). Commitment: NovaGold commits to monitor surface water, soil and vegetation throughout mine development and operation.	HC is satisfied with NovaGold's response.
Miscellaneous	HC	13.1.1.4	At this time, there does not appear to be any plans for follow-up monitoring to assess the impacts of the project on country foods after the mine becomes operational. HC recommends that the proponent	See response to 13.1.1.2.	HC is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			consult with the Tahltan to ascertain their views on the need for a follow-up impact assessment on country foods.		
Miscellaneous	HC	13.1.1.5	Noise Page 4-32 No modelling of predicted indoor noise was carried out to support the statement that off-shift workers will not be exposed to elevated noises from mine activities. However, in the absence of this data, we would like to see a commitment that noise monitoring be carried out to measure indoor noise in the living quarters of workers and that noise attenuation be implemented, if necessary, to reduce levels to acceptable community noise standards, particularly for sleep and quiet recreation.	NovaGold intends that the accommodation complex will provide a comfortable and healthy environment for employees. Construction standards will ensure appropriate noise levels. Commitment: Will compare the results of noise monitoring in the accommodation complex to noise levels related to sleep disturbance in the World Health Organization Guidelines for Community Noise (1999), and in the event that noise levels exceed these guidelines then mitigation measures that are technically and economically feasible will be undertaken.	HC is satisfied with NovaGold's response.
Miscellaneous	HC	13.1.1.6	Drinking Water Quality Page 5-4 Interviews with the Tahltan have indicated that, currently the Galore valley is not a commonly used area. However, as the project proceeds, access to the area will improve and it is likely that there will be increased use by the Tahltan. In this scenario, please discuss the possibility that country food harvesters may ingest contaminated surface water.	There will not be increased Tahltan access to Galore Creek or the Scud River due to mine development. Therefore incidental ingestion of water from these surface water bodies is unlikely. Water bodies along the road route are not anticipated to be effected by mine development and operation. Therefore, any adverse effects from ingestion of water from these water bodies would not be related to mine activities. Predicted changes to surface water quality in the Iskut River downstream of the filter plant are presented in Volume II, Section 7.6 of the main document. The minimum dilution of the filter plant effluent is 120:1. It is anticipated that due to the dilution and infrequency of consumption, it is likely that human health risks would be negligible. Commitment: NovaGold will evaluate the potential health effects from ingestion of surface water near the filter plant discharge location.	HC is satisfied with the response.
Miscellaneous	HC	13.1.1.7	Page 5-8 It was acknowledged in the report that seepage of water from the tailings impoundment to the groundwater regime is expected.	During mine operation there will be a pump back system that will collect and return higher than	HC would like to have an opportunity to review the aquatic

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			Please discuss the implications of this seepage for the possible contamination of fish that are harvested by the Tahltan.	permitted seepages below the dam to the tailing impoundment. In addition, alkaline conditions are projected in the tailings mass which will lower metal ion mobility. Subsequently, no significant residual effects on groundwater are expected as seepage water and metals mobilization will be minimal. Thus, it is unlikely that fish will be exposed to seepage from the tailings impoundment and therefore the quality of edible fish will likely not change. Upon mine closure the pumps will be shut off, at which point there is the potential for seepage water to reach surface water. If seepage water is not acceptable for discharge it will be treated or pumped back to the impoundment. Commitment: NovaGold will mitigate to ensure that seepage water upon closure does not adversely affect edible fish.	monitoring program as applicable to potential human health effects
Miscellaneous	HC	13.1.1.8	Page 5-10 The extent and magnitude of environmental impact of the filter plant and other facilities upon the aquifers are unknown at this stage. It was stated that the need for installation of additional groundwater monitoring wells at mine component locations outside of Galore Creek will be assessed. We would prefer to see the installation of additional monitoring wells as a firm commitment to ensure that drinking water sources are protected through an adequate network of monitoring wells.	At this time additional wells outside of Galore Creek valley for the purposes of monitoring drinking water are not warranted. The drinking wells at the Porcupine camp and filter plant will be monitored for drinking water quality. Additional monitoring wells would only be warranted if there is a chemical spill at these locations. Commitment: NovaGold commits that in the event of a spill additional monitoring wells will be installed for the purposes of monitoring any groundwater plume and to evaluate its potential to impact the drinking water source.	HC is satisfied with the response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Miscellaneous	NH	13.1.2.1	Please note that details of the proposed treatment systems, layout plans, equipment specifications and water quality data are to be submitted by a Professional Engineer qualified in BC in order that the applications can be reviewed.	Comment noted. Commitment: NovaGold will ensure that legal requirements for Professional Engineer certification are met.	NH is satisfied with the response.
Miscellaneous	KSRD	13.1.2.2	Land Tenure - Bob Quinn: It appears the company is holding through mineral tenures a large land area north of Bob Quinn. Presumably this approach was taken to secure land during a process of locating the filter plant site. I would recommend that the facilities at the filter plant be secured through a crown grant or long term lease, tenure size be limited to area needed for the development and that the other mineral tenures lapse unless needed for mineral exploration.	Comment noted. NovaGold has been allowing non-essential claims to lapse as planning has firmed over the past year. Commitment: Appropriate land tenure will be sought for the filter plant site and non-essential mineral claims will be permitted to lapse.	KSRD is satisfied with the response.
Miscellaneous	KSRD	13.1.2.3	Dispersed Development along Highway 37: The Regional District has no objections to NovaGold operating a camp for workers at the filter plant but will be reluctant to support proposals other businesses might make to develop services in the vicinity and along Highway 37. The Regional District prefers that development along Highway 37 North be concentrated in nodes such as Dease Lake, Iskut, Bob Quinn and Meziadin.	Comment noted. Commitment: NovaGold endorses the KSRD suggestion that development along Highway 37 North be concentrated in nodes.	KSRD is satisfied with the response.
Miscellaneous	KSRD	13.1.2.4	Iskut Landfill: The Regional District operates a landfill at Iskut. This is a small facility which is currently receiving relatively large volumes of refuse from exploration camps, construction projects and other sources. This accelerated use will probably require the Regional District to invest in upgrading and a higher level of day to day management of the landfill. In the Application, the proponent anticipates delivering domestic waste from the filter plant operations to the Iskut landfill. While it will be at greater cost to the company because of greater distance, the Regional District may ask that the company consider delivering waste to a larger, permitted landfill at Meziadin, at least until upgrading of the Iskut facility is complete. Discussions on this topic have occurred between the Regional District and NovaGold Resources.	NovaGold recognizes the KSRD concerns about potential impacts of the Galore Creek project on the Iskut landfill and will work with the KSRD to address their concerns. NovaGold proposes a comprehensive recycling program to minimize the volume of materials being sent to landfills. Commitment: NovaGold will work with the KSRD to address their concerns regarding the Iskut landfill. Furthermore, NovaGold will initiate a comprehensive recycling program to minimize the volume of materials going to landfills.	KSRD is satisfied with the response.
Miscellaneous	KSRD	13.1.2.5	Regional Service and Supply: Residents and businesses of the northwest will look to Galore Creek for employment and service & supply contracts. The company can assist regional participation in the	NovaGold is planning to keep northwest communities apprised of project recruitment and purchasing policies during construction and mine operations.	KSRD is satisfied with the response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			project by continuing to keep local chambers of commerce and economic development agencies informed of project recruitment and purchasing policies during construction and mine operations. Holding workshops in northwest communities as the project commences, to provide information on hiring practices, employment vacancies and purchasing methods, may be worthwhile.	NovaGold intends to maximize the use of regional labour and supplies. Commitment: NovaGold will keep northwest communities apprised of project recruitment and purchasing policies.	
Miscellaneous	USDA FS	13.1.3.1	There are no effects to seasonal flow or annual flow volumes or high flows addressed during the decommissioning and closure phase in Summary Tables 7.5-7 and 7.5-11 and 7.5-13. Will this be addressed?	The effects on surface water hydrology are considered in Volume II Section 7.5.2.2 (annual flows), Section 7.5.2.3 (seasonal flows) and Section 7.5.2.4 (high flows). It should be noted that the timing column in Tables 7.5-7, 7.5-11 and 7.5-13, refers to the start time of the effect and not the duration. Hence, within these tables the effects are considered for all stages of the mine life. Commitment: None required.	No further comment provided.
Miscellaneous	USDA FS	13.1.3.2	Pg 7-2 volume 2 Some of the project components listed are not seen on the diagrams and maps specifically E Ore and mine storage facilities and F Mine borrow pits and topsoil storage.	NovaGold acknowledges that some facilities mentioned in the text are not indicated on the map on page 7-2 of Volume II. The ore and mine storage facilities are shown on other maps, while the mine borrow pits and topsoil storage facilities will be determined at the feasibility stage. Commitment: NovaGold will provide detailed locations of mine facilities at the permitting stage.	No further comment provided.
Miscellaneous	USDA FS	13.1.3.3	Table 7.5-22 Seasonal flow distribution entry needs to be changed from non-significant to significant	Comment noted. The submission should have included an additional significance ranking table for surface water hydrology that noted that changes to the Galore Valley (local) were not considered significant. A discussion of the assessment methodology for surface water hydrology is provided in Volume II Section 7.5.1.3. Commitment: None required.	No further comment provided.
Miscellaneous	MOE	13.1.4.1	7.4 Noise Effects Assessment Table 7.4.3 Effects Assessment of Mine Issues on Noise: The potential for residual adverse impacts to be significant for mountain goats is considered likely. A potential	Blasting in the open pits will be scheduled to occur at consistent times during daylight hours.	MOE is satisfied with the response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			mitigation measure not indicated in the table is to set specific blasting time periods in the open pits. Monitoring wildlife will be further defined under the Wildlife Mitigation and Monitoring Plan. It is noted that on page 7-135 control of blast noise is discussed. During the kidding season, blast times will require discussion.	Commitment: Blasting in the open pits will be scheduled to occur at consistent times during daylight hours.	
Miscellaneous	MOE	13.1.4.2	7.4 Noise Effects Assessment Page 7-111, 7.4.2.3 Noise Modelling Results: The MOE promotes the use of the Wildlife Tourism Guidelines as they relate to helicopter use around mountain goats and their habitats. Where possible, we would like to see these utilized. They would be used for all helicopters flying in the project area where there is mountain goat class one and/or natal habitat.	Section 8.13.6.4 in Volume III outlines NovaGold's approach to avoiding or minimizing disturbance to mountain goats during helicopter activities. The interim Wildlife Tourism Guidelines (B.C. MWLAP, 2002) - the guidelines available at the time of writing the EA) were reviewed during the development of this approach, which includes establishing flight paths and careful scheduling of flight activities. Commitment: NovaGold will follow the approach to avoiding or minimizing disturbance to mountain goats as outlined in Section 8.13.6.4 in Volume III of the EA Application.	MOE is satisfied with the response
Miscellaneous	MOE	13.1.4.3	8.13 Wildlife Management Plan Section 8.13.7 Mine Site: The transmission line is to be treated the same as the access road with Environmental Monitors, critical habitat mapping and construction plan.	NovaGold intends to use a similar approach for constructing the transmission line as will be used for the access road. Environmental monitors will be employed and a construction plan will guide the process. Commitment: NovaGold will use a similar approach for constructing the transmission line as will be used for the access road. Environmental monitors will be employed and a construction plan will guide the process.	MOE is satisfied with the response.
Miscellaneous	MOE	13.1.4.4	8.15 Access Road Management Plan Comment: Many of the issues identified and discussed in this section have been mentioned elsewhere. It speaks to the number of issues involved with the access road and the need to put together and implement effective, comprehensive management plans to prevent and minimize environmental impacts. These plans should be completed prior to construction commencement.	NovaGold is developing environmental management plans for the access road. Commitment: NovaGold will develop environmental management plans for the access road.	MOE is satisfied with the response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Miscellaneous	MOE	13.1.4.5	10.5 Wildlife and Wildlife Habitat A detailed Experimental Design for the purpose of monitoring the focal species is required to be designed in conjunction with MOE biologists. The design will culminate with a long term monitoring and mitigation plan for the noted species. It is commendable that NovaGold commits to monitoring plans; it is the details of that plan and what is done with the results that are critical to the maintenance, restoration and protection of the species. These details are not provided in this section. It is not enough to simply count animals every 3 to 5 years. Classification surveys (three times/year), habitat use (on the ground investigations) and effectiveness are also required. How long will we monitor and will we know when to stop? What are the parameters that define that understanding? Mountain goats will be significantly affected. The overall cumulative effects of the project impacts are not clearly understood but it is known that mountain goats do not travel great distances which makes their habitat critical to them, especially when noise levels will be so great, they will be driven away from their preferred habitats. The sooner we know how the goats are utilizing their habitats within the project area, before construction begins, the better we will be able to show cause and effect of the project. Cause and effect if very difficult to link in a project of this magnitude. A sample of mountain goats require radio collars to be deployed, to give the best possible information to understand what they are doing now. Maintaining a sample of collared goats during construction and into operation phase, will give biologists results in how to maintain and protect this species so it is not extirpated from the Galore Creek area. MOE is prepared to assist NovaGold in the design of the monitoring and mitigation plan. Grizzly bears have the potential for significant adverse effects by the project in the interior portion (as noted earlier). The interior bears have been factored out of the monitoring plan and emphasis is placed on the salmon eating bears. The project area is very large, with 2 different climatic areas for bears - coastal and interior. I agree that the bears along the Stikine don't go to Bob Quinn Lake or Burrage Burn and vice versa, but what about the grizzly bears in the Round Lake Pass area? These bears could travel to the Porcupine River and back. The DNA results show no genetic diversity between the sections but the hair sampling stations have a bias towards salmon bearing streams. The long term monitoring plan needs to incorporate the interior portion and not just maintaining habitat values for grizzly bear and salmon. Again, MOE is prepared to	NovaGold accepts MOE's offer of assistance with the design of monitoring and mitigation plans. NovaGold commits to working with MOE, among others, in designing or refining the monitoring plans for focal wildlife species, including mountain goat, grizzly bear and moose. Commitment: NovaGold commits to working with MOE, among others, in designing or refining the monitoring plans for focal wildlife species, including mountain goat, grizzly bear and moose.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			assist NovaGold in the design of the monitoring and mitigation plan		
Miscellaneous	MOE	13.1.4.6	10.5 Wildlife and Wildlife Habitat Western toad research is being conducted by John S Richardson at the University of British Columbia and it is suggested that consultation be made with him.	Discussions regarding western toad research and monitoring plans for the study area have included, and will continue to include, consultations with Dr. John Richardson from UBC, Dr. Sanjay Pyare (University of Alaska Southeast), Dr. Purnima Govindarajulu (University of Victoria), Dr. Sharyn Marks (Humboldt University) and Dr. Ross Thompson (Monash University). Commitment: NovaGold will continue to consult key university researchers with respect to investigations of western toad in the project area.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.7	10.5 Wildlife and Wildlife Habitat Moose are to be included in the monitoring and mitigation plan with the same required surveys and habitat use investigations as outlined for mountain goats.	NovaGold commits to working with MOE, among others, in designing or refining the monitoring plans for focal wildlife species, including mountain goat, grizzly bear and moose. Commitment: NovaGold commits to working with MOE, among others, in designing or refining the monitoring plans for focal wildlife species, including mountain goat, grizzly bear and moose.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.8	10.5 Wildlife and Wildlife Habitat As monitoring progress over the years, after every survey a final report, along with digital raw data, is to be provided to the MOE. Annual reports are to also be submitted.	NovaGold will compile annual reports and provide them with raw data to appropriate regulatory agencies. Commitment: NovaGold will compile annual reports and provide them with raw data to appropriate regulatory agencies and the Tahltan Central Council.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.9	Appendix 6-J Galore Creek Ecosystem Mapping and Vegetation Baseline Report 2004-2005 Digital raw data please.	NovaGold will provide digital raw data on ecosystem mapping and vegetation baseline work by the end of 2006. Commitment: NovaGold will provide digital raw data on ecosystem mapping and vegetation baseline work by the end of 2006 to MOE, appropriate regulatory	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				agencies and the Tahltan Central Council.	
Miscellaneous	MOE	13.1.4.10	Appropriate valued ecosystem components (VECs) identified for MOE, Environmental Management Program concerns. If the project proceeds, EMA permitting will address many of the concerns raised in this section from the standpoint of monitoring, impacts and providing information to guide prevention/mitigation efforts.	Comment noted. Commitment: None required.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.11	5.12 Road Access For comment regarding glacier crossing, refer to section 1.5	The glacier crossing route is no longer being considered. Commitment: None required.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.12	5.12 Road Access Table 5.12-2 Summary of Gravel Pit Locations - have the pit locations been compared to wildlife habitat values at their respective locations? High value grizzly bear habitat and possibly moose in the Porcupine Valley, is to be avoided.	Gravel pits will be temporary features, and the sites will be reclaimed to appropriate habitat when they are no longer required. The pits will be sited adjacent to the access road which has been designed to avoid important wildlife habitats where possible. There are currently no gravel pits proposed for the Porcupine River valley. Commitment: Although there are no gravel pits currently proposed for the Porcupine River Valley, if gravel pits are required there in the future they will, where possible, avoid high value grizzly bear and moose habitat.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.13	Page 5-215, 5.12.1.5 Construction Methodology: It is indicated that the road design concepts have been prepared with consideration of many values including fish and wildlife. Has the construction schedule also been prepared with the same respect? Areas where mountain goats and avalanches exist will require timing sequences; natal areas for all species are to be avoided when it is birthing seasons; etc.	Section 8.13.2.7 and Table 8.13-2 in Volume III outlines wildlife sensitive periods applicable to the project. Where possible, these sensitive periods will be avoided. Where they cannot be avoided activities will be designed to minimize adverse impacts. Commitment: Where possible, wildlife sensitive periods will be avoided. Where they cannot be avoided activities will be designed to minimize adverse impacts.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.14	Comment: As the filter plant location has been changed from that as described in the application, an updated information package will be	Comment noted. Some updated information has been provided; more will be available for permitting.	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			required during permitting.	Commitment: Updated information will be provided for permitting.	
Miscellaneous	MOE	13.1.4.15	8.14 Domestic and Industrial Waste Management Plan: Permitting issues. This is a well considered identification of waste generation/management for the project. Putrescible waste handling, storage and destruction will be a significant on-going operations issue. Well constructed, maintained electric fences in conjunction with strict operating and putrescible waste handling procedures, are proven, effective wildlife deterrents.	Comment noted. Commitment: An appropriate domestic and industrial waste management strategy will be developed prior to operation.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.16	Comment: Many of the issues identified and discussed in this section have been mentioned elsewhere. It speaks to the number of issues involved with the access road and the need to put together and implement effective, comprehensive management plans to prevent and minimize environmental impacts.	Comment noted. Commitment: NovaGold will prepare appropriate management plans for the access road for permitting.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.17	Environmental effects monitoring program is required to assess potential effects from the access corridor. A program to assess potential risks to sensitive aquatic habitats along the access corridor needs to be included in section 10.0 Environmental Effects Monitoring.	The Aquatic Effects Monitoring Program includes sites along the access corridor. This includes one stream site along each of Sphaler, More and Scotsimpson creeks, one site on the Iskut River, and two sites on the Porcupine River. NovaGold refers MOE to Table 10.6-1 of Volume III. In addition, some smaller streams will be monitored along the road corridor to address MOE's concerns. Commitment: NovaGold will develop an appropriate environmental effects monitoring program for the access corridor for permitting. The program will include some smaller streams.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.18	This is an excellent summary of what the company has committed to throughout the document, however some of the commitments have been missed. The application needs to be carefully reviewed and the table updated to include all of the various commitments. (Permitting, Stewart) Action: Following review of all of the agency and public comments, action items and a re-review of the application, generate a	Commitment: NovaGold anticipates that many of its commitments will be incorporated as conditions of permits.	MOE is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			comprehensive summary of commitments for the project. Many of the commitments can be specified for a particular permit, (e.g. specific monitoring programs for the effluent permit.)		
Miscellaneous	MOE	13.1.4.19	Appendix 5-H Conceptual Water Treatment Design for Concentrate Filter Plant Water: An updated filter plant design and commitments report will be required for permitting. During permitting, provide an up-date concentrate filter plant proposal and design which considers issues identified in the application review and changes to the plant location and design. The report will provide back-up documentation for the filter plant effluent discharge application.	Comment noted. Commitment: NovaGold will provide all necessary filter plant design information during the permitting process.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.20	Section 7.7 Environmental Factors As briefly identified in this section, the major concerns regarding both the Round Lake and the Porcupine aerodromes will be: - Large volumes of fuel stored adjacent the aerodromes, - Dew-icing chemicals, - Spill/accident potential/occurrence - Handling of fuel, de-icing chemicals and other fluids of concern. These concerns have been brought up elsewhere in terms of property wide storage and usage of fuel and other chemical agents. The specifics of how the impacts from these agents will be minimized can be discussed during permitting. During permitting, provide a more detailed management plan from those provided in plans 8.5, 8.6, 8.9, 8.11, 8.14 and others for the storage, handling, containment, mitigation and clean-up strategies for all fuel and other agents to be used on the property. The updated plan would incorporate changes based on the EA Application review as well as enhanced engineering specifications as the project design moves forward.	Comment noted. Commitment: NovaGold will provide management plans for the storage and use of fuel and other chemicals during the permitting process. DFO will be consulted on the management of de-icing chemicals required for the Porcupine Aerodrome.	MOE is satisfied with NovaGold's response.
Miscellaneous	MOE	13.1.4.21	5.13 Infrastructure and Support Facilities Page 5-265, 5.13.4.2 Permanent Camps: Both permanent camps are to have electric fencing to prevent wildlife interactions. This is noted under construction camps but not permanent.	The residential and cooking/dining facilities at permanent camps will have electric fencing to prevent wildlife interactions. Commitment: The residential and cooking/dining facilities at permanent camps will have electric fencing to prevent wildlife interactions.	MOE is satisfied with NovaGold's response.
Monitoring	TC	14.1.1.1	8. Follow-up Programs During Operations, CH10. TC will participate in the design and requirements of a Follow-up program.	NovaGold acknowledges the comment and leaves this decision to the appropriate regulators.	TC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: None required.	
Monitoring	USDA FS	14.1.2.1	I reviewed Volumes 1,2 and 3 plus various appendixes to supplement my understanding of various components of this project. Overall the document is good at describing and developing mitigation scenarios for impacts during construction and the life of the mine. While the operation is running I feel Nova Gold has spelled out what they will do during the operation if any problems arise but has not really explained post closure issues in as detailed a manner. In reviewing such a large project a larger discussion on how this large tailings pond is going to be managed and monitored into the future after the operator leaves is necessary. Only one small section in this huge document, Section 14.7 Post-Closure Monitoring, spells out in a general way as to what will be monitored after closure. What does the post monitoring program entail to make certain that the tailing pond stays intact in a remote area? I feel this has not been adequately addressed in this document.	Comment noted. The water quality monitoring plan for closure will be finalized during the permitting process. NovaGold will develop a long-term water quality management program at closure, which will ensure compliance with discharge permits and will address the long-term closure goals. Commitment: NovaGold will prepare a schedule for post-closure monitoring of the dam for inclusion in the reclamation plan to be approved by regulatory agencies.	MOE and MEMPR have committed to seek input from U.S. federal and Alaska state agencies on the EMA permit application and post closure plan,
Monitoring	USDA FS	14.1.2.2	Pg. 10-19 It is not entirely clear as to what the frequency of the monitoring program for water quality will entail. It is very detail orientated during the mine operation but there is not an explicit discussion on what will go on post mining. What will be the frequency and duration of the water quality monitoring program on the tailings effluent after closure	The water quality monitoring plan for closure will be finalized during the permitting process. NovaGold will develop a long-term water quality management program at closure, which will ensure compliance with discharge permits and will address the long-term closure goals. Commitment: NovaGold will continue regular post-closure water quality monitoring at the mine site and downstream as required by permitting agencies.	See response for 14.1.2.1.
Monitoring	USDA FS	14.1.2.3	There was no real discussion about monitoring the water quality of the pit effluent. Is there going to be a long term monitoring plan for the pit water quality as well as the tailing pond?	There will be long-term monitoring of the pit effluent. The water quality monitoring plan for closure will be finalized during the permitting process. NovaGold will develop a long-term water quality management program at closure, which will ensure compliance with discharge permits and will address the long-term closure goals. Commitment: Monitoring of pit water quality during closure will be included in closure monitoring plan	See response for 14.1.2.1.
Monitoring	USDA	14.1.2.4	Since the pits take from .3-10 years to fill up is the post monitoring	The post-closure water monitoring program will	See response for 14.1.2.1.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
	FS		program going to go on past this time frame?	continue well past the filling of the pits. The intention is to monitor the site and downstream locations on a regular basis until regulatory agencies determine that the site conditions are stable and predictable. Even then regular monitoring will continue, although on a less frequent basis. Commitment: The post-closure water monitoring program will continue until regulatory agencies determine that the site conditions are stable and predictable. Even then regular monitoring will continue, although on a less frequent basis.	
Monitoring	USDA FS	14.1.2.5	Pg. 14-37 I see there is a dam inspection monitoring program, but what about water quality especially after the pits have filled up and start to contribute more water to the tailings pond	Water quality issues related to the pit lakes are discussed in Appendix 5A, Section 3.4.4. However, NovaGold is preparing a report with updated water quality predictions for the closure period. Commitment: NovaGold will prepare a report with updated water quality predictions for the closure period.	See response for 14.1.2.1.
Monitoring	USDA FS	14.1.2.6	Pg 14-39 Post monitoring is quite general. It has the right components but I do not see the specifics. There is a mention of another document called the Mine Plan and Reclamation Plan. Would this have more specifics on the post closure monitoring program to which most of my comments and concerns center on	The water quality monitoring plan for closure will be finalized during the permitting process. NovaGold will develop a long-term water quality management program at closure, which will ensure compliance with discharge permits and will address the long-term closure goals. Commitment: NovaGold will prepare a reclamation plan that will include details of post-closure monitoring.	See response for 14.1.2.1.
Monitoring	MOE	14.1.3.1	Page 1-158, section 5.9.3.2 It is noted that the tailings pond supernatant will be discharged at a paced rate "...simulating the natural flow hydrograph of Galore Creek." This will be a very important aspect of the effluent permit as to the ability to discharge will also be linked to water quality in both the supernatant and the receiving environment. Continuous flow monitoring will be a critical aspect of this process. As the company currently has automatic monitoring systems	Comment noted. Commitment: NovaGold will continue flow monitoring in the Galore drainage to enable accurate predictions and actual discharge capacity.	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			on the Galore Drainage, it will be critical that these stations (and more if required) are maintained to enable accurate predictions and actual discharge capacity. During permitting, flow monitoring programs to be provided in detail with effluent permit application.		
Monitoring	MOE	14.1.3.2	10.4 Noise Monitoring This monitoring as it relates to wildlife is to be included in the Wildlife monitoring and mitigation plans.	NovaGold will monitor noise levels from time to time as described in the noise monitoring plan. Pertinent information will be included in the wildlife monitoring plan (Volume III, Chapter 10.5). Commitment: NovaGold will include pertinent noise monitoring in the wildlife monitoring plan.	MOE is satisfied with NovaGold's response.
Monitoring	MOE	14.1.3.3	14.7 Post-Closure Monitoring No further comment as program will evolve over time with the project and the related concerns.	Comment noted. NovaGold expects the post-closure monitoring program to evolve over time. Commitment: Post closure monitoring will evolve over time.	MOE is satisfied with NovaGold's response.
Monitoring	MOE	14.1.3.4	4.3 Summary of Selected VECs Appropriate VEC's identified for the Environmental Stewardship Division. Long term monitoring programs will assist in addressing adaptive management for adjusting/use of mitigation measures.	NovaGold will implement long term monitoring to guide adaptive management as outlined in Volume III, Section 8.13.1.3. Commitment: NovaGold will implement long term monitoring to guide adaptive management.	MOE is satisfied with NovaGold's response.
Monitoring	MOE	14.1.3.5	MOE, through development of the provincial environmental effects monitoring program, will require a table identifying what will be considered significant biological effect or change for the bio-monitoring tools used for the project.	Comment noted. Commitment: NovaGold will develop a table identifying criteria for assessment of potential significant biological effects to receiving environment.	MOE is satisfied with NovaGold's response.
Monitoring	MOE	14.1.3.6	The glacier monitoring program includes a mass balance and extent characterization but does not contain any attempt to characterize firn layer hydrologic processes. Given that glacial coverage is very high in the project watersheds it would seem to be important to characterize firn layer processes as they relate to the generation of stream discharge. Firn layer vertical and horizontal extent, porosity and transmissivity are likely very responsive to changes in site climate and can directly influence the timing and magnitude of glacier discharge.	NovaGold will consider incorporating monitoring of firn layer hydrology into our glacier monitoring program. However, whether monitoring can be undertaken will likely depend on safety related issues, due to hazards of working at high elevations on the glacier surface. Commitment: NovaGold will consider incorporating monitoring of firn layer hydrology into our glacier	MOE is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			Since the glacial component of discharge can have a large effect on runoff coefficients for the project watersheds, monitoring and understanding firn layer processes may significantly improve the predictability of glacier runoff and the assessment of climate change effects.	monitoring program.	
Monitoring	MOE	14.1.3.7	Section 10.6: This section discusses the proposed Aquatic Effects Monitoring Program. The specific details of the program will be addressed during permitting, especially the monitoring frequency and reporting structures. During permitting, submit a detailed proposed program with rationales included as part of the mine effluent permit to be issued pursuant to the *Environmental Management Act.*	NovaGold acknowledges the importance of a detailed proposed program with rationales. Commitment: NovaGold will submit a detailed monitoring proposal during the permitting phase.	NMFS is satisfied with NovaGold's response.
Monitoring	EC	14.2.1.1	The Aquatic Effects Monitoring Program described in Section 10.6 of the Application demonstrates a good understanding of regulatory requirements. EC expects to have an opportunity for further input into the program as it develops.	NovaGold will seek input from Environment Canada. Commitment: NovaGold will forward the Aquatic Effects Monitoring Program to EC.	EC is satisfied with NovaGold's response.
Monitoring	NMFS	14.2.2.1	Volume 111, Section 10.5.4, Monitoring Habitat Loss, Change and Reclamation. This section states that "An Environmental Effects Monitoring (EEM) program will be established as a requirement of the permits and licenses under which the Galore Creek Mine will operate." Table 10.6-1 identifies the locations and frequency of sampling for the aquatic effects monitoring program. The monitoring program currently lists only one exposure location on the Stikine River (STIK-2 immediately below the confluence of the Scud and Stikine River). NMFS recommends including additional Stikine River downstream locations during the construction, operation, closure, and post-closure phases. This data would provide additional data points to evaluate potential cumulative and long term effects. The Application stated that some of the rocks at Galore Creek are potentially acid generating over long time scales and that there is expected to be a delay between time of exposure and onset of acid rock drainage (conservatively estimated to be greater than 22 years - page 5-35). The Application also identified projects that may be developed in the geographic area including: Red Chris, Mount Klappan Coal Project, Kutcho Creek, and Schaft Creek. NMFS would appreciate the opportunity to discuss and/or review proposals to include additional Stikine River monitoring locations during the construction, operation, closure, and post-closure phases.	NovaGold recognizes that the addition of another monitoring site may be beneficial, particularly to assess a depositional environment. Commitment: NovaGold will add an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during permitting.	No further comment provided.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Monitoring	NMFS	14.2.2.2	Volume 111, Section 14.4.1.4, Tailings and Waste Rock Containment Facility, page 14-37. According to this section, the tailings and waste rock containment facility will have a permanent water cover that is anticipated to have water chemistry suitable for discharge to the downstream receiving environment. Because excess water will be passively released without collection and treatment, we recommend that long-term water quality monitoring include the release waters from the tailings impoundment. If these waters acidify over time, dissolved metals would be released into downstream waters. Monitoring will help ensure that all release water meets applicable water quality standards in order to protect downstream fisheries.	Commitment: NovaGold will monitor water quality of the impoundment outflow post closure.	No further comment provided.
Monitoring	NMFS	14.2.2.3	Polycyclic Aromatic Hydrocarbons (PAHs) Baseline Sampling: NMFS recommends monitoring of polycyclic aromatic hydrocarbons (PAHs) in addition to the proposed water quality monitoring. Because of the potential for PAH deposition (from spills, pipeline leaks, and motor vehicle exhaust) during construction and operation of the mine it is important to include PAHs in water and sediment sampling to monitor PAH conditions. Samples could be taken in Porcupine, Sphaler, or More Creek, in the Scud and Iskut River, and in reference sites. NMFS recommends passive sampling with a semi permeable membrane device (SPMD) as a low-cost alternative to tissue sampling. One time analysis of water samples for PAH are unlikely to reproduce the bioaccumulation associated with chronic exposure to these carcinogenic and mutagenic compounds. The proven ability of devices such as SPMDs to concentrate trace quantities from the water and integrate exposure over time improves the detection of PAHs and permits capture of intermittent pulses of contaminants (Moles et. al. 2006).	NovaGold is planning to develop a spill prevention and contingency plan to address PAHs. NovaGold will monitor for PAHs in the lower Galore drainage and Stikine - Scud confluence on an annual basis. Commitment: NovaGold will monitor for PAHs in the lower Galore drainage and on the Stikine River below the mouth of the Scud River on an annual basis. In the event of an uncontained spill NovaGold will implement a more frequent PAHs sampling program and report results.	No further comment provided.
Monitoring	USDOI	14.2.2.4	Volume III, Section 14.4.1.4, Tailings and Waste Rock Containment Facility, page 14-37. According to this section, the tailings and waste rock containment facility will have a permanent water cover that is anticipated to have water chemistry suitable for discharge to the downstream receiving environment. Because excess water will be passively released without collection and treatment, we recommend that long-term water quality monitoring include the release waters from the tailings impoundment. If these waters acidify over time, dissolved metals would be released into downstream waters. Monitoring will help ensure that all release water meets applicable water quality standards	NovaGold acknowledges that long term monitoring of impoundment flow is required. Commitment: NovaGold will monitor water quality of the impoundment outflow post closure.	NovaGold's commitment to monitor water quality of the impoundment outflow post-closure addresses DOI's comment.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			in order to protect downstream fisheries.		
Monitoring	USDOI	14.2.2.5	Volume III, Section 10.5.4, Monitoring Habitat Loss, Change and Reclamation. This section states that "An Environmental Effects Monitoring (EEM) program will be established as a requirement of the permits and licenses under which the Galore Creek Mine will operate." Table 10.6-1 identifies the locations and frequency of sampling for the aquatic effects monitoring program. The monitoring program currently lists only one location on the Stikine River below its confluence with the Scud River (i.e., STIK-2). We would appreciate the opportunity to discuss including additional downstream locations (e.g., STIK-3 through STIK-8) during the construction, operation, closure, and post-closure phases of the project.	NovaGold recognizes that the addition of another monitoring site may be beneficial, particularly to assess a depositional environment. Commitment: NovaGold commits to an additional monitoring site downstream on the Stikine River at a depositional site to be determined during permitting.	DOI appreciates NovaGold's willingness to conduct baseline work at the confluence of the Stikine-Iskut Rivers in Canada and consider an additional monitoring site downstream on the Stikine River. DOI continues to believe, however, that it may be appropriate to include more than 1 additional site. At the same time, it is DOI's understanding that the site-specific water quality objectives (WQO) for certain metals of concern would be identified in the BC *Environmental Management Act* (EMA) permit. DOI looks forward to participating with Canadian federal, Alaska State, BC agencies and NovaGold on a committee to be established by MOE to discuss EMA permitting-related issues, which will be examining this information in detail.
Monitoring	USEPA	14.2.2.6	The Application for EA Certificate provides an introductory discussion that supports a strong commitment to environmental safeguards and sustainable mine development. The discussion of the existing environment with its geologic hazards and the mine project with its environmental hazards seems thorough. The significance of the hazards in terms of the environmental effects, however, appear to be largely minimized based on subjective estimates of likelihood of the consequences and proposed mitigation activities having a loosely-defined degree of certainty for success (Section 13 and some of the	The ability to store snowmelt until mid-July provides an inherent reduction in metal concentrations within the tailings impoundment. This mitigation is built into the water management plan and requires the ability to store 9 months of runoff during a 1 in 200 wet year and the installed capacity to pump the accumulated water out of the facility within a shortened time period. Storage volumes and pumping rates are discussed in detail in Volume III, Section 8.3 and also in Appendix	In response to USEPA's comment to 19.2.2.16, NovaGold has committed to develop a water treatment program if monitoring data suggest that a problem is developing. In the EA Application and in response to other comments, NovaGold has committed to monitoring

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			sections on residual effects). The mining project is an inherently difficult undertaking particularly because of the steep mountainous setting for mining operations and water/waste management facilities directly subject to landslides, avalanches, high surface water flows and other geologic hazards. The consequences of failures in predictions or mitigation are high with respect to aquatic impacts, including those on the Stikine River and its resources. EPA hopes the project will implement the Environmental Management System, Monitoring Plan, and Mitigation Measures Plan included in the Application and revise these plans and mitigations as needed to ensure protection of resources, including the Stikine River. A feature of the project that is of major concern for downstream resources is the exceptionally large waste impoundment and the attendant assumption for project feasibility that water quality from the impoundment will be acceptable. Mitigation for error in this assumption appears to be simply monitoring and short-term storage. Success of the project appears to be based on the ability to discharge water from the impoundment when operationally required, such as during seasonally high flow, during inundation by storm, landslide, or avalanche induced runoff, or by seepage. A mitigation for discharge when water is not of acceptable quality does not appear to be in place, leading to a scenario where it would have to be discharged regardless. This approach for the project management seems questionable and would seem likely to lead to downstream impacts from contaminated water or contaminated sediment.	7-D . Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.	impoundment water quality during operations, closure and post closure. The Joint Report includes commitments for implementation of an ISO 14001 certified Environmental Management System and numerous commitments related to water quality and management, protection of aquatic resources and dam stability. These commitments address EPA's comments and we encourage Canadian agencies to include these commitments in enforceable permits for the project.
Monitoring	USEPA	14.2.2.7	Volume III, Section 10.6, page 10-14 and Table 10.6-1: The Environmental Effects Monitoring Program includes only one monitoring station in the Stikine River downstream of the mine (Stik-2). The monitoring plan should include contingencies for additional monitoring downstream of station Stik-2, if monitoring results at Stik-2 show exceedences of water or sediment quality standards or baseline levels.	NovaGold recognizes that the addition of another monitoring site may be beneficial, particularly to assess a depositional environment. Commitment: NovaGold commits to an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during permitting.	USEPA is satisfied with the response and commitment regarding an additional monitoring station on the Stikine River.
Navigable Waters	TC	15.1.1.1	6.21 Residual Adverse Effects and Their Significance, S8.5.4.3. At the Aug 2, 2006 meeting, TC informed NovaGold that the diffuser system for the filter plant discharge needs to be designed such that there is at least 1m of water above the system at low water. It is understood that the diffuser system is being finalised and will be provided as part of the permitting phase (S8.5.4.3).	NovaGold is aware of this requirement. Commitment: The design for the diffuser system takes into consideration the requirement for at least 1 m of water above the diffuser at seasonal low water.	TC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Navigable Waters	TC	15.1.1.2	3.3 Mine Development, Tailings dam -S5.9.4, S5.9.5, App 5-I. The tailings dam may require an *Navigable Waters Protection Act* (NWPA) approval, which will be confirmed following the site visit on September 19 to 21, 2006.	NovaGold will apply for approval of the tailings dam under the NWPA. Commitment: NovaGold will apply for approval of the tailings dam under the NWPA.	TC is satisfied with NovaGold's response.
Navigable Waters	TC	15.1.1.3	3.4.4 Pipelines - Concentrate Slurry and Diesel Fuel, S5.7.1, S13.2.1, S8.5.Aerial crossings of navigable streams will require an NWPA approval. Where the pipeline is attached to a bridge, the NWPA approval will include the works associated with the bridge i.e. the slurry and diesel pipeline as well. If the pipeline can be installed using horizontal directional drilling, the following guidelines may be applied: http://www.tc.gc.ca/pacific/marine/nwpd/pipelinecrossingguidelines.htm	NovaGold is aware that NWPA approval will be required for structures to carry pipelines across navigable watercourses. Commitment: NovaGold will apply for approval for pipeline crossings of navigable waters.	TC is satisfied with NovaGold's response.
Navigable Waters	TC	15.1.1.4	S7.18. At the Aug 2, 2006 meeting, TC informed NovaGold that all streams >3m in width or gazetted streams (i.e. named) will need to be reviewed by Navigable Waters Protection Division to determine navigability. Many of these streams will also need to be assessed during the site visit proposed for September 19 to 21, 2006. Most crossings over navigable waters require at least 1.5m above Q100. As stated during the meeting, the bridge proposed over the Porcupine River will require 3m above Q100 to accommodate jet boat use. All bridge design criteria will be confirmed following the site visit.	NovaGold will apply for approval of all crossings of navigable waters. Commitment: All crossings over navigable waters will meet the requirements of the Navigable Waters Protection Act and related regulations.	TC is satisfied with NovaGold's response.
Pipelines	DFO	16.1.1.1	The plans for the concentrate and diesel pipelines are still in the conceptual stage. DFO suggests that since the pipelines are carrying substances that would be considered deleterious, design should focus on reducing the risk of pipeline breakage should a bridge with an aerial pipeline crossings fail.	NovaGold has recently released the feasibility report (PSI) on the pipelines which includes specific design features at aerial crossings to lessen the risk and consequence of pipeline failure. Commitment: NovaGold will design the pipeline aerial crossings to reduce the risk of failure.	DFO is satisfied with NovaGold's response.
Pipelines	EC	16.1.1.2	Storage and Handling of Hazardous Materials Given that a spill from the proposed fuel line or copper concentrate line could result in significant environmental damage in the event of a major release, Environment Canada requests more information on the pipelines than is included in the Application.	NovaGold has recently released the feasibility report (PSI) on the pipelines. Commitment: None required.	Given that the pipelines are regulated under the *Pipeline Act* under the jurisdiction of the Oil and Gas Commission, EC is satisfied with NovaGold's response.
Pipelines	EC	16.1.1.3	The description of the fuel pipeline design should include: the	NovaGold is preparing a spill contingency and	See response for 16.1.1.2

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			sensitivity of the leak detection system; backflow preventer designs and placement; distances between block or isolation valves; valve automatic controls and power sources; means of detecting pipeline movement; and additional protection measures within the access tunnel. The pipeline profile ranges through about 1000 metres in elevation difference (Page 5-134, figure 5.7-1). This difference, and the challenging terrain, set some very difficult design criteria for the pipeline and its leak detection system. The description should estimate minimum and maximum volumes of diesel fuel which could escape, anywhere along the pipeline, from a point break or rupture large enough to activate the block valves; and estimate volumes below the automatic leak detection threshold which could escape.	emergency response plan for the pipeline system. Commitment: NovaGold will prepare an emergency response plan for the pipeline system.	
Pipelines	EC	16.1.1.4	The design should describe extra protection for the section of the fuel pipeline inside the 3.8 kilometre access tunnel, where a break could create an extreme safety hazard.	NovaGold is preparing a safety management plan for the tunnel which will include the pipeline system. Commitment: NovaGold will prepare a safety management plan for the tunnel which will include the pipeline system.	See response for 16.1.1.2
Pipelines	EC	16.1.1.5	It is recommended that all storage and handling of petroleum products and allied petroleum products be in accordance with the Council of the Ministers of Environment Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003). Environment Canada considers the Canadian Council of the Ministers of Environment Environmental Codes of Practice to be the basis of good storage tank management. These standards also apply to "temporary" fuelling facilities and construction activities.	Comment noted. Commitment: None required.	EC is satisfied with NovaGold's response.
Pipelines	EC	16.1.1.6	Presumably, the project will require a bulk fuel plant at the terminus of the fuel pipeline on Highway 37. The bulk plant does not seem to have been included in the scope of the project, however EC recommends that the bulk plant be constructed and maintained in accordance with abovementioned Canadian Council of the Ministers of Environment guidelines.	Volume I, Section 5.13.2.1discusses the single diesel fuel tank proposed for the start of the fuel pipeline at the filter plant. Commitment: None required.	EC is satisfied with NovaGold's response.
Pipelines	MOE	16.1.2.1	Page 8-77: Leak Detection System in pipelines. States that failure warning occurs within 2-15 minutes, and that leak detection "...are a comparison of flow rates, pressures and densities along pipelines..."	Pipelines are regulated under the *Pipeline Act* and these issues will be addressed in the application for a permit under that Act. Administration of the *Pipeline*	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			How sensitive are the detection systems? What % pressure drop is required? Volume loss? Change in flow rate? How long could a slow, low volume leak continue until it was detected? Where the pipelines are exposed along bridges, is there containment to ensure leakage does not directly enter the aquatic environment? During permitting, further detail is required as to the sensitivity of the monitoring systems. May need to build in a monitoring program within the permit which includes a minimum inspection schedule and the use of methods such as "intelligent pigs" to assess the pipeline. The exposure of the pipelines along the bridges is a concern as recognized by the proponent on page 8-74, Section 8.5.4. Secondary containment and other contingencies need to be explored for the exposed pipe sections.	*Act* is the jurisdiction of the Oil and Gas Commission, although MOE may participate under a Memorandum of Understanding between the two agencies. Regulators have expressed concerns about pinhole leaks in the pipelines. Pinhole leaks are typically due to corrosion caused by "stray currents" which develop between the material being transported and the wall material or by differences in potential on the outer surface of a pipe and ambient conditions. The Galore Creek concentrate pipeline will be lined with a HPDE liner and thus the "stray current" potential will not exist. Cathodic protection along with coatings will be employed to eliminate corrosion potential from the exterior environment. If pinhole leaks develop in the slurry pipeline despite the erosion protection systems, such leaks in the high pressure section of the slurry pipeline would very quickly become large ruptures that would be detected by the leak detection system (LDS). It is extremely unlikely that a pinhole leak would exist for any significant length of time. Small leaks in low pressure sections of the slurry pipeline could occur and persist for a longer period of time prior to detection due to loss of flow volume, but the escape of slurry would be much slower due to the lower pressure on the line. All commercial LDS have multiple protocols for determining a leak - including pressure change, flow change, hydraulic gradient line deviation, accumulated mass flow deviation, etc. Leaks smaller than the "detection limit" will eventually show up when the accumulated loss (mass flow, for example) is enough to warn of a leak. Right of way (ROW) patrols remain a key part of detecting very small leaks. The pipe trench is excavated in soil and rock - the surrounding material is much less permeable. If a very small leak occurs, the soil above the pipe (compacted after construction) is the "weakest" path. Evidence of a possible leak is typically seen before the material leaves the boundary of the previously excavated trench. Integrity	

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				monitoring is a combination of routine pipeline inspection (such as intelligent pigging, cathodic protection surveys, etc.), right of way patrols, and a state of the art leak detection system. Leak prevention remains the primary operating objective. Commitment: NovaGold will submit comprehensive information on pipeline monitoring and security in its application for approval of the pipelines under the *Pipeline Act*.	
Pipelines	MOE	16.1.2.2	Page 8-77 For the drain-out, clarification is needed as to whether containment is within a tank, a sump or a combination of both. Although a concrete sump is illustrated, the text discusses a covered tank. Is there excess capacity built into the sizing of the containment? During permitting, a major component of the pipeline contingencies, further specifics are required as to its capacity and functionality for permitting.	The sump is a covered concrete enclosure or tank as illustrated in the EA in Volume I, Section 5.7.1.2, Figure 5.7-2. It is designed to accept the maximum volume that could be drained to the location in the event of an accident. Commitment: Full details of the pipeline and related systems and facilities will be provided during the *Pipeline Act* permitting stage.	MOE notes the BC Oil and Gas Commission regulates pipelines.
Regulatory Context	MEMPR	17.1.1.1	Land Tenure (Section 1.4): The proponent will be required to update their mineral claim tenure map for its *Mines Act* permit application if changes should occur to the status.	Comment noted. Commitment: NovaGold will ensure that the mineral tenure map is up to date for the *Mines Act* permit application.	MEMPR is satisfied with NovaGold's response.
Regulatory Context	MEMPR	17.1.1.2	1.Land Tenure Nova Gold has control of mineral claims covering the mine site and plant area. A mineral lease(s) will be required for those areas that will be mined and surface tenure will be required for other areas. Prior to making submission for a *Mines Act* tenure, the proponent will be required to update their mineral tenure map to reflect any changes in the status of the tenures. Pioneer Metals Corporation (Pioneer) has mineral claims (Grace claims) over the area designated for the tailings impoundment. Nova Gold has an option agreement with Pioneer which is currently the subject of a legal dispute that expected to go to court in September, 2007. Nova Gold has made application (on June 21, 2006) to the Integrated Land Management Bureau for Land Act tenure over the proposed tailings facility. Given the legal dispute and potential that issuance of a surface tenure over the Grace	Commitment: A copy of the report titled "The Exploration and Subsequent Condemnation of the Galore Creek valley Tailings Disposal Facility and Plant Site" has been made available to the EAO and is posted on the EAO website.	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			claims may be disputed, it is important that Nova Gold demonstrate there is no economic mineralization on the Grace claims that would be isolated from further development (i.e. sterilized) by the construction of the tailings/waste rock facility. The results of exploration and geotechnical drilling on the Grace claims have been summarized in a report prepared for Nova Gold titled "The Exploration and Subsequent Condemnation of the Galore Creek valley Tailings Disposal Facility and Plant Site" by Scott Petsel, dated June 21, 2006. The ministry has reviewed this report and concurs that sufficient condemnation work has been done to negate the probability of sterilizing an economic mineral resource in the area of the proposed tailings facility. It is recommended that this report be made available to the EA office and working group members.		
Regulatory Context	MEMPR	17.1.1.3	Licenses, Permits and Approvals (Section 2.6): A reminder that under Section 10 of the *Mines Act*, before starting any work in or about a mine, which includes diversion structures and coffer dams etc. there must be a permit issued by the Chief Inspector of Mines.	Commitment: NovaGold will comply with the requirements of the *Mines Act* for permits.	MEMPR is satisfied with NovaGold's response.
Regulatory Context	MOE	17.1.1.4	8.15 Access Road Management Plan Page 8-278, 8.15.1.1 Regulatory Considerations: The Mining Right of Way Act is not listed. This act will allow for the restricted use along the road. NovaGold needs to consider this.	NovaGold has consulted the various provincial agencies to identify appropriate means to limit the use of the access road. The *Mining Right of Way Act* was deemed to not be an appropriate solution. Agencies recommend passing the road through the mining lease where the filter plant will be located to assist in limiting access. Commitment: NovaGold will pass the road through the mining lease where the filter plant will be located to assist in limiting access.	MOE is satisfied with NovaGold's response.
Social and Cultural Effects	ECDV	18.1.1.1	Page 7-699 - income impacts on Smithers and Terrace state that during construction there will only be indirect employment -just to confirm this is also the situation for primary impact communities (page 7-715 shows 3,289 jobs with contractors for construction)? In addition, the project will provide approximately 1,000 construction jobs in Northwest BC over a three-year period - how many will be through indirect employment? Please specify?	During construction, employment and income effects will be indirect in both the primary and secondary impact communities. Employment and income effects will be indirect because they will be generated through contractors to NovaGold. The 1,000 construction jobs in Northwest B.C. over the three year period will be indirect because they will also stem from contractors to NovaGold.	ECDV is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Commitment: None required.	
Social and Cultural Effects	ECDV	18.1.1.2	Page 7-713 - with as many as 50 trucks in B-train formation that would be operating and making as many as 100 round trips per day hauling - what is the status of the Traffic Management Plan (TMP) for the increased traffic through the District of Stewart and increased industrial truck traffic along Highway 37A? Should be discussing any possible mitigation measures that are planned to minimize local business disruptions, other than the possible by-pass which is part of Stewart's Official Community Plan.	An analysis of all alternatives was undertaken during the development of the project design and supporting infrastructure. This analysis included consideration of transportation options. The currently most viable route is the one which is proposed. However, should the construction of a by-pass in Stewart proceed as outlined in the official Community Plan, NovaGold would be in support and alter its current transport route to take advantage of the by-pass. The project effects assessment considered potential effects of the project on Stewart. From an issues scoping exercise, which included direct input from public open house events and interviews with key informants in Stewart, the following valued components were identified: economic development, business development, employment, incomes and traffic. The effects assessment reported that positive effects would result for all valued components, with the exception of traffic and transportation in Stewart. The analysis showed that adverse traffic and transportation effects would be experienced during the operational phase of the project. However, balanced against the positive gains of employment, incomes, business opportunities and economic development, the significance of the adverse transportation effects was reduced. This balance is especially important in light of the forthcoming closures of the Huckleberry and Eskay Creek mines which generate significant taxes and income in Stewart. Mitigation measures also include speed and noise controls. Street layout precludes effective re-routing of traffic unless the by-pass is constructed. NovaGold proposes discussion and collaboration with the District of Stewart and the Ministry of Transportation in attempts to resolve traffic issues. Commitment: None required.	ECDV is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
Social and Cultural Effects	ECDV	18.1.1.3	Direct construction employment incomes should be consistent (states $60,000 on 7-654) but for table 7.15-10 income amount should be $2,760,000 not $3,680,000, while tables 7.15,11, 19-20, 28-29, and 39-40 use $80,000 for direct construction incomes - needs to be consistent.	The $60,000 employed on p.7-654 should be $80,000 and $3,680,000. Commitment: None required.	ECDV is satisfied with NovaGold's response.
Social and Cultural Effects	ECDV	18.1.1.4	Pages 7-654 to 7-678 - indirect employment for construction and operations employment (without Red Chris) for the local business Spatsizi Remote Services shows 35 persons from Dease Lake, Iskut and Telegraph Creek - 105 persons, I take this method is used to approximate the 108 persons who worked for Spatsizi in 2005? Please clarify?	Yes, with the qualification that since mining employment remunerates better than service employment, there may be an increased number of employees employed in mining positions and fewer in service positions, and that the distribution of such employees by community may change. Commitment: None required.	ECDV is satisfied with NovaGold's response.
Social and Cultural Effects	ECDV	18.1.1.5	Page 7-701 - Table 7.15-51 states total output at $460.9 million (no safety net) -just to confirm this is the annual amount of total output, it doesn't seem to specifically state?	Yes. Table 7.15-51 refers to annual amount of total output. Commitment: None required.	ECDV is satisfied with NovaGold's response.
Social and Cultural Effects	ECDV	18.1.1.6	Page 9-74 - 9.10.2 Linkage with Other Human Actions should include the possibility of other projects such as the Davidson Project (Blue Pearl) Molybdenum mine near Smithers and the Swamp Point Aggregate Mine (received Mines Act permit on August 23/06) in regards to its effect on their employment numbers (including indirect and induced) for Smithers, Stewart and local surrounding areas.	Swamp Point employment is not expected to impact significantly on Galore Creek's direct, indirect and induced employment of Stewart residents. Most Galore Creek employment of Stewart residents is expected to be indirect and induced and reflect the demands of transportation services and port facilities. Current underemployment of the Stewart labour force and future mine closures suggest that Stewart will accommodate the requirements of both Galore Creek and Swamp Point and that neither development will have a notable impact upon the other. Because the Blue Pearl mine is sited near Smithers, it may be anticipated that the Blue Pearl mine will be a preferred source of employment to residents of Smithers and the Bulkley Valley. Blue Pearl will enable employees to commute daily to the mine site, forgo any need for fly-in / fly-out camp schedules, and thereby maintain more traditional family oriented lifestyles. With mine development and production scheduled for 2007, Blue Pearl will have the indirect	ECDV is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
				effect of drawing employees who might otherwise have been employed at Galore Creek. The effect of this will be to increase the number of employees resident in more distant communities such as Prince George. The induced impact of Blue Pearl on Smithers is more likely to be positive by creating another mine market for the provision of Smithers-based goods and services. Commitment: None required.	
Water Quality	DFO	19.1.1.1	Iskut River: The cobble substrate and velocity of the river at the diffuser site raise questions about the anticipated maintenance schedule. DFO would prefer a design which would require a minimum of maintenance and disturbance to the stream bed.	NovaGold also desires a minimum of maintenance and disturbance to the stream bed. Good engineering practice will be applied to the design and installation of the diffuser pipe to minimize maintenance and disturbance. During the Application review, NovaGold provided a report to the Technical Working Group which provides further details on the design and installation of the diffuser. Commitment: Will work with DFO, TC and the Tahltan Central Council, to ensure the design of the diffuser minimizes potential impacts on fisheries resources.	If the design, installation and operation of the diffuser cannot achieve the desired results and harmful alteration, disruption or destruction of fish habitat is anticipated, then Nova Gold will need to identify the area of fish habitat that will be impacted and a *Fisheries Act* section 35(2) authorization would be required with compensation proposed. Additional information will be required on mountain whitefish use at the diffuser site.
Water Quality	DFO	19.1.1.2	Iskut River: There needs to be a risk assessment of the diffuser pipe becoming fully exposed based on an assessment of bed stability.	See response to 19.1.1.1.	See comment in 19.1.1.1
Water Quality	DFO	19.1.1.3	Iskut River: At the filter plant location no additional disturbance to vegetation should occur east of the road. This will provide a good buffer for the lake situated nearby.	NovaGold agrees and will endeavour to limit disturbance to buffer vegetation east of the primary access road close to the filter plant. Commitment: NovaGold will endeavour to limit disturbance to buffer vegetation east of the primary access road close to the filter plant.	DFO is satisfied with NovaGold's response.
Water Quality	DFO	19.1.1.4	Iskut River: DFO requests more design information on the installation and operation of the filter plant diffuser on the Iskut River to determine impacts to fish and fish habitat. The conditions observed (August 2006)	Commitment: NovaGold will provide information on installation and operation of the diffuser on the Iskut River. Additional information will also be provided on	See comment in 19.1.1.1

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			at the site raised concerns about channel movement, construction technique and window timing, spawning of mountain whitefish and the impact of debris on the diffuser.	the environmental conditions at the site, including information on whitefish and stream morphology. Good engineering practise will be applied to the design and installation of the diffuser pipe.	
Water Quality	EC	19.1.1.5	Filter Plant The Application proposes to pipe concentrate slurry to a dewatering plant on the Iskut River near Bob Quinn Lake. The Application diligently presents baseline data and details of the proposal for the dewatering plant. The slurry pipeline would remove about 2,000 m^3/day of water from the Galore Creek valley, and the filter plant would discharge 1,400 m^3/day to the Iskut River. The filter plant discharge, if designed and operated as presented in the Application (pages 5-140 to 5- 146), will be unlikely to significantly impact the Iskut River in terms of metals and TSS. It is not evident if sulphate concentrations will be elevated in this discharge water, and whether this will have an effect.	Assessment of sulphate concentrations observed in the Iskut River at stations downstream from the diffuser shows that, on a monthly basis, variability is in the order of two standard deviations from the monthly mean. This implies that any sulphate concentration observed in the Iskut River that differs from the baseline monthly average by less than two standard deviations should not be regarded as being outside of natural variability in the river. Using this criterion, it may be shown that for the worst case scenario, being the annual low flows in the month of February, a mixing zone of less than 500 m from the discharge will be required for sulphate concentrations to fall within the natural range of 64.04±12.65mg/L (n=7) observed for February. During annual high flows the sulphate concentration will fall within the range of natural variation within less than a metre from the diffuser. Iskut River water hardness and conductivity data are presented in Appendix 6-E of the EA, more specifically in Figures 3.1-13, 3.1-15, 3.1-16, and 3.1-18, and in the Appendix 3.1-1." A summary of water quality by watershed is also presented in Table 6.5-6 (Environmental and Socio-Economic Setting Chapter) of Volume I of the EA Application. Commitment: Sublethal toxicity testing will be conducted as part of MMER requirements.	EC is satisfied with NovaGold's response.
Water Quality	EC	19.1.1.6	The Application states (page 11-61), with respect to the filtration plant discharge, that "the degree of treatment necessary would be	Commitment: NovaGold will treat the concentrate water to meet MMER criteria and EMA permit	EC is satisfied with NovaGold's response.

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			somewhat dependent upon the available flow of freshwater at the discharge point to dilute the effluent to meet receiving water criteria." The *Fisheries Act* does not recognize dilution as a method of treatment for effluents, so effluent should be non-deleterious prior to discharge to the Iskut River.	objectives prior to discharge to the Iskut River.	MOE notes the discharge permit will identify numbers that will need to be met.
Water Quality	DFO	19.2.1.1	Erosion Control and Sediment Management Plan: This area has an intense climate as measured by rainfall, snowmelts, and general mountainous conditions. Erosion control and sediment management is going to be a challenge in this steep terrain. Although standard mitigative measures have been listed in the Application it is unclear if the amount of difficulty in achieving these has been considered for this northern mountain area. More details on proposed methods are required to determine the significance of impact.	Commitment: NovaGold will develop Erosion and Sediment Control Plans for construction and operations, as part of the requirements for permitting. A subsequent plan will be developed for operations.	DFO is satisfied with NovaGold's response.
Water Quality	DFO	19.2.1.2	Galore Creek: A relationship between ambient elevated metal concentrations in the stream could be investigated to establish water quality limitations to fish presence. This is complicated by the fact that the Application suggests that new water quality objectives will be sought based on the adaptation of organisms to ambient levels which exceed existing water quality objectives.	Comment noted. Commitment: NovaGold will address this issue during the permitting process with MOE and with input from other agencies.	DFO is satisfied with NovaGold's response.
Water Quality	DFO	19.2.1.3	Galore Creek: The synergistic/additive aspects of mixtures of metals in aqueous solution are well-documented and acknowledged in the Application; however no modelling of this has been done. Without this information, it is difficult to accept the conclusions of no significant effect.	This question cannot be determined through modelling, but rather requires detailed laboratory test work. Some toxicity test work was done on the pilot plant tailings effluent (Volume VI, Appendix 5-G). NovaGold will further investigate the cumulative effects of the additive aspects of mixtures of metals and their effect on aquatic life, including testing of actual tailings effluent during the first year of operations prior to discharge to Galore Creek. Commitment: NovaGold will further investigate the cumulative effects of the additive aspects of mixtures of metals and their effect on aquatic life, including testing of actual tailings effluent during the first year of operations prior to discharge to Galore Creek.	DFO is satisfied with the response. MOE notes the monitoring will take into account synergistic effects of metals.
Water Quality	DFO	19.2.1.4	Scud River: The annual contribution of Galore Creek as a food and nutrient stream and in terms of water quantity to the Scud River is not well quantified. This information is necessary for conclusions on the	See response to 9.1.1.7.	See comments in 9.1.1.7

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			change in productivity of the Scud. Reduced water quantity could also result in impacts on chinook, sockeye and coho spawning areas of the Scud.		
Water Quality	DFO	19.2.1.5	Scud River: Sampling times have only been during the summer and fall months. This has resulted in inventories missing the presence of chum and pink salmon in this (and other) system(s) in the Project area. These species need to be included in the work window table.	Sampling timing would have encompassed chum and pink spawning season, but not outmigration of fry. The historical data for the Stikine River did not show any presence of pink or chum salmon in the Scud River. Commitment: None required.	DFO is satisfied that the populations of chum and pink are very insignificant in this area of the Stikine drainage.
Water Quality	EC	19.2.1.6	Mine Site Baseline data for Galore Creek suggests total suspended solids (TSS) averages 92 mg/L, copper 0.04 mg/L, aluminum 1.8 mg/L, and iron 2.6 mg/L. These are an order of magnitude above Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life. Sulphate concentration, at 261 mg/L, is almost three times the BC Water Quality Criteria. Site-specific water quality objectives will likely be derived for Galore Creek. While the proponent will likely achieve these site-specific objectives with ease if their effluent meets Metal Mining Effluent Regulations (MMER) and probable permit requirements, sulphate may be problematic. Section 7.6 of the Application presents results of water quality modelling in the lower reach of Galore Creek, and in the Scud River where Galore Creek enters. These are the areas of interest because fish are found only in the lower kilometre or so of Galore Creek and in the Scud River. The Application asserts that there will be no change in water quality during winter low flows. However, during summer high flows, sulphate may be elevated to 200 mg/L in lower Galore Creek, and to 100 mg/l in the Scud River. (The Scud River summer baseline is below 10 mg/L.) These increased sulphate levels may have adverse effects on periphyton and/or macrophytes.	Sulphate concentrations in the water discharged from the tailings impoundment are predicted to be less than 1500 mg/L, due to snowmelt water and rainfall (with low sulphate) entering the facility from the hillslopes surrounding the pond. The background sulphate concentration during June and July in Galore Valley (GAL-3) is less than 50 mg/L which accounts for the predicted concentrations of 200 - 790 mg/L. Sub-lethal toxicity testing has been conducted with site water from Galore Creek on multiple occasions with the following laboratory species: algae (*Selenastrum capricornutum*) (4 times), an aquatic plant (*Lemna minor*) (4 times), an invertebrate (*Ceriodaphnia dubia*) (8 times), and a fish (*Oncorhynchus mykiss*) (2 times). During operation under the MMER, sublethal toxicity testing will be conducted. Developed protocols for bioassays with indigenous aquatic species found in Galore Creek do not exist. Commitment: Sub-lethal toxicity testing will be conducted under the MMER during operations.	EC is satisfied with NovaGold's response.
Water Quality	EC	19.2.1.7	The Application asserts (Appendix 7E, Section 6.3) that the end of pipe predictions for all metals will be less than MMER limits in all scenarios, and less than baseline levels due to retainment of TSS in the impoundment area. Sulphate is predicted to range between 200 and 630 mg/L, and up to 790 mg/L in some scenarios. Dissolving gypsum in the ore body may result in sulphate near 1,500 mg/L. This	The tailings impoundment will be operated in a manner which ensures that the tailings are deposited in such a way to minimize suspended solids. Tailings will be discharged as far away as possible from the floating water intake barge during discharge periods and the floating water intake barge intake will be	EC is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			is double or more what is predicted. If this were to be the case, then Scud River sulphate would be elevated well above the BC criteria level in the area where Galore Creek water is actively mixing. Modelling of sulphate levels downstream in the Scud River, the Stikine River below the Scud, and the Stikine River mouth under this scenario should be conducted. Galore Creek has elevated total suspended solids (TSS) derived from glacial runoff. Flows average 11 cubic metres per second (m3/sec) with an average of 92 mg/l TSS (Table 6.5-2b and Table 6.5-6). Most of this flow will be diverted around the tailings impoundment. Water escaping the diversions will collect within the tailings impoundment. The impoundment waters would be discharged from mid-May to October, by pumping into the diversion outlet channel into Galore Creek (page 5-199, section 5.11.1.4). Assuming the mine is in commercial production, this pumped discharge, originating from within the project's operations area, would be an effluent subject to the Metal Mining Effluent Regulations (MMER). Appendix 7E Table 6.3-6 estimates maximum concentrations for total metals. Concentrations of arsenic, copper, lead, nickel and zinc seem likely to be below limits set in the regulations, and are not considered further. The mill will not use cyanide. The Application does not model suspended solids in the pumped discharge. Section 7.8 of the Application discusses sediment loading effects but does not include any reference to particle size analyses of TSS in present Galore Creek flows. The tailings are estimated to be 23 percent by weight in sizes smaller than 13 microns, meaning the particles are fine silt or clay. Being too small to settle within the impoundment, they would therefore be pumped over the dam and discharged (page 7-313). This pumped effluent would contain particulate matter sized between 13 microns (or larger, depending on the reservoir's residence time) and 0.45 microns, the pore size of the filter in the standard method for TSS determination. The TSS concentrations could exceed the15 mg/l maximum monthly mean specified in the MMER, despite the assumption in Appendix 7E (page 4-35) that they will remain below that limit. The Application does not provide assurance that the project could comply with the MMER TSS limits. Also, the likelihood of entraining TSS by channel erosion during discharge should be considered when modelling water quality in lower Galore Creek. Page 7-311 asserts TSS will be managed from the tailings pond so concentrations do not exceed 15 mg/L.	designed to skim water off the surface of the impoundment. The pumps will be located inside the floating well. If required, a floating thickener will be used to feed the pump well. This floating thickener concept was used successfully at the Ekati diamond mine during the mine development stage. It allows the use of settling aids (flocculants) to enhance settling. At Ekati the floating thickener is no longer used because the impoundment provides the necessary settling to meet all the compliance requirements. The tailings facility at Galore Creek is designed to store water for up to 18 months at the start of mill operations. For each subsequent year, the mine discharges could be stored for nine months prior to discharge. The process pilot plant testing showed that the tailings settled quite effectively without settling aids. NovaGold is committed to meeting the MMER requirements and during the operating period will model the quality of discharge waters at closure in order to ensure that appropriate management systems are in place for closure. Commitment: NovaGold will closely monitor the quality of water discharged from the tailings and waste rock impoundment during operations and ensure that discharge standards are met. During operations NovaGold will model the quality of discharge waters at closure to ensure that appropriate management systems and bonding are in place for closure.	

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Water Quality	EC	19.2.1.8	Modelling was not done for a site on the Stikine River just below the Scud tributary. Modelling here would offer additional reassurance that Scud River conclusions, and projections of effects from those conclusions (i.e., that there will be no significant effects on the Stikine) are valid, particularly with respect to water quality impacts at the international border.	The water quality effects assessment (Section 7.6, Volume II of the EA Application) concluded that the Project would not produce any significant effects on water quality in the Scud River. As a result, the analysis was not extended downstream to the Stikine River as the large additional dilution provided by the Stikine would only decrease concentrations further. It is thought unlikely that there would be any measurable changes on water quality in the Stikine River, except under certain conditions (e.g., maximum pumping rate from the facility during average or low flow conditions) that are likely to be rare and short-lived. However, the Stikine River is included within the environmental effects monitoring program proposed for the mine and any changes to the Stikine River water quality during operations will be reported on an annual basis. Commitment: None required.	EC is satisfied with NovaGold's response.
Water Quality	EC	19.2.1.9	Monitoring and modelling results should be interpreted in context with natural variability. In other words, some judgment should be made regarding where expected project impacts can no longer be distinguished from background noise.	Mean, median, minimum and maximum for all water quality data are provided by site for 2004 (Volume X, Appendices 3.1-3 to 3.1-5) and 2005 (Volume XI, Appendices 3.1-2 to 3.1-4). These can be compared to the water quality data provided in Appendix 7-D of the Application. Monitoring and modelling results are interpreted in context with natural variability and are presented in Section 7.6.4.1 Effluent Discharge of the EA Application in Volume II Environmental and Socioeconomic Effects Assessment. Commitment: None required.	EC is satisfied with NovaGold's response.
Water Quality	EC	19.2.1.10	The proposal states the impoundment facility will retain water until July if water quality is poor and unsuitable for discharge. The Application does not present a plan for the contingency that water quality remains unsuitable for discharge in July. As discussed above, TSS and sulphates may be higher in the supernatant than predicted in the	The ability to store snowmelt until mid-July provides an inherent reduction in metal concentrations within the tailings impoundment. This is the contingency built into the water management plan and requires the ability to store 9 months of runoff during a 1 in 200	EC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			Application.	wet year and the installed capacity to pump the accumulated water out of the facility within a shortened time period. Storage volumes and pumping rates are discussed in detail in Volume III, Section 8.3 and also in Appendix 7-D . Commitment: None.	
Water Quality	EC	19.2.1.11	Sediment Quality Changes in downstream sediment loadings due to mine operations are modelled in Section 7.8. The model suggests sediment load will decrease during mine operations. It asserts that changes in the Stikine River will be within expected ranges of natural variability. Two criticisms can be made: 1) the assumption that the TSS concentration in the impoundment discharge will be less than 15 mg/L is not validated; and 2) the higher bioavailability of metals retained in finer tailings is not accounted for. However, model assumptions appear conservative, and the result is defensible: little or no change in sediment quality is expected during mine operations. Metals will collect behind the tailings dam instead. It is asserted that an 8 m deep water cover over tailings after closure will minimize resuspension and downstream deposition of tailings, but it is not shown whether this water depth is sufficient to prevent significant resuspension under expected wind-driven wave action scenarios.	It should be noted that the input to the model, data for total metals content from fine tailings was determined on the tailings fraction less than 13 microns (from cyclone sizing). Only 0.3% of the time do winds exceed 7.5 m/s at the site. The maximum fetch is less than 3 km on the closure pond. Wave forecasting curves for shallow water (US Army Corps of Engineers Shore Protection Manual) predict waves up to 0.25 m high for a 7.5 m/s wind and 0.4 m for a 15 m/s (about 30 knots) wind. Bottom currents for those waves are calculated to be 4.2 m/s at a depth of 0.33 m for the 7.5 m/s wind and 3.6 m/s at a depth of 0.53 m for the 15 m/s wind. However, these currents attenuate very quickly with depth and the bottom current at a depth of 4 m for the 7.5 m/s wind is only 0.02 m/s and falls to 0.01 m/s at 5 m depth. For the 15 m/s wind the bottom currents would be 0.21 m/s at 4 m depth and 0.09 m/s at 5 m depth. The proposed depth of cover for tailings at closure will eliminate the possibility of wave scour.	EC is satisfied with NovaGold's response.
Water Quality	NRCan	19.2.1.12	F.1.5 - Management of Dissolved Metals Background concentrations and loadings from mine and filter plant operations for all parameters were considered as part of the EIA process and the proponent is commended for undertaking the collection and assessment of both the background and modelled data. NRCan concurs with the overall assessment that site specific water quality guidelines are appropriate for a number of parameters, due to the normally high background levels in this metalliferous area combined with the likelihood of locally	NovaGold' is interested in ensuring that all background sampling is completed prior to disturbance. Water in wetlands in the vicinity of the mine that were not previously sampled due to dry conditions will be sampled prior to disturbance. Commitment: NovaGold will continue to sample the Galore valley to establish background conditions.	NRCan is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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			adapted flora and fauna. The assessment of the potential for downstream effects of selenium, as well as other dissolved metals in process water combined with leaching from the mine site was well received. The proponent is encouraged to continue efforts in this direction. A review of the possible mitigation strategies for metals (in addition to relying on the dilution capacity in the TMF) and an assessment of any emerging data gaps would also be beneficial. It is recommended that background samples of wetlands in the vicinity of the minesite be collected as these may also show high background levels. These areas were dry and samples were not available during the original sampling campaign.	Water in wetlands in the vicinity of the mine that were not previously sampled due to dry conditions will be sampled prior to disturbance.	
Water Quality	NMFS	19.2.2.1	Volume 111, Section 14.8, page 14-39. Who will develop this long term monitoring plan?	The long-term monitoring plan will be developed by NovaGold following guidelines provided by the regulatory agencies, and subsequently approved by the responsible authorities. Commitment: None required.	No further comment provided.
Water Quality	NMFS	19.2.2.2	Volume 111, Section 14.8, page 14-39. Will U.S. agencies have an opportunity to review and comment on the post-closure long term monitoring plan?	Commitment: None required.	No further comment provided MOE notes that U.S. and Alaska State government agencies will have an opportunity to review and comment on the post-closure monitoring plan.
Water Quality	NMFS	19.2.2.3	Volume 111, Section 14.8, page 14-39. What will be the frequency and duration of water quality monitoring for the tailings effluent, spillway, below dam seepage, groundwater, pit waters, and road corridor after closure? Will there be long term monitoring in the Skud and Stikine Rivers?	The long-term monitoring plan will be developed by NovaGold following guidelines provided by the regulatory agencies, and subsequently approved by the responsible authorities. Commitment: None required.	No further comment provided
Water Quality	NMFS	19.2.2.4	Volume 111, Section 14.8, page 14-39. With the closure of all easy access to Galore Creek due to closure of the road and tunnel, how will a problem be taken care of in a timely fashion?	Monitoring and remediation will be carried out through automatic continual surveillance, helicopter access and equipment (including earth-moving equipment) stored on-site. Commitment: None required.	No further comment provided

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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Water Quality	NMFS	19.2.2.5	Volume I, Section 5.5.1.1, Pit Slope Stability, page 5-83. This section states that both vertical and horizontal dewatering wells and drains will be installed in the pit as part of mining operations. It is unclear, if during mine operations, water from these wells and drains will be routed to the water treatment plant before release. Figure 8.3-7 (in Volume 111, Section 5.5.1.1) shows a connection of these water sources to the treatment plant, however we could not find supporting text narrative on this plan. In addition, it is unclear whether after mine closure, these wells and drains will be plugged, since the water treatment plant will no longer be in existence. We are concerned with maintenance of water quality post-closure and detection of any increase of trace metals above water quality standards due to their potential effects to downstream salmonid fisheries. Therefore, we recommend appropriate narrative be included in the Application to address the operation and close-out of dewatering wells and drains.	During mining operations water collected within the pits will be used as make-up water within the process plant, as shown in Figure 8.3-7. To be clear, this is not a treatment plant, but is the mill where the copper/gold concentrate is extracted from the ore. Pit dewatering wells will be decommissioned on mine closure. Long term monitoring will identify water quality trends and allow adaptive management if necessary. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including but not limited to, a water treatment plant.	No further comment provided
Water Quality	NMFS	19.2.2.6	Volume I, Section 6.5.2.5, Stikine River, Table 6.5-6 and page 6-51. The third paragraph refers to baseline parameters exceeding water quality guidelines and references Table 6.5-6. The data in Table 6.5-6 is collapsed. This section should also reference where the reader can find the data specific to each sampling site. The 4th paragraph states: "At the one stream reference site, the following parameters..." We assume that this is Stik-1. It would be useful to identify the specific site in the narrative and/or identify Stik-1 as a reference site in Figure 6.5-9.	All original water quality data are provided for 2004 (Volume X, Appendix 3.1-1) and 2005 (Volume XI, Appendix 3.1-1). The reference site mentioned is REF-1 (on Oksa Creek, a tributary of the Stikine River). Commitment: None required.	No further comment provided
Water Quality	NMFS	19.2.2.7	Volume III, Section 9.3.2.6, Mitigation and Monitoring, page 9-25. This section states that "Guidelines that were created to be protective for all water bodies in Canada do not necessarily consider the specific environmental conditions of the aquatic ecosystems in Galore Creek and the Scud and Iskut rivers. Therefore, site-specific water quality objectives (WQOs) for specific contaminants of concern (Section 7.6) will need to be developed during the permitting process to provide relevant benchmarks for the aquatic effects monitoring program." Since juvenile coho were captured within 1 km of the mouth of Galore Creek (Volume I, page 6-1 10) we recommend setting copper concentrations below those found to cause olfactory problems in juvenile salmon as reported by Baldwin, DH, et al., 2003. Sublethal effects of copper on coho salmon: impacts on non-overlapping receptor pathways in the peripheral olfactory nervous system. Environ. Toxicology and Chemistry 22:2266-2274.	NovaGold acknowledges the comment, and will review the applicability of this reference. Commitment: NovaGold will review the applicability of this reference. Site specific water quality objectives will be developed using background concentrations.	No further comment provided

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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Water Quality	NMFS	19.2.2.8	Volume 111, Section 8.4.10 Summary of Closure Concepts, page 8-67. This section states that after closure it is assumed that the impoundment water chemistry will be suitable for direct discharge to the environment and water exiting the spillway will be released without collection and treatment. NMFS has concerns with post closure monitoring and assurance that water quality standards will be met post closure. What specific actions will be taken post closure to test the water flowing over the dam, in the spillway, and seepage from the dam to empirically test assumptions? If assumptions are not met what will be done?	The long term monitoring program will be addressed during permitting. NovaGold accepts that there will be a long term monitoring program after closure. NovaGold will develop a long-term water quality management program at closure, which will ensure compliance with discharge permits. Commitment: NovaGold will implement a long-term water quality monitoring plan, and will develop a long-term water quality management plan at closure.	No further comment provided
Water Quality	NMFS	19.2.2.9	Volume 111, Section 14.8, Post Closure Monitoring, page 14-39. Only two sentences and four bullets describe post closure monitoring. It states "Post-closure monitoring will be conducted within the project area to ensure closure and associated reclamation efforts remain effective in the longer term." How long is the "longer term"?	Post-closure monitoring will be determined during the permitting process and will be subject to re-evaluation every 5 years. Monitoring will continue as long as required based on the performance of the system. Commitment: NovaGold will implement a post-closure monitoring plan developed during the permitting process. NovaGold will monitor as long as required to ensure the reliable performance of the system.	No further comment provided
Water Quality	USDA FS	19.2.2.10	Pg 7-356 Water quality issues after closure During the life of the mine water quality will be monitored. After the mine is closed, is dilution supposed to take care of any water quality concerns	NovaGold is confident that the proposed water management strategy will meet all regulatory requirements. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including but not limited to, a water treatment plant.	No further comment provided
Water Quality	USDA FS	19.2.2.11	Pg 9-20 What if the effluent from the tailings ponds does not meet water quality standards after 3 months in the spring prior to the start of the pumping of the tailings ponds? What will be the plan of action so they will meet water quality standards	NovaGold is confident that the proposed water management strategy will meet all regulatory requirements. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including but not limited to, a water treatment plant.	No further comment provided
Water Quality	USDA FS	19.2.2.12	Table 7.5-22 Flow pathways entry needs to be changed from non-significant to significant.	Comment noted. The submission should have included an additional significance ranking table for surface water hydrology that noted that changes to the Galore	No further comment provided

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				Valley (local) were not considered significant. A discussion of the assessment methodology for surface water hydrology is provided in Volume II Section 7.5.1.3. Commitment: None required.	
Water Quality	USDA FS	19.2.2.13	Pg 7-229 The range for HQ should be changed to 0.04 to 3.4 not 0.04 to 3.9	Comment Noted. Commitment: None required.	No further comment provided
Water Quality	USDOI	19.2.2.14	Volume I, Section 5.5.1.1, Pit Slope Stability, page 5-83. This section states that both vertical and horizontal dewatering wells and drains will be installed in the pit as part of mining operations. However it is unclear during mine operations if water from these wells and drains will be routed to the water treatment plant before release. While Figure 8.3-7 (in Volume III, Section 5.5.1.1) shows a connection of these water sources to the treatment plant, we could not find supporting text narrative on this plan. As a result, it is unclear whether after mine closure, these wells and drains will be plugged, since the water treatment plant will no longer be in existence. Our concern is maintenance of water quality post-closure and detection of any increase of trace metals above water quality standards due to their potential effects to downstream salmonid fisheries. Therefore, we recommend appropriate narrative be included in the Application to address the operation and close-out of dewatering wells and drains.	During mining operations water collected within the pits will be used as make-up water within the process plant. Figure 8.3-7 the pit water is seen to be routed to the 'Process Plant'. To be clear this is not a treatment plant, but is the mill where the copper/gold concentrate is extracted from the ore. All de-watering wells and drains will be plugged at mine closure. Commitment: NovaGold will plug wells and drains at mine closure.	DOI appreciates the clarification provided by NovaGold that wells and drains will be plugged at mine closure. This clarification addresses DOI's comment.
Water Quality	USDOI	19.2.2.15	Volume III, Section 9.3.2.6, Mitigation and Monitoring, page 9-25. This section states that, "Guidelines that were created to be protective for all water bodies in Canada do not necessarily consider the specific environmental conditions of the aquatic ecosystems in Galore Creek and the Scud and Iskut rivers. Therefore, site-specific water quality objectives (WQOs) for specific contaminants of concern (Section 7.6) will need to be developed during the permitting process to provide relevant benchmarks for the aquatic effects monitoring program." We recommend setting copper concentrations below those found to cause olfactory problems in juvenile salmon as reported by Baldwin, DH, et al., 2003. Sublethal effects of copper on coho salmon: impacts on nonoverlapping receptor pathways in the peripheral olfactory nervous system. Environ. Toxicology and Chemistry 22:2266-2274.	NovaGold acknowledges the comment. The baseline copper values in the Scud and Iskut rivers significantly exceed the levels discussed in the reference provided. Despite these levels, there are healthy salmon stocks in both rivers. Commitment: NovaGold will continue low level copper analyses initiated during the baseline program and will work with the MOE to develop appropriate water quality objectives.	DOI believes that its concern for fish toxicity response to extremely low copper concentrations (e.g., behavioural effects such as predator avoidance) has been demonstrated in this (Baldwin, DH, et al) and other references provided to NovaGold. Therefore, DOI believes that low concentration copper analysis is needed to determine if there could be potential adverse effects on juvenile salmon. As a

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
					result, DOI would like to see a commitment by NovaGold to develop water quality objectives (WQOs) for copper during the permitting process to provide relevant benchmarks for the aquatic effects monitoring program. At the same time, it is DOI's understanding that the site-specific WQOs for copper would be included in permits to be issued to NovaGold under the EMA. DOI looks forward to participating with Canadian federal, BC and U.S. regulators and NovaGold on a committee to be established by MOE to discuss EMA permitting-related issues, which will be examining this information in detail.
Water Quality	USEPA	19.2.2.16	Volume I, Section 5.9.7 and Sections 5.10.1, page 176 and Volume III, Chapter 15: The first and fourth paragraphs on this page state that it is assumed that the pond water chemistry will be suitable for direct discharge to the environment both during operations and at closure. The text states that if this assumption is not correct then mitigation measures will be investigated. However, the table of mitigation measures (Table 15.1-2) does not include any measures that would be taken if water quality is not acceptable for discharge. Water treatment should be included as a possible mitigation measure, during both operations and closure, in the event that water quality in the impoundment exceeds water quality criteria.	NovaGold is confident that our proposed water management strategy will meet all reasonable regulatory requirements. However, NovaGold will develop a water treatment program if on-going monitoring data suggests that a problem is developing. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.	USEPA is satisfied with NovaGold's response.
Water Quality	USEPA	19.2.2.17	Volume I, Section 6.5.2.5, Streams, page 6-51: This section discusses baseline water quality in the Stikine River and refers to Table 6.5-9. The correct reference should be to Table 6.5-6. The text states that water quality at the Stikine sites exceeded CCME and/or BC water quality guidelines for a number of parameters. However, based on review of the table it appears that water quality guidelines were not exceeded for	NovaGold refers USEPA to the raw data appendices to compare to guidelines for each individual sample. All original water quality data are provided for 2004 (Volume X, Appendix 3.1-1) and 2005 (Volume XI, Appendix 3.1-1). The reference site mentioned is REF-1 (on Oksa Creek, a tributary of Stikine River).	USEPA is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			some of the parameters listed in the text, e.g., cadmium. It is also not clear how many of the samples exceed guidelines since all of the Stikine sample data was averaged. Please provide a discussion or separate table that indicates how many samples on the US side exceeded guidelines or provide a reference as to where data for individual samples can be found.	Commitment: None required.	
Water Quality	USEPA	19.2.2.18	Volume II, Section 7.6: Water quality predictions and impacts in this section appear to be based only on conditions during operation. There should also be a section or subsection that discusses water quality impacts due to release of water from the impoundment after the mine is closed. Post closure water quality predictions should include predictions of pit water quality and how pit water quality will impact water quality in the impoundment (since some of the pit lakes will flow into the impoundment) and the resulting quality of water that will flow from the impoundment.	Comment noted. During the Application review, NovaGold submitted a report on post-closure long-term pit water quality which was provided to the Technical Working Group. The issues raised in the report will be further discussed during the permitting stage. Commitment: NovaGold will maintain high alkalinity in the pit lake with additions of lime and will develop a closure management plan.	USEPA notes the report describes the potential for oxidation of pit walls and resulting potential for copper and zinc to be released from the facility at levels exceeding the provincial and federal water quality guidelines and the need for mitigation for decades into the future. USEPA is satisfied with NovaGold's response.
Water Quality	SOA	19.2.2.19	Lower Stikine River: The lower Stikine River, its delta and surrounding marine waters support many important terrestrial, avian and aquatic species. Eulachon, a valuable commercial and subsistence species, spawn in the braided channels of the delta and the area hosts commercial Dungeness and Tanner crab, as well as beam trawl shrimp fisheries. The State of Alaska (SOA) is concerned about the possible accumulation of metal-influenced sediment on the lower Stikine River and estuary and the possible long-term impacts upon fish and wildlife. The following statements in the Application support these concerns: During freshet, larger particles (sand and silt) as well as some clays were observed within the Stikine River water column, based on water sampling through the summer months. This indicates the low settling rates of particles in the Stikine River under baseline conditions. Similarly, fine tailings particles are not expected to settle in Galore or Scud rivers, but most likely in the Stikine River and estuary. - Volume II page 7-315 Due to their small size and the fast flowing nature of Galore Creek and the Scud River, metal-enriched colloidal material will not settle out in these waters. It is more likely that these colloidal materials will be transported into the Stikine River. Colloids already diluted to this point would probably still not settle out, being transported down the Stikine River to the Pacific Ocean which represents dilution by another	Metal calculations show that available metal due to suspended sediment load is actually less due to storage within the sediment pond. Reference Volume II, table 7.8-6 on page 7-314. Commitment: None required.	SOA is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			order of magnitude. Therefore, sediment quality is not predicted to change based on effluent discharge. - Volume II page 7-316		
Water Quality	SOA	19.2.2.20	Baseline Studies: Results of the 2004 baseline studies indicate a significant difference in grain size at the Stik-7 site, which had the highest percentage of both silt (54.8%) and clay (3.3%). These figures represent the average of three samples taken, two of which contained a 70.7% of silt. There was no date identifying when these samples were taken in Appendix 3.1-9 so it is assumed they were taken close to the other baseline samples for that sampling period. The 2005 sediment sample for Stik-7 for this sampling period showed great differences in the percentage of silt, 19.4% compared to 54.8% the previous year. Stik-7, the only baseline sediment and water quality site on the U.S. side of the border, was chosen as representative of the slower flow regime present in the lower river. This site can also be influenced by high tides during low flow periods, which further reduces the velocity at this location. The SOA had difficulty interpreting the results of baseline sediment and water quality monitoring for the Stik-7 site, which was to be done quarterly. Only the results of the August 2004 monitoring were included in Appendix 3.1-9 and displayed in the 2004 Aquatic Baseline Monitoring Report (Appendix 6-D). Similarly the 2005 Aquatic Baseline Report only displayed the August 2005 results for sediments and water sampling only included analysis of the May 28, 2005 sampling. An analysis of seasonal differences (quarterly) for both metals and grain size would be helpful, for both the Stik-6 and Stik-7 sites. The Position/Depth Water Quality Study Results indicate Stik-6 showed a position effect with a consistently higher concentration in midstream samples for all parameters including those associated with particulates (Appendix 6-E part 1, page 3-189). How was Stik-7 sampled for both water and sediment? The 2004 Baseline Studies Report (Appendix 6-D) states - "Sediment quality at a site in the U.S. section of the Stikine River was comparable to sediment quality observed at several study sites further upstream in Canadian waters" (page ii) Since the 2004 grain size analysis showed a great difference between Stik-7 and all other sites, the SOA questions the accuracy of this statement. In addition, SOA has questions regarding the locations of samples collected following the 2005 position study. The 2004 (Appendix 6-D) and 2005 (Appendix 6-E) Galore Creek Aquatic Baseline Studies Reports contain tissue sampling results for a total of only 8 Dungeness crabs and 13 "bay" shrimp (Crangon alaskensis), a non-commercial	Water sampling at STIK-7 was conducted in March, May and August of 2005 (Volume XI, Appendix 3.1-1). Sediment is sampled once a year, therefore no seasonal comparison can be made. At Stik-7, water was collected from mid-stream on the Stikine River and sediment was collected along the shore. The statement regarding similarities or dissimilarities among sites was directed as a general statement toward all parameters. Stik-7 did not stand out from other Stikine River sites, except for grain size variability, which is expected based on variable water elevation and shoreline fluctuation and erosion. The relatively insignificant contribution of sediment from Galore Creek (projected from operational discharge permit values) into the Scud and Stikine rivers is discussed in detail in Volume II Section 7.8.2.2. The sample site was suggested by US and Alaska authorities who recommended sampling one fish and one crustacean species. Species composition represents what is present at the sample site. The site was chosen due to its proximity to the Stikine River. Commitment: None required.	SOA is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			species, from a single sampling site on the Stikine Delta. Tissue samples were not collected and analyzed for commercial shrimp species, including pink shrimp (Pandalus borealis), sidestripe shrimp (Padalopsis dispar), coonstripe shrimp (Pandalus hypsinotus),and spot shrimp (Pandalus platyceros). Similarly, Alaska Tanner crab (Chionoecetes bairdi), another commercial species, was not sampled or analyzed. SOA therefore questions the adequacy of the species representation, number of individuals sampled, and number of sample sites (one).		
Water Quality	SOA	19.2.2.21	The SOA has been unable to find any predictions or models regarding post-closure pit lake water quality. Have such models been run? Table 14.4-1 predicts that filling of the pits make take as much as 11 years. What is the water quality of the first flush from the pit lakes likely to be?	Reference Volume IV, Appendix 5A, page 109 for information on pit water acidity at closure. During the Application review, NovaGold submitted a report on post-closure long term pit water quality which was provided to the Technical Working Group. The issues raised in this report will be further discussed during the permitting stage.	SOA is satisfied with NovaGold's response.
Water Quality	SOA	19.2.2.22	Aquatic Resources Effects Assessment: Attention in the Environmental Assessment is focused on higher energy flow regimes and there is little or no discussion or analysis of the potential impacts of accumulation of metal-influenced sediment in the sloughs and slower backwater areas in both the US and Canadian waters. Low energy hydrologic regimes are important rearing areas for juvenile salmonids. Since it is anticipated that fine tailings particles will settle out in slower reaches of the Stikine River and estuary, the potential impacts to these areas need to be considered. More sample sites that better represent the variety of habitats and flow regimes in the lower Stikine River would be appropriate. Eulachon are an important subsistence fish for residents of both Wrangell and Petersburg. Eulachon (Thaleichthys pacificus) spawning is present from the mouth of the Stikine River to just below the border and occurs from March through May with the peak occurring in early April, lasting for 3 - 4 weeks. There is no discussion of potential impacts from either the deposition of metal-enriched sediment or water containing high concentrations of metals upon the survival of eulachon eggs and larvae.	No impacts to water quality, sediment quality or fish populations are predicted for the entire length of the Stikine River. Commitment: NovaGold will establish an additional monitoring site on the Stikine River in Alaska at a depositional site to be determined during permitting.	SOA is satisfied with NovaGold's response.
Water Quality	SOA	19.2.2.23	Environmental Effects Monitoring and Follow-Up Program The Aquatic Effects Monitoring Program includes fast flowing sites on both the	NovaGold acknowledges this comment; the final selection of sampling points will be established during	SOA notes that it supports NovaGold conducting annual

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			Galore and Scud sediment where deposition is unlikely to occur. The only site downstream of the project on the Stikine River is Stik-2, approximately 80 kilometres above the border. This site is representative of the fast flowing mainstem and it is unlikely metal bearing sediment would have had a chance to settle out. In addition, there are no sites below the confluences of the Iskut and Porcupine Rivers, both of which have the potential to be influenced by effluent effecting water and sediment quality. Since the concentrate filter plant will be operating year round, effluent will be released into the Iskut River during low flow periods during the winter when the Stikine River is frozen. During winter low flows metal enriched sediment and colloidal material may settle out in the lower Stikine River. The Environmental Effects Monitoring Program should include the Stik-7 site for semi-annual water and sediment monitoring. The sampling period should be in late the fall during low flow conditions, following the tailings effluent release period during the freshet, and in the spring following breakup, prior to the freshet. Sampling during low flow periods may allow the collection of sediment samples in mid-river and result in more accurate and statistically valid sampling. The Position/Depth study indicated that Stik-6 showed a position effect with consistently higher concentrations in midstream samples for almost all parameters including those associated with particulates and it was noted midstream sampling may be more effective for larger river sites. Additional annual sediment sampling sites should also be added at the mouth in the vicinity of Pt. Rothsay and in several sloughs or backwater areas. Baseline monitoring indicated significantly elevated metal levels at Stik-8.	the permitting stage of the project with the various agencies. No impacts to water quality, sediment quality or fish populations are predicted for the entire length of the Stikine River. Commitment: NovaGold will establish an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determinate during the permitting stage.	sampling and analysis of sediment and twice annual sampling and analysis of water quality for all parameters previously tested. MOE notes that details related to sampling will be determined during the review of NovaGold's *Environmental Management Act* permits. U.S. federal and Alaska state agencies will have an opportunity to participate in permitting-related discussions.
Water Quality	SOA	19.2.2.24	MINE SITE: It was unclear how the groundwater removed in the initial dewatering for the pits would be handled (Sections 7.7 and 8.3.6). Will the facilities be in place at this time to store this water, or will it need to be discharged? If discharged, will it need to be treated?	Any water from the open pit development will be directed to a settling pond and discharged. Commitment: None required.	SOA is satisfied with NovaGold's response.
Water Quality	SOA	19.2.2.25	Section 8.7.9 states, "Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure." The SOA believes that more frequent monitoring would initially be appropriate, with sampling intervals increasing over time, assuming that no problems are observed.	Section 8.7.9 refers only to the sampling of seeps upon closure. Other monitoring will be more frequent. As noted in section 8.7.9 monitoring of seeps will be more frequent if a problem is identified. Commitment: None required.	SOA is satisfied with NovaGold's response.
Water Quality	MEMPR	19.2.3.1	Drainage Chemistry Predictions & Impact Assessment: Groundwater flows from the Scotsimpson tunnel do not appear to have been	Flows are anticipated to be insignificant relative to the overall project water flows.	MEMPR is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			included in the water balance for the pits. These flows are expected to average flows 50 L/s.	Commitment: Flows will be monitored as part of construction and operations.	
Water Quality	MEMPR	19.2.3.2	Drainage Chemistry Predictions & Impact Assessment: Modelled predictions for the receiving environment have not been included for closure. Albeit expectations are that water quality will likely revert to pre mine conditions, scenarios should be run based on worst case leaching for the pit walls and NPAG waste dumps.	NovaGold will provide additional model results which will describe predicted water quality during the closure period. Commitment: NovaGold will provide additional model results which will describe predicted water quality during the closure period.	MEMPR is satisfied with NovaGold's response.
Water Quality	MEMPR	19.2.3.3	3.1 Scotsimpson Tunnel It is proposed that excess water encountered from development of the south portal will be directed to the mine site and handled as part of the water management plan. Prior to completion of the tunnel, there may be a need to collect and treat water on the south side of the tunnel that does not meet discharge requirements. A plan will be required to address this potential concern.	NovaGold will include provision for water treatment of discharge from Scotsimpson tunnel prior to completion of the tunnel. Commitment: NovaGold will include provision for water treatment of discharge from Scotsimpson tunnel prior to completion of the tunnel.	MEMPR is satisfied with NovaGold's response.
Water Quality	MEMPR	19.2.3.4	Tailings Water Discharge. NovaGold has stated that there will be a discharge from the tailings pond to handle the yearly inflow and that the water quality will meet discharge quality requirements. Information is required to show how this conclusion was determined. The details on the quality of the water and a contingency plan to handle water that may require treatment prior to discharge should be provided as part of the EA review.	NovaGold believes that the proposed water management strategy will meet all reasonable regulatory requirements. The water management plan already has many mitigation measures including; the ability to store up to nine months of water during a 1 in 200 wet year; controlled outflows from the facility; large water diversion structures; rapid submergence of PAG waste rock; rapid submergence of tailings; and seepage control ponds and groundwater wells. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including but not limited to, a water treatment plant.	MEMPR is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.5	Page 5-138/14: Filtration Plant Location. It is acknowledged that the filtration plant location has changed from the application proposal. The new location information has been forwarded to the Ministry. Further assessment of the filtration plant location and design would be appropriately discussed at the permitting stage. This discussion will	NovaGold recognizes that the new filter plant location will require additional review and design to ensure that water quality requirements for discharges are met.	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			necessarily include containment strategies (contingencies) for discharge waters which do not meet water quality requirements, and therefore cannot be released to the river. Page 5-147 Concentrate Load-Out Facility; Detailed design with containment, prevention and mitigation strategies will be required for permitting discussions. This would include details of any truck washing facilities, as briefly mentioned in section 5.7.3.2, page 5-148. Provision of an updated report on the filter plant design, location and operation including contingencies for non-dischargeable water quality.	NovaGold recognizes that further details will be required during the permitting stage of the load out facility to ensure that water quality requirements for discharges are met. Commitment: NovaGold will complete design work during the permitting stage to ensure that all discharge from the filter plant will meet discharge water quality requirements. NovaGold will complete design work during the permitting stage to ensure that all discharge from the load out facility will meet discharge water quality requirements.	
Water Quality	MOE	19.2.3.6	Section 5.10.1 "Water Storage in the Tailings Pond". States "Tailings impoundment water (contact water) is assumed to not require treatment prior to release to the environment based on the water balance model. If this assumption proves incorrect, other mitigation measures will be investigated to address the problem." The appropriate time to investigate other mitigation measures is during the EA or at the very least during EA follow up. The EA should contain a listing of feasible mitigation measures. The water balance model predictions alone are not sufficient to forgo the investigation of potential off-spec water scenarios and their mitigation. Clearly define in detail during permitting, the potential mitigation and implementation strategies for effluent which cannot be discharged. This would include short term, operational strategies as well as long-term, post closure strategies.	NovaGold believe that the proposed water management strategy will meet all reasonable regulatory requirements. The water management plan already has many mitigation measures including; the ability to store up to 9 months of water during a 1 in 200 wet year; controlled outflows from the facility; large water diversion structures; rapid submergence of PAG waste rock; rapid submergence of tailings; and seepage control ponds and groundwater wells. However, NovaGold will consider the development of additional mitigation measures, including a water treatment program, during the permitting process. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including but not limited to, a water treatment plant.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.7	Section 5.10.1 indicates that TSF discharges will be paced to match the receiving environment hydrograph. Is there a contingency to maintain minimum baseflows outside of this window? If the TSF is stratified during the winter (i.e., with a clean water lens on top) would it not be possible to allow some level of baseflow discharge outside of the main discharge window? As a component of the effluent permit monitoring requirements, the water column of the tailings impoundment will require profile sampling to determine the best depth	NovaGold acknowledges potential low flow issues and is investigating methods to supplement the flow. During operations the water discharged from the facility will come from the upper layer of the water column within the TSF. This will be done to ensure that the effluent complies with MMER requirements for TSS. Profile sampling can be included as part of the site monitoring plan, which will be finalized during	MOE is satisfied with NovaGold's response.

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			for pumping out effluent. Note that as the tailings impoundment, and its inputs, "mature", changes to the water profile are likely to occur. Flexible discharge capacity is seen as a beneficial component of the effluent permit.	permitting. However, it should be noted that the water management plan is to lower the water level in the TSF before the end of the open water season in every year. This will be done to maximize the available storage within the pond required to contain winter runoff and to ensure contingency in case water needs to be stored early in freshet in the following year. Hence, during operations the retention time of water within the facility will likely be less than one year, meaning that a mature, stratified water body should not be able to develop. Commitment: NovaGold will investigate methods to supplement the flow, if required. NovaGold will develop a site monitoring plan during the permitting stage.	
Water Quality	MOE	19.2.3.8	Page 5-242 Tunnel: Discusses groundwater flow within the access tunnel., describing a steady state inflow of 50 l/s upon completion, with flush flows up to 35 l/s from features such as faults. It was not clear as to whether this was on top of the steady state volume or part of it. If additional to the steady state flow, it speaks to the need for the proper sizing of sediment ponds during construction. Upon completion of the tunnel, all water will be directed to the mine workings, but in the interim, it will likely have a very high sediment load and would have to be treated accordingly before it could be discharged. It is noted that there is minimal validation information available for these flow predictions. Sediment ponds will require construction prior to tunnel initiation and on-going flow monitoring will be required to ensure that the ponds can contain the inflow whish is actually intercepted during the tunnel development. For comment regarding glacier crossing, refer to section 1.5.	Estimates of groundwater flow rates from the tunnel are based on an analytical evaluation of probable hydrogeological conditions including depth of the groundwater table below surface, and rock mass permeabilities that vary with depth as evidenced from other tunnel projects in similar geological environments. Flush flows will be in addition to the steady state flow rate. A sediment control plan for construction is currently being developed and will be submitted during permitting. Commitment: A sediment control plan for tunnel construction will be submitted during permitting.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.9	Section 6.5.2 Surface Water Quality requires more detail. The Ministry of Environment, Environmental Quality section will require a detailed table for the water quality data from each of the main receiving environment monitoring locations. The table should maintain the layout in Table 6.5-6 and highlight excceedences of the BC Water Quality Guidelines (BCWQG) for each individual station. The text in the	NovaGold presents water quality data by variable using figures and discusses exeedences in the text. NovaGold refers MOE to Appendices 6-D and 6-E (Volume X) of the EA to review water quality data grouped by site to compare to provincial and federal guidelines.	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			associated section should discuss the magnitude of any water quality variables that exceeded the BCWQG.	Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.	
Water Quality	MOE	19.2.3.10	Section 6.5.2 Surface Water Quality should include a detailed table for the Adit water Quality. The data from the adit represents potential mining related effects on surface water quality. This data shall be compared to the BCWQG to give insight into potential concerns in the mine effluent.	NovaGold refers MOE to Appendices 6-D and 6-E of Volume X to review raw data and summary tables of water quality data. Commitment: NovaGold will address this concern during permitting.	MOE is satisfied with NovaGold's response
Water Quality	MOE	19.2.3.11	Table 4.11.1 notes why certain fish/fish habitats were included as VECs'. One of the rationales was the "perceived potential ..." for water contamination. This should not be classed as a perception but rather as a real possibility given the scale and type of operation occurring within the Galore Ck. watershed. Galore Ck water quality will be changed from existing conditions and there is a real potential for process upsets, spills, etc. The inclusion of "perception" trivializes the effect the project will have on the Galore Ck. valley specifically, as well as the downstream environment into which Galore Ck. flows. Future use of the table and discussion regarding downstream impacts should have the word "perceived" removed.	Comment noted. Commitment: NovaGold will not use the word "perceived" in future tables or future discussions regarding downstream impacts.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.12	Page 8-58, 8.4.4 In-Impoundment Water Quality Monitoring During permitting a monitoring program will be established which will consider the potential variability of the tailings impoundment water and the receiving environment to which it is being discharged. Depending upon the depth of the supernatant, this may entail water column profiles, as well as various surface water stations in order to determine the most appropriate location for the discharge pump. Monthly monitoring, as proposed will be insufficient to provide meaningful information for on-site management decisions, especially during periods of discharge. Consideration will be given to variable seasonal monitoring frequencies, internal/external monitoring, and other strategies to ensure that monitoring information is appropriately used to manage tailings water discharges. (Permitting, Stewart) Action: During permitting, submit a detailed monitoring proposal which reflects the expected variability in discharge quality and flow conditions and which	NovaGold acknowledges the importance of monitoring tailings impoundment water prior to any discharge. Commitment: NovaGold will submit a detailed monitoring proposal during the permitting phase.	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			enables effective and timely management of supernatant discharges to ensure effluent discharge compliance and the meeting of receiving environment targets.		
Water Quality	MOE	19.2.3.13	Throughout the section, reference is made to the MMER as the benchmark by which the discharge water quality will be measured. Although this somewhat accurate, the more significant document will be the provincial effluent permit which is required prior to discharge as issued pursuant to the Environmental Management Act (EMA). This permit tends to be more site specific, restrictive, and generally more comprehensive than the MMER. During the permitting phase, detailed contingency and management plans will be required to address non-compliant discharge waters. The proponent may wish to consider on-site analytical capacity for water quality in addition to ABA and other test work proposed. If established, and the results are corroborated with external analysis, the on-site information can comprise a very effective on-site management tool which enables the proponent to make appropriate operational decisions in a timely manner. This can be especially important in regard to effluent discharges.	NovaGold acknowledges that the provincial effluent permit will be more site specific, restrictive and more comprehensive than MMER. Commitment: NovaGold will have on-site analytical capacity for water quality.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.14	8.10 Erosion Control and Sediment Management Pn: Primarily permitting/operations issues, both at the construction phase and the operations phase.	Comment noted. Commitment: NovaGold will provide erosion control and sediment management plans for permitting.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.15	Section 10.6 indicates that periphyton will not be monitored as part of the AEEMP. Based on personal communications with Francois Laundry, (Rescan Biologist) this has changed and periphyton monitoring has been included in the 2006 program. The text should state that periphyton is being included in the 2006 monitoring program.	NovaGold agrees with comment. Commitment: Periphyton was monitored during the 2006 program.	MOE is satisfied with NovaGold's response.
Water Quality	MOE	19.2.3.16	Page 14-37, Tailings and Waste Rock Containment Facility. Although NovaGold "...anticipates that the chemistry of the water cover will be suitable for discharge to the downstream receiving aquatic environment both during operations phase and at the end of mining", there exists a real possibility that the water will not be directly dischargeable at some point in time. What contingencies are being developed to address tailings impoundment water of a quality that cannot be directly discharged to the receiving environment? These contingencies must consider both operational and post-closure	NovaGold is confident that the proposed water management strategy will meet all reasonable regulatory requirements. The water management plan already has many mitigation measures including; the ability to store up to nine months of water during a 1 in 200 wet year; controlled outflows from the facility; large water diversion structures; rapid submergence of PAG waste rock; rapid submergence of tailings; and seepage control ponds and groundwater wells.	MOE is satisfied with NovaGold's response

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			scenarios. In the event of water treatment, the significant aspects of long-term costs, maintenance, operations, re-supply, sludge handling and all other aspects of effluent treatment must be considered in detail. (Permitting, Stewart) Action: Provide detailed, achievable contingency plans to address tailings water which cannot be directly discharged to the receiving environment either during operations or post-closure.	However, NovaGold will develop additional mitigation measures (including a water treatment program), if on-going monitoring data suggests that a problem is developing. Commitment: NovaGold will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.	
Water Quality	MOE	19.2.3.17	One aspect of the closure plan not considered was the impact of Galore Ck on the exposed waste rock in the upper reaches of the tailings impoundment. The sub-aerially disposed waste rock will be subject to fluctuating water conditions post closure due to the seasonal and diurnal flow variability of the stream once it is re-channelled back into the main valley. Unless the final stream channel through the dump is constructed to prevent the incursion of Galore Ck. into the waste rock dumps, there will be cycles of wetting and drying within the dump. This would likely result in water chemistry changes due to altered weathering patterns and rates of the waste rock, changes to mineral exposure rates, flushing rates, and other affects. The comprehensive, long-term monitoring program will need to incorporate the sub-aerial waste rock dump.	At closure PAG rock will be permanently submerged below the level of the spillway invert and will not be subject to water level fluctuations. Not PAG rock will be subject to minor water level variations during freshet. Commitment: NovaGold will continue to monitor water quality in the impoundment.	MOE is satisfied with NovaGold's response
Wildlife	EC	20.1.1.1	EC cannot issue a permit for the incidental harm to migratory birds, including destruction of their nests or eggs, under the *Migratory Birds Convention Act* (MBCA). As such, EC recommends the Proponent develop a nest survey program where project activities overlap with the migratory bird breeding season to assure compliance with the MBCA. The survey program should consider protocol, mitigation, and reporting procedures. Briefly, the Inventory Methods for Forest and Grassland Birds, RIC 1999[1], is a useful standard that can be employed as a guide in development of a nest survey design. Specific details of the project, species and habitat will determine whether additional or alternate measures are needed to assess breeding bird activity, given that nests can be sometimes difficult to find and protect. A systematic, replicated survey effort improves the likelihood of locating active nests. Survey	NovaGold is aware of the *Migratory Birds Convention Act* and the requirement to protect nesting birds, eggs and occupied nests. Commitment: NovaGold will avoid vegetation clearing during the migratory bird breeding season, estimated in the EA application to be between May 15 and July 31, where possible. Where this is not possible, NovaGold will undertake comprehensive and intensive nest surveys in advance of such vegetation clearing, and will provide nest survey results to agencies, to determine the appropriateness of clearing and appropriate buffers as and where	EC is satisfied with NovaGold's response.

[1] Digital copies available at http://www.for.gov.bc.ca/ric

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			effort (i.e. area covered/unit of time) will depend on, among other things, habitat type and topography. In general terms, 1.0 ha/hour/survey can be considered a rough rule of thumb, and a minimum level of effort. Effort should be increased substantially in forested and other such difficult to survey habitats. Surveys should be replicated at least twice (i.e. a total of three surveys/unit area). Transects, nests, and sightings should be geo-referenced on a topographic map and submitted for review. Observation stations and transects should cover areas adjacent to where project activities occur, to address potential disturbance impacts to nesting birds. A 20-30m buffer zone around active nest trees has been used for other projects; but site specific adjustments should be considered for species-specific sensitivities. Species-specific buffers have been developed and are described in best management practices such as those developed by the provincial Ministry of Environment. In the event of a favourable review decision, Environment Canada is prepared to provide further advice to the Proponent on the above matter during detailed project design. Environment Canada is not requiring a nest survey program be vetted by the department as a condition of project approval. Environment Canada recommends its development and implementation as a matter of due diligence pursuant to the MBCA.	needed.	
	EC	20.1.1.2	EC notes Marbled Murrelet (MAMU) radar surveys were completed. Potential impacts to nesting MAMU should be considered and addressed in the Nest Survey Program as mentioned above.	NovaGold has conducted surveys to determine whether marbled murrelets are present in the project area and will consider the potential for nesting marbled murrelets in the nest surveys. Commitment: NovaGold will consider the potential for nesting marbled murrelets in the nest surveys.	EC is satisfied with NovaGold's response.
	EC	20.1.1.3	EC is satisfied that the proponent has identified those species at risk the project would likely impact. For this project, any listed wildlife species other than migratory bird species are the responsibility of the Province of British Columbia per the *Canada-British Columbia Agreement on Species at Risk*, specifically section 10. This responsibility includes the assessment of the effectiveness of mitigation measures.	Comment only. Commitment: None required.	No response required.
	EC	20.1.1.4	EC is satisfied that the Proponent has applied and met the objectives	Comment only.	No response required.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			of the Federal Policy on Wetland Conservation.	Commitment: None required.	
	EC	20.1.1.5	Wildlife Management Plan (WMP) • Access Road – Environment Canada is satisfied with the WMP as it relates to the access road and migratory birds. A 100m buffer for Harlequin Duck rivers is recommended over a 50m where it is feasible to do so. • Transmission Line – EC supports the use of diverters to reduce the potential for migratory birds- transmission line collisions. CWS is interested in reviewing a draft of the proposed monitoring plan. • Aerodrome/Aircraft Activities – The use of deterrents or other methods to scare migratory birds will require a Scare Permit, which would include any requirements for SARA-species compliance, from the Canadian Wildlife Service (CWS). EC recommends CWS be contacted on this matter. • Pit Walls – Removal of migratory bird nests could result in contravention of the Migratory Birds Convention Act (refer to CWS Occasional Paper *Birds protected in Canada under the Migratory Birds Convention Act* for a list of species protected under the MBCA). Environment Canada recommends CWS be contacted in the event removal of nests is proposed in relation to the Project.	Commitment: A draft monitoring plan for the transmission line will be available for CWS's timely review. EC will be contacted if there is a requirement to scare SARA-listed species from the aerodrome. CWS will be contacted if there is a requirement to move bird nests in relation to the project. Commitment: NovaGold will endeavor to maintain a 100m buffer for Harlequin duck breeding habitat where it is feasible to do so, and will minimize potential impacts and prevent the removal of riparian nesting habitat, woody debris and riparian vegetation to maintain a 50m buffer along road right-of-way at identified breeding reaches where possible.	EC is satisfied with NovaGold's response.
Wildlife	TC	20.1.1.6	Please also note that TC's Template for the Development of an Airport Management Plan was developed to reduce wildlife collisions, particularly with birds, and to ensure aviation safety. Although the Plan requires an assessment of wildlife behaviour, it does not specify that an assessment of the potential effect on the individual and its habit or its population is required. Please clarify in S 10.4 and S10.5.2.2 if a monitoring program will be developed to assess the potential effect of aerodrome activity and noise on wildlife.	S10.4 states the concern that grizzly bear feeding on spawning salmon along the Porcupine River may be affected by aircraft noise from the Porcupine aerodrome. The potential for grizzly bear to be affected by noise in the Valley is outlined in detail in S7.13.5.2- Wildlife Effects Assessment - Disturbance of Feeding, Breeding and Denning Habitats or Behaviours. In this section, the potential for significant adverse effects to grizzly bear as a result of noise disturbance was identified as considerable. Therefore, a monitoring program to assess the potential effects of aerodrome activity on grizzly bears specifically will be developed as part of the Wildlife Effects Monitoring	TC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				Program. This program is briefly outlined in S10.5.3.4. S10.5.2.2 briefly outlines the general wildlife monitoring program for the aerodrome. The intent of this monitoring program is to document wildlife interactions/observations/behaviour in the vicinity of the aerodrome to assist in determining the effectiveness of mitigation and management strategies designed to reduce wildlife collisions. The program will not be developed to assess the potential effects of the aerodrome activity and noise on wildlife. Commitment: A Wildlife Mitigation and Monitoring Plan will be developed to assess potential effects of noise and aerodrome activity on grizzly bear specifically. Monitoring of other wildlife species occurring in the Porcupine River valley will focus on documenting occurrence and behaviour in the vicinity of the aerodrome from a safety perspective.	
Wildlife	TC	20.1.1.7	7.4 Monitoring, S10.1 to S10.6. As discussed under "Residual Adverse Effects and Their Significance" above, please clarify in S 10.4 and S10.5.2.2 if a monitoring program will be developed to assess the potential effect of increased aerodrome activity and noise on wildlife.	S10.4 states the concern that grizzly bear feeding on spawning salmon along the Porcupine River may be affected by aircraft noise from the Porcupine aerodrome. The potential for grizzly bear to be affected by noise in the Valley is outlined in detail in S7.13.5.2- Wildlife Effects Assessment - Disturbance of Feeding, Breeding and Denning Habitats or Behaviours. In this section, the potential for significant adverse effects to grizzly bear as a result of noise disturbance was identified as considerable. Therefore, a monitoring program to assess the potential effects of aerodrome activity on grizzly bears specifically will be developed as part of the Wildlife Effects Monitoring Program (WEMP). This program is briefly outlined in S10.5.3.4. S10.5.2.2 briefly outlines the general wildlife monitoring program for the aerodrome. The intent of this monitoring program is to document wildlife interactions/observations/behaviour in the vicinity of the aerodrome to assist in determining the effectiveness of mitigation and management	TC is satisfied with NovaGold's response.

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				strategies designed to reduce wildlife collisions. The program will not be developed to assess the potential effects of the aerodrome activity and noise on wildlife. Commitment: A Wildlife Mitigation and Monitoring Plan will be developed to assess potential effects of noise and aerodrome activity on grizzly bear specifically. Monitoring of other wildlife species occurring in the Porcupine River valley will focus on documenting occurrence and behaviour in the vicinity of the aerodrome from a safety perspective.	
Wildlife	MOE	20.1.2.1	1.3 Project Development Philosophy The next paragraph on page 1-15 states: "Significant effects on renewable resources will be limited to the permanent loss of terrestrial ecosystems in the Galore Creek valley. This will not, however, affect the sustainability or integrity of these ecosystems within the Stikine region or their carrying capacity to support wildlife populations during project operations or the post-closure period." The mountain goats in the Galore Creek valley will be impacted by significant effects, which goes above just terrestrial resources (see further comments in this response document). Carrying capacity is a concept in resource management involving the specification of several key aspects. These are (1) a level of use that (2) will allow for the long term maintenance of (3) some level of environmental quality within (4) some predefined level of management activity determined by the costs of maintaining the resource quality at (5) a level that will provide resource user satisfaction. The philosophy that the permanent loss of terrestrial ecosystems will not affect carrying capacity is great but the reality is quite the opposite. Any level of use greater than zero will result in change. A baseline value must be determined in order to have an effective and meaningful monitoring program. The terrestrial ecosystems will be changed in the Galore Creek valley which will affect the animals that use the area and reclamation will not restore the area to the way it was pre-development. The carrying capacity will be different and may be sustainable in its new form but not in relation to the pre-development form.	Comment noted. The term "carrying capacity" was defined for the purposes of the EA Certificate Application in Section 7.13.2.1 (Volume II) as 'Although carrying capacity is driven by a number of factors, it refers for the purpose of the assessment to "biological carrying capacity": the ability of the landscape to sustain the biological functions of wildlife in the study area (e.g., forage production, breeding habitat availability, escape terrain).' Commitment: NovaGold is committed to meaningful dialogue with MOE on the ultimate land use and wildlife habitat in the Galore Creek valley.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.2	6.13 Wildlife and Wildlife Habitat Page beginning 6-166, Section 6.13	Commitment: NovaGold will provide raw data digital	MOE is satisfied with NovaGold's

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			Wildlife and Wildlife Habitat: A request has been made previously for all raw data collected for wildlife species to be provided to the MOE, ESD for incorporation into our data base system. This information has not been received to date. Please provide raw data in digital format.	on wildlife baseline surveys to MOE and the Tahltan Central Council by the end of 2006.	response.
Wildlife	MOE	20.1.2.3	6.13 Wildlife and Wildlife Habitat Baseline program did not include hoary marmot, American marten or western toad although these species are listed as VECs. A brief outline of why they are not included in this section is required. This is noted since the wildlife monitoring plan identifies environmental effects/follow-up monitoring for current population levels of western toad.	Hoary marmot, American marten and western toad were focal species for habitat suitability mapping, which included field observations of occurrence and local habitat use for each species - Volume XIV, Appendix 6-Q (Galore Creek Wildlife Habitat Ratings and Enhanced Habitat Suitability Models for Six Focal Species, 2004 to 2005). Western toad observations within the study area were also reported in Volume XIV, Appendix 6-N (Galore Creek Small Mammals, Bats and Herpetiles Baseline Report 2005). Section 6.13.3 in Volume I summarizes the results of Appendix 6-N, including western toad observations. Section 6.13.4 summarizes the results of Appendix 6-Q, including American marten (Section 6.13.4.4), hoary marmot (Section 6.13.4.5) and western toad (Section 6.13.4.6) Commitment: None required.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.4	6.13 Wildlife and Wildlife Habitat Page 6-205, 6.13.4 Wildlife Habitat Suitability: The habitat models constructed for assessment of the focal species are referred to as "enhanced". All models that the MOE utilizes in regular daily wildlife habitat management are constructed with the same attributes for mapping (i.e. digital layers, TRIM, air photos, etc.) and are validated by field identification with species presence or absence, including potential foraging species. The Galore Creek habitat models are not different and need not be referred to as enhanced.	Comment noted. Commitment: None required.	No comment required.
Wildlife	MOE	20.1.2.5	7.4 Noise Effects Assessment The figures in this section identify goat habitat polygons as moderate to very high suitability. The polygons combine the habitat so it is not known if the high suitability (what is "very high" defined as and where did it come from?) is close or far from the initial noise source. Defining separately allows for the review to outline exactly where the Class 1 habitat is.	As outlined in Volume XIV, Appendix 6-Q (page I, Executive Summary), 'suitable habitat' includes areas rated Class 1 to 3, where Class 1 is 'very high' suitability, Class 2 is 'high' and Class 3 is 'moderate' for species like mountain goat, that were rated on a 6 class system. This is the equivalent of the definitions	MOE is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
				of High (class 1), Moderately high (class 2) and Moderate (class 3) outlined on page 10 of the RISC standards (RIC, 1999). The terms 'very high' and 'high' (as opposed to 'high' and 'moderately high') were considered more appropriate for the Galore habitat suitability mapping work, both in terms of reflecting the value of the habitat in the study area, and for the effective communication of the models to a wide range of stakeholders. Habitat suitability maps presented in or with Volume XIV, Appendix 6-Q, and in Volume II, Section 6.13.4 provide a visual representation of suitable habitats by class. These maps could be used in conjunction with the figures presented in the noise effects assessment section to determine where class 1 habitat occurs in relation to predicted noise levels. Commitment: None required.	
Wildlife	MOE	20.1.2.6	7.13 Wildlife and Wildlife Habitat Table 7.13 Potential Effects of Mine Components on Moose: Moose presence/absence and moose habitat in the open pit area has been shown to be low or nil. This table incorrectly identifies potential impacts to moose in the open pit/mine site/tailings areas.	Table 7.13-4 highlights the potential impacts that were considered for moose. The lack of moose sitings or moose sign in the Galore Creek valley is provided as the rationale in Section 7.13.3.4 for not considering these potential effects further. Commitment: None required.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.7	7.13 Wildlife and Wildlife Habitat Table 7.13.15 Summary of Areas of Suitable Habitat: A beneficial comparison for habitat is the amount of classed habitat lost to the amount of same classed habitat available in the zone of impact. Comparison to the entire PEM and/or TEM area is not significant and masks the actual impact in the sub-regional perspective. IF there is only a x amount of Class 1 available in the open pit area and all of it is removed, what benefit will there be to those displaced goats to the rest of the PEM study area? Science has shown that mountain goats do not travel beyond 200m of escape terrain in the winter. The mountain goats in the open pit area will not be accessing the entire PEM study area. Therefore their immediate habitat loss is significant. This aspect of comparing to the total habitat	Digital raw data is being assembled and will be provided to allow the reviewer to make the assessment indicated. NovaGold recommends review of the 1:100,000 scale habitat suitability maps that also provide an outline of the project footprint in relation to mapped habitats. With respect to goats, a total of 313 ha of suitable habitat (i.e., class 1 to 3 combined) for mountain goat will be lost in the Galore Creek valley. Section 7.13.2.1 in Volume II outlines that the loss of this habitat is associated with lower-elevation slumps and slides in the valley - these areas, although rated as suitable, were not identified	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			available within the study area is carried throughout this section. The digital data was not made available so this assessment by this reviewer was not possible. Digital raw data format is requested. More specific details around the implications of the lost habitat and effects is found in Wildlife Management. Re-assessment may be required.	as being occupied by goats during either summer or winter aerial surveys (Figure 2.4-1 and Figure 2.4-2 in Volume XIV, Appendix 6-Q). The loss of this habitat is therefore not considered significant. Commitment: Digital raw data will be provided to MOE and the Tahltan Central Council.	
Wildlife	MOE	20.1.2.8	7.13 Wildlife and Wildlife Habitat Table 7.13-16 Habitat Alteration Effects Assessment Table: Particularly related to goats is the permanent removal of Class 1 habitat in the mine footprint area and negligible significant effect suggested. Class 1 habitat is directly related to escape terrain. If the escape terrain is permanently removed there will not be reclamation to Class 1 habitat. The terrestrial habitat may be restored but not the escape terrain. Therefore this loss does have the potential to be considerable.	The habitat suitability model for mountain goat reflects the abundance of goat habitat available in the study area but, when used alone, is limited in its ability to assess the impact of land use on goats. Highly suitable goat habitat as determined by computer-based models can exist without being occupied by goats, and attempting to use models beyond their predictive capacity for assessing impacts may lead to inappropriate management decisions. The assessment of effects relating to habitat loss therefore included integration of habitat models with seasonal survey data, observational data, and field experience within the study area. A total of 313 ha of suitable habitat (i.e., class 1 to 3 combined) for mountain goat will be lost in the Galore Creek valley. Section 7.13.2.1 in Volume II outlines that the loss of this habitat is associated with lower-elevation slumps and slides in the valley - these areas, although rated as suitable, were not identified as being occupied by goats during either summer or winter aerial surveys (Figure 2.4-1 and Figure 2.4-2 in Volume XIV, Appendix 6-Q). The loss of this habitat is therefore not considered significant. Commitment: None required.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.9	7.13 Wildlife and Wildlife Habitat Page 7-535, 7.13.4.4 Aircraft Noise: In forested areas it is difficult to observe animal behaviour to aircraft due to visibility barriers. Having bears habituated to human disturbance is behaviour that no one wants to strive for. Bears generally killed once habituated to human disturbance.	The killing of bears is related more to habituation to human presence or food-conditioning than human disturbance. Habituation to mechanical disturbances can however have the potential to be detrimental where habituation increases the risk of negative	MOE is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				interactions with mechanical devices (e.g., habituation to road traffic increasing the risk of bear-vehicle collisions). It is considered unlikely however, that habituation of grizzly bears to airborne aircraft will result in mortality, either direct or indirect. It is a lack of habituation in this instance that would be more of a concern, as the disturbance could result in significant adverse impacts for bears feeding on salmon in the Porcupine River Valley. Commitment: None required.	
Wildlife	MOE	20.1.2.10	7.13 Wildlife and Wildlife Habitat Page 7-613, 7.13.10 Significance of Adverse Residual Effects: It has not been identified that there could be adverse effects to grizzly bears in the More Creek/Round Lake/Sphaler Creek pass area. As indicated in comments above for the summary of areas of suitable habitat, there has not been given adequate consideration to habitat loss as it relates to the zone o impact. Re-assessment of this area with all activities associated with the mine project should occur.	Assessment of habitat loss within the access corridor alone is not considered an appropriate scale over which to assess impacts for grizzly bear. Grizzly bear are a 'landscape species', hence the delineation of a large study area for the Galore Creek Project, and in turn the assessment of habitat loss in terms of the availability of suitable habitats remaining in the study area. Another important factor to consider is that for many species it is not the amount of habitat loss, but the extent and configuration of the remaining habitat that is critical when assessing the impacts of habitat loss (e.g., Potvin et al., 1999). At a landscape scale, and considering the extent of the remaining habitat, the loss of 244 ha of suitable early summer habitat (the maximum amount of suitable habitat loss for grizzly bear, Table 7.13-15) in the More Creek/Round Lake/Sphaler Creek area following construction of the access road is not considered to be significant for grizzly bear. Commitment: None required.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.11	8.18 Summary of Residual Effects Page beginning 8-345, Table 8.18-1: Based on the information provided the impacts of the project will have a significant adverse impact to mountain goats and grizzly bear. As noted in sections above, further refined assessments on habitat suitability are required.	Although there is some scientific uncertainty in the assessment of significance, NovaGold's assessment concluded that there is considerable potential for significant adverse effects on mountain goats and grizzly bears. NovaGold would appreciate clarification	MOE is satisfied with NovaGold's response.

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
				of MOE's suggestion that further refinement of habitat suitability should be completed. Commitment: NovaGold will discuss with MOE the suggestion that further refinement of habitat suitability should be completed.	
Wildlife	MOE	20.1.2.12	Appendix 6-B Galore Creek Mountain Goat Baseline Report 2004-2005 Digital raw data please.	Digital raw data is being assembled and will be provided by the end of 2006. Commitment: NovaGold will provide digital raw data for the mountain goat baseline surveys.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.13	Appendix 6-L Galore Creek Moose Studies Baseline Report 2005 Digital raw data please.	Digital raw data is being assembled and will be provided by the end of 2006. Commitment: Digital raw data will be provided for moose baseline surveys.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.14	Appendix 6-M Galore Creek Grizzly Bear Study Baseline Report 2004/2005 Digital raw data please.	Digital raw data is being assembled and will be provided by the end of 2006. Commitment: Digital raw data will be provided.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.15	Appendix 6-N Galore Creek Small Mammals, Bats and Herpetiles Baseline Report 2005 Digital raw data please.	Digital raw data is being assembled and will be provided by the end of 2006. Commitment: Digital raw data will be provided.	MOE is satisfied with NovaGold's response.
Wildlife	MOE	20.1.2.16	Appendix 6-Q Galore Creek Wildlife Habitat Ratings and Enhanced Habitat Suitability Models for Six Focal Species, 2004 to 2005 TEM and PEM final products were not reviewed by the Region Ecologist in the Ministry of Forests and Range. Digital data was not provided which made assessment difficult and the hard copies maps arrived only 2 weeks before the end of the review period. Assumptions have been made that the maps have been constructed according the provincial standards. Allen Banner, Region Ecologist has yet to be consulted. Mountain Goat Model assumptions are conservative and has possibly overestimated high value goat habitat. Slope and aspect parameters require better defined limits (i.e. slope is defined as >40 degrees with	With reference to mountain goat specifically, topographic algorithms for the habitat model were selected by consensus amongst the members of the Galore Wildlife Working Group on 3 Feb, 2005 at the BC MOE office in Smithers. The model reflects the abundance of goat habitat available in the study area but, when used alone, is limited in its ability to assess the effects of land use on goats. Highly suitable goat habitat as determined by computer-based models can exist without being occupied by goats, and attempting to use models beyond their predictive capacity for	MOE is satisfied with NovaGold's response.

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			no upper limit).There is a mixing of units within slope, please use one only. Class 1 distance to escape terrain was to be changed to 250m but remained at 300m. This affects the Class 2 designation and so on. Algorithms for the models and adaptability have not been provided or they are scattered throughout several reports such that review of all aspects has been cumbersome. All models compared suitable habitat to the entire PEM study area which does not provide an evaluation at a sub-population level. We need to know if the Class 1 habitat loss in the sub-population level will be significant as it relates to the individual species as we understand what they do. If the species doesn't move very far, there is little worth in knowing there is still a majority of Class 1 habitat available throughout the study area. More discussion is required on this aspect.	assessing impacts may lead to inappropriate management decisions. The assessment of effects relating to habitat loss therefore included integration of habitat models with seasonal survey data, observational data, and field experience within the study area. This integration of methods currently constitutes the best method for assessing impacts of land use on mountain goats. Allen Banner was consulted periodically for various ecological questions throughout the development of the PEM used for the habitat suitability modelling. Commitment: NovaGold is willing to further discuss this issue with MOE.	
Wildlife	MOE	20.1.2.17	5.12 Road Access Page 5-248, 5.12.2.5 Avalanche control: During operation of the mine, avalanche control along the road will be required. There are many areas where avalanches will coincide with mountain goat winter habitat. Prior to controlled avalanche blasting, areas will be monitored for mountain goat utilization as blasting cannot occur if mountain goats are in the area.	NovaGold's research has indicated that Parks Canada monitors mountain goat presence, but does not schedule blasting for avalanche control around the presence or absence of goats in Glacier National Park. The goat population in the vicinity of the highway has remained stable and they are present in avalanche control areas. It will not always be possible to observe blasting areas prior to avalanche control as some blasting will be done remotely in poor weather. Commitment: NovaGold will consider the protection of goats.	MOE is satisfied with NovaGold's response.
Wording Changes	TC	21.1.1.1	1.7 Regulatory Context, S2.5 to 2.7. To clarify, TC issues an NWPA approval and not an NWPA "authorization". The NWPA approval is not just for stream crossings, but may also apply to any work placed in, on, over, under, through or across any navigable water. Work includes e.g. bridge, dam, pier, or pipe.	Comment noted. Commitment: None required.	No further comment.
Wording Changes	TC	21.1.1.2	3.7 Alternative Means of Carrying Out the Project, Ch 11, Table 11.1-2. If the number of streams is estimated to be low for the Southern Route, the same should be stated for its estimated capital costs (i.e. additional stream crossings would likely increase the cost of road construction). It should be noted that the compensation costs for the	Comment noted. Capital costs of the southern route would likely increase somewhat if the suspected additional stream crossings were quantified. The reviewer is correct in surmising that the habitat compensation costs would also likely be higher for the	TC is satisfied with NovaGold's response.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Response
			Southern Route would likely also be significantly greater than the Northern Route. Likewise, the estimated cost for the modified Northern Route is more accurate as the estimated number of crossings and perhaps the survey details are more accurate.	Southern Route. Similarly, the more complete information available for the Northern Route would increase certainty for estimates related to that route. Commitment: None required.	
Wording Changes	NMFS	21.1.2.1	Volume I, Section 2.4.1, Trans-Boundary Management, fourth full paragraph. To more accurately reflect this baseline sampling work, we recommend that this sentence be revised to read: "At the request of U.S. Federal and Alaska State agency representatives, a number of baseline water, sediment, and fish community samples have been collected. This includes samples taken at 1 location downstream of the confluence of the Stikine-Iskut Rivers in Canada, and at 2 locations in the Stikine River in Alaska. The purpose of the sampling and resulting analysis is to help assist future analyses of project-related effects on Alaska-based fishery and wildlife resources."	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	Comment noted.
Wording Changes	USDA FS	21.1.2.2	On Pg 4-6 Under the heading Surface Water Quality Section 4.7.2 United States Forest Service and Alaska Department of Natural Resource Habitat Division should be added to that list of agencies that had emphasized water quality concerns.	NovaGold acknowledges that other U.S. federal and Alaska state government agencies may have concerns with water quality.	EAO and CEA Agency notes this comment is captured in the Assessment Report/Comprehensive Study report.
Wording Changes	USDOI	21.1.2.3	For consistency, we recommend that the terminology "U.S. Federal and State agencies" be referred to as "U.S. Federal and Alaska State agencies" or "U.S. federal and Alaska state agency representatives" throughout this document. We recommend that references in the Application to Alaska-based fisheries in the Stikine River be expanded to include subsistence, sport, and commercial fisheries.	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	The recommended terminology for U.S. federal and State agencies as well as information regarding expanded references to Alaska-based fisheries in the Stikine River has been included in the Assessment Report/Comprehensive Study report.
Wording Changes	USDOI	21.1.2.4	Volume I, Section 2.4, Alaskan and Federal United States Participation, pages 2-14, paragraph 1. To capture the full range of use of the Stikine River salmon fisheries, we recommend revising the second sentence in this paragraph to read:" The salmon fisheries of the Stikine River represent an internationally shared resource, which includes Canadian and U.S. subsistence, sport, and commercial fisheries, managed in accordance with the Pacific Salmon Treaty	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	See response for 21.1.2.3.

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

Parameter	Agency	Comment Received		Proponent Response/Mitigation Measure/Commitment	Government Response
			between the United States and Canada."		
Wording Changes	USDOI	21.1.2.5	Volume I, Section 2.4.1, Trans-Boundary Management, fourth full paragraph. To more accurately reflect this baseline sampling work, we recommend that this sentence be revised to read: "At the request of U.S. federal and Alaska State agency representatives, a number of baseline water, sediment, and fish community samples have been collected. This includes samples taken at 1 location downstream of the confluence of the Stikine-Iskut Rivers in Canada, and at 2 locations (1 of which was moved in 2005) in the Stikine River in Alaska. The purpose of the sampling and resulting analysis is to help assist future analyses of project-related effects on Alaska-based fishery and wildlife resources."	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments. Commitment: NovaGold will add an additional monitoring site downstream on the Stikine River I Alaska at a depositional site to be determined during the permitting stage.	MOE is satisfied with NovaGold's response. DOI appreciates NovaGold's willingness to conduct baseline sampling work at the confluence of the Stikine-Iskut Rivers in Canada and at 2 locations in the Stikine River in Alaska. We believe it is important to include this information in an appropriate section of the Assessment Report/Comprehensive Study Report.
Wording Changes	USDOI	21.1.2.6	Volume I, Section 3.3.2.1, Overall, first full paragraph, page 3-33. To accurately reflect participation in this meeting, we recommend that the first and second sentences be revised to read: "NovaGold representatives traveled to Juneau in May 2004 to discuss the project with U.S. federal, Alaska State agency, and local government representatives. Participants in this meeting included representatives from the Alaska Departments of Natural Resources, Environmental Conservation, and Transportation and Public Facilities; U.S. Department of the Interior (including the Fish and Wildlife Service and the Bureau of Indian Affairs); U.S. Department of Agriculture - Forest Service; U.S. Department of Commerce - National Marine Fisheries Service; U.S. Environmental Protection Agency; and City of Wrangell."	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	EAO and CEA Agency note this information is included in the Assessment Report/Comprehensive Study Report.
Wording Changes	USDOI	21.1.2.7	Volume I, Section 3.3.2.1, Overall, first full paragraph, page 3-33. We recommend that the last sentence be revised to read: "The meeting ended with discussion of the participation in the Galore Creek review by the Alaska Departments of Natural Resources, Environmental Conservation, and Fish and Game; U.S. Department of the Interior; U.S. Department of Agriculture - Forest Service; U.S. Department of Commerce - National Marine Fisheries Service; and U.S. Environmental Protection Agency"	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	EAO and CEA Agency note this information is included in the Assessment Report/Comprehensive

APPENDIX D - GOVERNMENT AGENCY COMMENT TRACKING TABLE

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Wording Changes	USDOI	21.1.2.8	Volume I, Section 4.11, Fish and Fish Habitat, page 4-7. We recommend that the following information be included in this and/or other appropriate sections of the Application: "The salmon fisheries of the Stikine River represent an internationally shared resource, which includes Canadian and U.S subsistence, sport, and commercial fisheries, managed in accordance with the Pacific Salmon Treaty between the United States and Canada. As a result of cooperative efforts of the Alaska Department of Fish and Game, the Pacific Salmon Commission, and the U.S. federal Subsistence Management Program, which includes four bureaus of the U.S. Department of the Interior and the U.S. Department of Agriculture Forest Service, federal subsistence salmon fisheries were established on the U.S. side of the border. A sockeye salmon fishery was initiated in 2004; Chinook and coho salmon fisheries followed in 2005. U.S. Federal subsistence regulations also provide for the taking of eulachon, trout, and char. Eulachon subsistence fisheries occur on the Stikine River, but at a lower level than the salmon fisheries. While provided for in the regulations, very little subsistence taking of trout and char is thought to occur on the Stikine River."	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	Because of the importance of the Stikine River salmon fisheries, we recommend that this language be included in the Assessment Report/Comprehensive Study Report.
Wording Changes	USEPA	21.1.2.9	Volume I, Section 2.4, page 2-14: The third sentence of this paragraph needs to be revised to include the full range of uses of the Stikine River. We agree with the revised wording proposed by the US Department of the Interior in their first comment.	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	USEPA is satisfied with NovaGold's response.
Wording Changes	USEPA	21.1.2.10	Volume I, Section 2.4.1, page 2-15, second bullet: The text appropriately includes a discussion of the International Boundary Waters Treaty Act (*Boundary Waters Act*). However, the discussion focuses only on the part of the *Boundary Waters Act* related to project impacts that change the natural level and flow of boundary waters. The *Boundary Waters Act* concerns water quality as well as water quantity. Add to this section a brief discussion of the general principles of the *Boundary Waters Act* related to water quality, i.e., that boundary waters shall not be polluted on either side to the injury and health of the other.	NovaGold acknowledges the comment and recommends that the EAO and CEA Agency incorporate the proposed wording into the joint report to be prepared by the federal and provincial governments.	The EAO and CEA Agency note that the correct reference is used in the Assessment Report/Comprehensive Study Report.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

TABLE OF COMMENTS

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

<u>Acronyms:</u>

Application	Galore Creek Copper-Gold Silver Project Application for an Environmental Assessment Certificate
CEA Agency	Canadian Environmental Assessment Agency
DFO	Department of Fisheries and Oceans
EAO	Environmental Assessment Office
EC	Environment Canada
MEMPR	Ministry of Energy and Petroleum Resources
MOE	Ministry of Environment
MOFR	Ministry of Forests and Range
NovaGold	NovaGold Canada Inc.
Project	Galore Creek Copper-Gold-Silver project
TCC	Tahltan Central Council
THREAT	Tahltan Heritage Resources and Environmental Assessment Team

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
Archaeology	1.1.1.1	The reader should refer to Section 5.6 of the document 'Tahltan Comments on the Application by NovaGold Canada Inc. for an Environmental Assessment Certificate for the Galore Creek Project, October 18, 2006' for detailed background information on these comments.	Comment noted. Commitment: None required.	View is that all obsidian finds in the Archaeological Impact Assessment should be assumed to be sourced to Mount Edziza.
Archaeology	1.1.1.2	Given the importance of the trade of obsidian from the Mt. Edziza deposit to the history and past movement patterns of the Tahltan, we request that an analysis be done on the obsidian found in the NovaGold archaeological investigations to determine its source. Cairns, or “rock piles” are archaeological features that have high Tahltan ethnographic significance and some methods, e.g. flight over the study area, will not produce evidence of them. We have seen photographs from the lower Stikine where these features have been covered by organic material -- soil build up and plant growth. Fladmark (1985:30-36) describes tephra layers (volcanic ash layers) as a means of establishing chronological marker horizons and identifies four layers within this region. Attempts by archaeological consultants to document these four tephra markers in their excavations would make a great contribution to the archaeological knowledge of the Tahltan Territory. Rock, or cliff, or cave shelters have been located in other regions of Tahltan territory (Fladmark 2005, pers. comm.). These archaeological features, and the research findings associated with their excavated contents, have made a tremendous contribution to the archaeological record. These shelters have been demonstrated to be a real useful sediment trap, especially if the floor of the shelter is sloped inwards. Ancient archaeological data have been excavated from these features. In the cases of Charlie Lake Cave site (HbRf39), (Fladmark et al. 1988) and On Your Knees Cave site (Site 49-PET-408) (Lee 2001), the research provided extensive remarkable archaeological data, including radio-carbon dates exceeding 10,000 B.P. Potential for ice patch archaeology within the Galore Creek project area has not been considered in the report. Although ice patch archaeology is in its infancy, there are multiple examples of sites today in Alaska and Yukon, both similar and comparable regions to that of Tahltan territory (Dixon et al. 2005; Hare et al. 2004; Lee 2001). Dixon et al. (2005) conclude that the archaeology of glaciers and ice patches is an exciting new interdisciplinary research frontier contributing new insights into high latitude and high altitude human adaptations, prehistoric	NovaGold recognizes the importance of obsidian to the cultural heritage of the Tahltans. NovaGold will discuss the potential value of confirming the source of a representative sample of obsidian pieces with experts in the field before deciding whether to proceed with analyses. Archaeological studies for the Project will continue to monitor for the presence of cairns or rock piles. Future archaeological assessments will consider the sampling of tephra layers noted during excavations. Ice patch archaeology is, as noted by the reviewer, in its infancy. NovaGold will consider the inclusion of ice patch archaeology where appropriate within the Project footprint. NovaGold is undertaking geochemical analysis to determine the source of a representative sample of obsidian pieces. Commitment: Once the obsidian source(s) has been determined, NovaGold will follow up with the Tahltan to confirm the approach for determining possible routes back to Raspberry Path (Mount Edziza). Archaeological studies for the Project will continue to monitor for the presence of cairns or rock piles and rock, or cliff, or cave shelters. Future archaeological assessments will consider the sampling of tephra layers noted during excavations. NovaGold will consider the inclusion of ice patch archaeology where appropriate within the project footprint.	EAO notes the commitment is reflected in Appendix F (Table of Proponent’s commitments) and Schedule B of the EA Certificate.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

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		technological systems, and new opportunity for paleoenvironmental analyses (2005:141).		
Archaeology	1.1.1.3	The trade in obsidian, and the routes across which it was traded, is a key component of the archaeological story of the Stikine River valley that extends over 10,000 years into the past. Despite the importance of the obsidian trade, there was little reference to it in the Application.	Locating trade routes beyond the study area is beyond the scope of the Galore Creek archaeology study. Commitment: None required.	Comment noted.
Archaeology	1.1.1.4	Page 7-506 states that 'some potential for past human uses were identified and marked on maps.' We are interested in further information about how the potential past human uses were identified. Upon what was this based?	A Tahltan Elder examined project maps, and identified some possible traditional camp locations. (This information is located in Volume II, page 7-617). Commitment: None required.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Archaeology	1.1.1.5	7.14.1.3 -- Spatial boundaries. There is a large statement that past inhabitants were nomadic (note: this is unsourced); that the study area is part of a larger cultural area; and that a larger region must be considered when interpreting study results and assessing site significance. This point has been discussed in great detail by THREAT and certainly we agree. We also recognize that by contributing with documents such as this, there is greater chance of providing a more complete and comprehensive assessment. We also recognize that there are cumulative impacts and risks to archaeological and heritage data by numerous proposed developments within Tahltan territory.	There was a typo in the report and it should read that past inhabitants were semi nomadic as stated by Sylvia Albright (1984). NovaGold acknowledges that there are numerous other proposed developments within Tahltan territory that may cause cumulative impacts and risks to archaeological and heritage data. However, at the time the assessment was completed NovaGold did not have information on the archaeological potential of the footprint of those projects. They will have to be assessed independently. Commitment: None required.	Comment noted.
Archaeology	1.1.1.6	7.14.1.4 -- The temporal boundaries include the past 9,000 years (page 7-506). This is limited in scope considering the archaeological record of On Your Knees Cave site 49-PET408 (see Section 5.6, 'Tahltan Comments on the Application by NovaGold Canada Inc. for an Environmental Assessment Certificate for the Galore Creek Project, October 18, 2006'). Expansion of the temporal range would add breadth and current archaeological record to this research.	According to E. James Dixon, principal investigator of archaeology at 49-PET-408, humans were exploiting the maritime resources of the Northwest Coast by at least 9,500 BP (or 10,150 cal BP). This date is 500 years older than the temporal boundary used for the study. NovaGold now recognizes that there may have been human activity in the project area several hundred years earlier than the temporal boundary used for the assessment, but is of the opinion that the difference does not affect the outcome of the assessment. Commitment: None required.	Comment noted.
Archaeology	1.1.1.7	7.14.1.5 -- When speaking to the ethnographies of the turn of the century it is stated that, by that time, a considerable amount of integration had already taken place, and many of the elders with traditional knowledge had succumbed to one	This information was obtained from the following sources referenced in the Application: George Emmons (1911), James Teit (1906 and 1914), Dawson (1889),	Comment noted.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		of the many epidemics. This may be accurate; however, without a source for this information it is difficult to assess.	Commitment: None required.	
Archaeology	1.1.1.8	7.14.2 -- The evidence presented and sourced to Ryder and Clague (1989) can certainly be refuted or at least challenged with the new archaeological evidence of On Your Knees Cave, which of course speaks to movement of people and resources from Tahltan territory 10,300 years ago.	Comment noted. Commitment: None required.	Comment noted.
Archaeology	1.1.1.9	7.14.2 -- The Application makes an unsubstantiated statement by saying that Tahltans originated in the interior and moved into the Stikine region about 300 years ago. What is the source for this information? According to our information, dates have yet to be determined for migration of Athapaskans into the region. Such a statement can be refuted and is inaccurate.	The source for the Tahltan being an Athapaskan-speaking Dene group who originated in the interior and moved to the upper Stikine region is Emmons (1911 The Tahltan Indians. University of Pennsylvania Museum Anthropological Publications IV(1)). MacLachlan (1981 Tahltan. In Handbook of North American Indians, Volume 6, Subartic, edited by J. Helm, pp. 458-468. Smithsonian Institution, Washington) suggests that this migration may have occurred approximately 300 years ago. NovaGold acknowledges that this date is contentious and does not take a position regarding its accuracy. Commitment: None required.	Comment noted
Archaeology	1.1.1.10	Table 7.14-2 (page 7-518) raises an issue also of great concern to Tahltan -- stewardship, protection and preservation of heritage resources. The document states the need for orientation programs for all employees and site visitors to ensure that the sites are not contaminated. Not having this important training for employees poses a potential risk and mitigating this issue would require such professional development for all employees. There is a need for a training plan and policies to ensure protection of potential sites in the future.	NovaGold recognizes the importance of heritage resources to British Columbia and the Tahltans and will develop and implement an archaeological chance find procedure to protect archaeological sites and artefacts. Commitment: NovaGold will develop and implement an archaeological chance find procedure to protect archaeological sites and artefacts.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Archaeology	1.1.1.11	THREAT is interested in the status of the artefacts recovered during this study. Where are the artefacts presently? And when will they be given to the repository (we believe this to be the Royal British Columbia Museum in Victoria).	The artefacts are in Vancouver and will be sent to the Royal British Columbia Museum in Victoria once it is clear that there is no longer a requirement to retain them for further analysis. Commitment: The artefacts will be forwarded to the repository once they are no longer required for study.	Comment noted.
Archaeology	1.1.1.12	In the future, in an effort to address place and context, it would also be helpful to receive a map of the study area plotted on a Tahltan Territory map. It would also be useful to have copies of the references cited included with the document.	References cited in the document are listed in Volume III, Section 18, References, and in Volume XIV, Appendix 6-R, Galore Creek Project Archaeological	Comment noted.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			Resource Baseline Assessment. Commitment: NovaGold commits to include a map of the study area plotted on a Tahltan Territory map in future archaeology reports.	
Archaeology	1.1.1.13	9.9.4 Effects of Other Projects 'The potential Johnny Mountain and Schaft Creek developments lie within the cumulative effects assessment study area, but they have not been included here because no local inventories of archaeological sites are available.' Page 9-72 Archaeological assessments for several resource development projects are limited or absent. This lack of adequate information on archaeological sites could lead to destruction of sites just because their existence is unknown. This is a significant data gap in the cumulative impacts assessment and needs to be identified as such and the resulting limitations of the assessment need to be brought forward in a section at the beginning of this section-data gaps and uncertainties. If you don't look for impacts you will not find any.	It is beyond the scope of the Project to conduct archaeological assessments outside the study area identified in the *Heritage Conservation Act* permit issued by the Archaeology Branch for this Project. Commitment: None required.	NovaGold's archaeological assessment addresses the requirements set out in the Terms of Reference for the EA Application.
Acid rock drainage	2.1.1.1	The discussion of acid production and buffering capacity in section 5.3.6.5 (Potential for acid rock drainage) ignores critical issues about space and time. Regarding time, actual in-situ buffering capacity and actual in-situ acid production do not necessarily occur at the same time. In other words, available buffering capacity (higher pH water) does not necessarily occur when acid production (low pH water) occurs, meaning that buffering could happen before or after acid production but in either case not effectively buffer acid production. As a result, on paper there is a strong appearance that buffering capacity will 'treat' acid production, but that does not necessarily happen in the field. Regarding space, the Application's analysis ignores that waste and the waste rock piles are not homogenous - buffering production does not necessarily happen in the proximity of acid production and vice versa. In the environmental assessment the net buffering amount is added and the net acid production amount allowing the environmental assessment to possibly erroneously conclude that acid produced will be neutralized and acid mine drainage will thereby be controlled. This may not be the case. NovaGold should be required to fully prepare for acid mine drainage production - taking into account when and where acid will be produced and establish a plan to prevent acid production and a contingency plan(s) to treat acid mine drainage if it should occur.	This comment implies that potentially acid generating (potentially acid generating) rock will be mixed with non-potentially acid generating rock. This is not the case. NovaGold has proposed conservative waste rock segregation criteria that will result in the potentially acid generating rock being placed under water and non-potentially acid generating rock in upland aerial dumps. Therefore, acid rock drainage will not be produced and the timing and spatial issues raised in the comment do not need to be considered. For the non-potentially acid generating dumps, every kinetic test has demonstrated that acid produced by oxidization of sulphide minerals is immediately neutralized by contact with acid consuming minerals and there is no issue with timing and availability of neutralization potential in rock classified as non-potentially acid generating. Commitment: Will assess the need for water treatment for operations, closure and post closure, including but not limited to, a water treatment plant during permitting as possible mitigation measures to address water quality concerns.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Acid rock	2.1.1.2	8.7 Metal Leaching/Acid Rock Drainage Prediction and Prevention Management	There are several precedents in BC for blast hole	MEMPR supports the Proponent's

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
drainage		Plan Identifying Potential Acid Generating Materials Section 8.7.2 identifies that blast hole sampling for potentially acid generating will be undertaken, but appears to defer to a yet-unwritten 'permit' for the details of this testing: 'Potential for acid rock drainage would generally be determined by the measurement of neutralization potential/acid generation potential (or surrogates). Appendix 5-A describes development of a site-specific neutralization potential/acid generation potential criterion (1.3) based on calcium and magnesium carbonate neutralization potential. Actual permit conditions will specify the operational criterion.' [p. 8-103] In section 8.7.7 the environmental assessment further describes the testing for unoxidized waste rock: 'Routine samples for waste classification will be obtained from blast hole cuttings. In the initial stages of mining, all blast hole samples will be analyzed. As mining progresses and knowledge of the distribution of acid rock drainage potential increases, the sampling frequency may decrease.' [p. 8-110] This approach not only precludes the pubic from commenting on the standards to be applied. NovaGold should determine the standards that will protect the environment and develop a plan that will not degrade water quality at any discharge point. This is particularly important because the mine proposes to use non-potentially acid generating generating waste rock for construction. Whether or not the handling of potentially acid generating waste rock is considered sufficient, if the method used to identify potentially acid generating materials fail to accurately and precisely identify potentially acid generating materials then the handling and disposal of potentially acid generating materials is suspect if not guaranteed to fail. For this reason, the potentially acid generating identification should not use surrogates or blends and should be taken by representative samples from each blast hole drilled. Timely analysis is critical to ensure that the results are available before blasted rock is handled and managerial oversight is important to ensure that the analytical results translate into actual materials handling. These steps are made more important because the delay in acid production will mean that the success of the plan will not be known until the mine actually nears closing and the results will be impossible to reverse.	sampling to characterize waste rock during mining. The concept is therefore demonstrated but it is fully expected the details of the management plan (sampling design, analysis, implementation) will be prescribed in the *Mines Act* Permit. Volume V, Appendix 5-A (attachment Appendix K) specifies in detail the proposed standards that will be applied to different types of waste rock proposed for construction or disposal in waste rock dumps. The standards recognize the need to prevent acid rock drainage from developing and the particular need for protective standards for rock placed downstream of the impoundment. Commitment: NovaGold has committed to treat initial waste rock blasts as potentially acid generating and test to evaluate the possible preferential enrichment of sulphide minerals in the fine fraction of blasted rock. Whole rock and the -2 mm fraction will be analyzed to determine whether adjustment to the $IC_{Ca,Mg}$/AP is needed. An annual program will be designed to continually re-evaluate this distribution. NovaGold has also committed to conduct additional comparative testing of not-potentially acid generating and acid base accounting to refine the not-potentially acid generating pH boundaries and ensure that there are no biases related to rock type and mineralogy.	commitment to set out details of the management plan in the *Mines Act* permit application. EAO notes the commitments are reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Acid rock drainage	2.1.1.3	Appendix 5-A, Executive Summary, Water Quality Predictions Operational runoff chemistry from the pit walls was calculated assuming that rubble on benches is the main contributor of load and that the walls behave as a waste rock dump equal in height to the number of benches multiplied by the assumed thickness of rubble on the benches (one meter). [p. iv, emphasis added] Assuming a thickness of one meter for the fractured zone of the pit walls is probably the minimum thickness that would be fractured by blasting. A more conservative fracture thickness should be used for the potential geochemical effects of the pit	NovaGold believes that the approach used to estimate loadings from pit walls was appropriate. In any case, during operations, the loadings from the pit walls will be small compared to loadings from waste rock and tailings supernatant. This is illustrated in Figures 6.2-1 and 6.2-2 in Appendix 7-D. During closure the pit wall chemistry will be more important. During the Application review, NovaGold submitted a	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		walls.	report to provide information on pit water quality post closure. Commitment: NovaGold has committed to, during operations and after closure, monitor and manage drainage from the tunnel, not-potentially acid generating dumps, ore and marginal storage stockpiles, pits, seeps and other mine areas, including the impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the *Environmental Management Act* effluent discharge permit limits and federal Metal Mining Effluent Regulation discharge criteria that are applicable at the time.	
Acid rock drainage	2.1.1.4	Page 6-78 of Application- It is stated in the Application: 'In gossans, copper leaching is occurring under neutral pH conditions'. What are the implications of this for far future metal (copper) loadings from the weathering of exposed waste rock dumps that were considered non-potentially acid generating?	As described in Section 3.4.2.1.5 of Appendix 5-A, Volume V, leaching effects observed for the gossan were incorporated into the predictions. Commitment: None required.	Comment noted.
Acid rock drainage	2.1.1.5	Table 3-3: Summary Statistics for Consolidated Rock Groups Used to Select Central, Southwest and West Fork Zone Samples for Humidity Cells The neutralization potential/acid generation potential ratio does not match the values for neutralization potential and acid generation potential given in the Table. Either the neutralization potential and acid generation potential values are incorrect, or the calculation of the ratio of neutralization potential/acid generation potential is incorrect.	The neutralization potential/acid generation potential column in these tables shows the distribution of neutralization potential/acid generation potential, they are not calculated from the neutralization potential and acid generation potential values in the table. Commitment: None required.	Comment noted.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
Acid rock drainage	2.1.1.6	3.3.2.2 ABA Correlation with Rock Type In this section there is a description by SRK of the assumptions for ABA criteria used to differentiate potentially acid generating (potentially acid generating) rock from Not potentially acid rock drainage generating (not-potentially acid generating) rock. In these sections, screening ABA criteria are used to classify potential for acid rock drainage. These criteria are: - neutralization potential/acid generation potential. 2 - Not potentially acid rock drainage generating (not-potentially acid generating). [p. 48] The assumptions utilized by SRK for their analysis do not represent a conservative basis for differentiating potentially acid generating from non-potentially acid generating material. The most accepted (published) distinction between potentially acid generating and non-potentially acid generating material is: - neutralization potential/acid generation potential. 3 - Not potentially acid rock drainage generating. Could this result in material in the 1	As explained in this section, these are screening criteria. Following the presentation of these criteria, the report states "As described elsewhere in this report, site specific methods have been used to calculate neutralization potential and neutralization potential/acid generation potential and are subsequently used in the acid rock drainage block model. The screening criteria are not used for waste classification purposes, but site specific criteria were developed based on mineralogical assessment and kinetic test results. A theoretical neutralization potential/acid generation potential criterion was developed (1.3) but NovaGold has elected to use a value of 2 to ensure that acid rock drainage does not form. NovaGold has committed to: • use a conservative neutralization potential ratio of 2 to segregate the potentially acid generating from not potentially acid generating waste rock for underwater disposal. Will continue to monitor to verify pre-mining conditions and update the operational management plan for waste rock, tailings, low grade ore and construction materials as more information is gained from the site. This document will be a living document with updates submitted to the Ministry of MEMPR and MOE for approval whenever significant changes occur. • use construction material with an NP/AP>3 and paste pH>6 and metals <2 x crustal abundance and Cu/S<y (where y is still being determined by leach column tests), for the downstream dam fill and all other fill requirements located outside of the dam containment area.	EAO notes these commitments are reflected in Appendix F (Table of Proponent's commitments) of the Joint Report and Schedule B of the EA Certificate.
Acid rock drainage	2.1.1.7	The environmental assessment's conclusion that acid production will take place after 22 years (5.3, p.5-41) - if one accepts the accuracy of that prediction - does not reduce the threat acid production poses to the environment. It pushes the threat beyond the environmental assessment's primary timeframe and thereby does not fully consider how to measure or treat acid mine drainage that is produced. The estimated 22-year delay does allow the company to remove the	Potentially acid generating waste rock will be placed within the tailings storage facility, so that all potentially acid generating rock will be under water at closure. As a result acid rock drainage will not be produced from this rock. During the lifetime of operations and into the closure period, NovaGold will monitor runoff from the	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		value from the land before substantial acid is produced, or environmental impacts from that production, are known.	sub-aerially exposed waste rock dumps which will be composed of non-potentially acid generating. Remedial action will be undertaken if these waste dumps are found to generate acid rock drainage. Commitment: NovaGold has committed to during operations and after closure, monitor and manage drainage from the tunnel, not-potentially acid generating dumps, ore and marginal storage stockpiles, pits, seeps and other mine areas, including the impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the *Environmental Management Act* effluent discharge permit limits and federal Metal Mining Effluent Regulation discharge criteria that are applicable at the time.	
Acid rock drainage	2.1.1.8	The environmental assessment strongly suggests that acid that is formed will be naturally neutralized - and therefore not present a problem. The threats to surface and ground water are great if acid is not naturally neutralized as described. The environmental assessment relies on not having an acid problem in many places (see e.g. 7.7.5 Residual Environmental Impacts). Should acid not be naturally neutralized it will cost tens of millions of dollars to contain and clean the acid mine drainage released.	The mine plan has been specifically designed to ensure that acid rock drainage is not produced. potentially acid generating waste rock will be placed within the tailings storage facility, so that all potentially acid generating rock will be under water at closure. As a result acid rock drainage will not be produced from this rock. During the lifetime of operations and into the closure period, NovaGold will monitor runoff from the sub-aerially exposed waste rock dumps which will be composed of non-potentially acid producing material. Remedial action will be undertaken if these waste dumps are found to generate acid rock drainage. Commitment: See commitment for 2.1.1.7.	See commitment for 2.1.1.7.
Acid rock drainage	2.1.1.9	It is imperative that NovaGold develop detailed contingency plans, and allow First Nations and public review/comment, on how the company will respond to acid mine drainage problems.	NovaGold submits that the design of the mine already incorporates a high level of conservatism in the geochemical criteria and facility design and that no additional measures are needed to address potential for acid rock drainage. NovaGold will monitor water flows from the mine site and will be prepared to treat flows as necessary to meet discharge standards. The Participation Agreement requires that the Tahltan be consulted on all permits and monitoring plans.	See response for 2.1.1.7.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			Commitment: See commitment for 2.1.1.7.	
Acid rock drainage	2.1.1.10	5.3.6.5 Potential for acid rock drainage 'Geochemical testing has shown that some of the rocks at Galore Creek are potentially acid generating over long time scales. Evaluation of test results has led to the identification of a site-specific ratio of $IC_{Ca,Mg}$ to acid potential (acid generation potential) that defines potentially acid generating and non-potentially acid generating rock. This relationship is: $IC_{Ca,Mg}$ /acid generation potential = 1.3' [p.5-35] This is apparently contradicted by both the SRK report and the NovaGold report on acid rock drainage: 'NovaGold has decided to use a criterion of 2, which provides an additional factor of safety.' [Appendix 5-A, Galore Creek Project metal leaching/acid rock drainage Characterization Report, SRK Consulting (Canada) Inc., May 2006, p.88] This could result in material in the $IC_{Ca,Mg}$ /acid generation potential = 1.3 - 2.0 range being used for dam construction, or placed in the not-potentially acid generating waste. If so, acid rock drainage problems could result in the long term. The value for $IC_{Ca,Mg}$ /acid generation potential that will be used to determine potentially acid generating rock should be clearly stated.	Interpretation of test work results has shown that rock with $IC_{Ca,Mg}$/neutralization potential>1.3 will not generate acid rock drainage. NovaGold has decided to use a value of 2 for waste management purposes. As described in Appendix K attached to Appendix 5A, Volume V, the 1.3 value is not used for waste classification purposes. Commitment: See commitment for 2.1.1.7.	See response for 2.1.1.7.
Acid rock drainage	2.1.1.11	Page 7-2 and 7-199 of Application - A temporal boundary for the environmental assessment has been established to end approximately 250 years after the end of project decommissioning. This does not seem to be appropriate for assessing impacts on water quantity or quality considering that a dam will need to be maintained forever and that peak acid rock drainage production on remaining exposed surfaces (e.g., pit walls above overflow level) may not occur for hundreds of years.	NovaGold feels that a time frame of 250 years is sufficient to assess the important impacts of the mine site development. Predicting water quality beyond this time frame would require extrapolation of the available field data and model results to an extent where the results will have such a large uncertainty as to be meaningless. The mine site closure plan will be updated during the lifetime of the mine. During operations ongoing monitoring will allow NovaGold to obtain a much better understanding of the chemistry of runoff from pit walls and the waste rock dumps and these data will be used to make more accurate and informed predictions of closure water quality. Commitment: The mine site closure plan will be updated during the lifetime of the mine. During operations ongoing monitoring will allow NovaGold to obtain a much better understanding of the chemistry of runoff from pit walls and the waste rock dumps and these data will be used to make more accurate and informed predictions of closure water quality.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Closure	3.1.1.1	It is good that topsoil is to be salvaged in two lifts (root zone separately from lesser-developed materials below it). However, the mine should salvage the two	The calculations indicate that there is a net positive balance of reclamation material (Volume III, Chapter 14,	EAO notes that reclamation requirements are set out in the Health,

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		lifts of material from all areas disturbed by mining. Plant re-establishment, and thereby reclamation, is greatly improved by increased depths of soil and subsoil. Section 5.5.7 describes areas that will 'typically' be salvaged and excludes numerous large areas, such as those to be flooded by tailings or underwater waste rock placement (p.5-106). Soil is critical to reclamation success and therefore all available soils and subsoils should be salvaged to maximize the amount of available material for reclamation. This would increase the amount of material available for reclamation use by the reclamation plan (see e.g. 14.3.2.1, Table 14.3-2).	Page 14-24) and if topsoil deficits arise, salvage will be taken from other affected areas. The goal is to have a cover thickness of 1 m over the waste materials. This depth of soil cover should provide a good basis for plant establishment and growth. Salvaging soil from the tailings pond when it is not needed may have the effect of increasing sediment to downstream areas. As well, the some of the valley borrow areas do overlap portions of the tailings pond. Commitment: None required.	Safety and Reclamation Code for Mines in BC (Ministry of Energy and Mines, 2003).
Closure	3.1.1.2	Soil salvage should not be governed by a salvage-to-replacement ratio (p.5-106) and, again, no area should be excluded from soil salvage. Instead, all available soils should be salvaged thereby maximizing available material for replacement. There is no reason to only salvage high-quality soils: The mine already proposes removing soil in two lifts - which will facilitate salvaging poorly developed or rocky soils that might otherwise not be suitable for replacement as horizon A or horizon B substitutes. These latter low-quality soils can be salvaged and stored with the other less-developed (low horizon) materials.	The salvage-to-replacement ratio is used to insure that sufficient salvage is retained to achieve good reclamation results without causing more disturbance that may not be required or which can detrimentally affect the environment. The soils have been assessed for suitability for reclamation purposes and the plan has been developed such that there is a net positive balance of reclamation material (Volume III, Chapter 14, Page 14-24). Commitment None required.	See response for 3.1.1.1.
Closure	3.1.1.3	The 'progressive revegetation' (14.3.2.2, p. 14-19) proposed for the soil salvage stockpiles is important. The environmental assessment does not discuss the matter, but species used for these nurse crops should be native species and similar to those planned for reclamation seeding/planting.	Native seed is difficult to obtain and generally has poor viability. The goal with a temporary soil stockpile is to protect it from erosion and weeds and a rapid establishing agronomic species that provides good coverage will work better in this situation. Commitment: NovaGold will seed temporary stockpiles appropriately to protect them from erosion and weeds. NovaGold will develop some test plots during mining to help determine what species work best.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Closure	3.1.1.4	The proposal to use 'just enough organic matter to allow native seed propagation' (8.2.2.5) on waste rock piles is not sufficient. Maximum available soils and organics should be calculated based on available materials and depth thereby maximized. The documents mention 'excavated surface soils, organic matter' in numerous places but it is only in 6.12.3.6 that organic forest soils (organics and A and B horizons) are salvaged. It is unclear whether the volumes will be sufficient for intended placement and whether or not the salvaged	Based on the calculations, a sufficient amount of material will be salvaged. It is recognized that the organically enriched surface materials are high in nutrients and are important in terms of successful plant establishment. The soils will be removed in two lifts where possible to take advantage of this material. In terms of the pH of the soils, currently the soils can	MEMPR notes that reclamation requirements are set out in the Health, Safety and Reclamation Code for Mines in B.C. (Ministry of Energy and Mines, 2003).

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		materials will be of suitable pH (forest soils and organics are often acidic which may inhibit plant growth).	support the native vegetation. Fertility issues such as a low pH level are generally not a major concern as they can be easily rectified with amendments. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting.	
Closure	3.1.1.5	The topsoil resource is described as including' forest litter and the developed mineral horizons to the depth of common rooting (typically includes the A and B horizons).' [14.3.2.1, p. 14-12]. If forest litter and in particular woody debris are significant, the carbon to nitrogen ratio in the topsoil could become unfavourable for plant regeneration. The soils used for reclamation should therefore be tested for nutrients and carbon in the material before reapplying it during reclamation, and nitrogen applied if needed.	The litter will be mixed in with the mineral soil diluting the concern of the C:N ratio which decreases over time with decomposition. The fertility of the soils will be assessed to insure successful reclamation. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting.	See response for 3.1.1.4.
Closure	3.1.1.6	The environmental assessment proposes that: 'The replacement root zone thickness of 0.5 m is based on results of the soil investigations undertaken within this area (Rescan, 2005). An additional thickness of 0.5 meters of overburden, to act as a buffer or barrier, is assumed for areas where the quality of mine substrates is not known and may be unsuitable for root development. A total thickness of one meter (0.5 meters of topsoil overlying 0.5 meters of overburden) is to be replaced in the upland, reclaimed terrain overlying exposed bedrock or waste rock. The need for the 0.5 meter buffer of overburden material on various post-mine landforms will be further investigated in a series of reclamation test plots during mine operations.' [14.3.3.2, p.14-19] Because potentially acid generating materials should be separated by analysis during blasting (see discussion above) non-submersed waste rock should not be acid producing. If material is chemically or physically unsuitable for plant/root development then the reclamation plan should require a sufficient capillary barrier to ensure that moisture in the waste rock can not migrate upwards to the soil material or root-zone. The proposed test plots should therefore not only investigate the need for a buffer, but should determine whether 0.5 meters is sufficient and whether the overburden material proposed will physically provide a sufficient capillary barrier.	A capillary barrier would be required if the cover is placed on acid generating waste rock. However, the acid generating material will be submerged. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting.	See response for 3.1.1.4.
Closure	3.1.1.7	The Reclamation Plan should include revegetation standards (percent cover, alpha and beta plant diversity, etc.) that must be met and specific steps that will be taken to ensure that these goals are met.	The reclamation plan will use plants that will set the stage for natural succession and the establishment of plant communities that reflect the ecology of the area. Commitment: NovaGold has committed to conduct test	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			plots during operations to support appropriate revegetation of reclaimed areas and to use plants that will set the stage for natural succession and the establishment of plant communities that reflect the ecology of the area.	
Closure	3.1.1.8	The environmental assessment should identify the actual post-mine land use that is sought. This should include post-mine plant types and zones, such as grassy meadows versus forest zones. See e.g.14.3.5.2 where the environmental assessment proposes that reclaimed waste rock piles could become suitable forest zones.	The post-mining land use is for wildlife habitat, forestry, and parkland (Volume III, Chapter 14, page 14.-8) Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting.	See response for 3.1.1.4.
Closure	3.1.1.9	Amended overburden should not be used as a substitute for soil. The environmental assessment states: 'The practicality of placing separate lifts of topsoil and overburden on the steep (2H:1V) slopes of waste rock of irregular particle size will be tested during operations. An alternative may be to place 1.0 m of overburden instead of the preferred topsoil/overburden combination. The overburden would need to be amended with commercial fertilizers and/or organic materials to make up for the initially reduced fertility. During operations, field test plots will be established to test various methods of applying soil materials to slopes.' [14.3.3.2, p.9-22] Amended materials are not suitable substitutes for, and certainly not comparable to, topsoil. Where steep slopes prohibit topsoil placement, erosion controls including erosion mats, dozer basins and terraces should be employed to create a suitable surface. Field tests implemented during mining will not necessarily demonstrate the suitability of this method because such tests are relatively short-duration and therefore can not accurately predict long-term success. Amendments and organics on these plots will often sustain the plants until exhausted after which revegetation will likely fail. The chances are small that the mine can create a soil suitable for long-term plant establishment, especially in this wet environment. Field tests employed should evaluate the depth of soil materials and ensure that the proposed depths (generally relatively thin) could actually support the proposed post-mine revegetation, especially trees.	The reclamation plan will include overburden to provide a base for the topsoil on waste materials. There is a net balance of topsoil based on a thickness of 50 centimetres over mineral soil and one meter over waste material. Depths greater than those proposed will offer no benefits to the plants as there is sufficient rooting depth material. Commitment: NovaGold has committed to salvage and stockpile topsoil for use in reclamation and protect topsoil stockpiles through revegetation and other practices as described in the environmental assessment.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Closure	3.1.1.10	It is unclear whether or not the development of Riparian (Channel Crossings and Re-established Creeks) and Littoral Areas (14.3.3.2, p.14-23) would be beneficial. An appropriate evaluation of potential riparian channels and littoral areas should be included in the reclamation plan and available for First Nations and public review.	The goal is to provide as much riparian/wildlife habitat as possible as a means to providing a range of ecosystems and uses which reflect current conditions. Commitment: NovaGold will prepare comprehensive reclamation and mine closure plans as part of permitting and the Tahltan will be consulted about the proposed	See response for 3.1.1.4.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			reclamation plan as required under the Participation Agreement.	
Closure	3.1.1.11	The discussion of the open pits' Facility-Specific Post-Mine Capability (14.3.5.1) does not consider that these pits may be full of acidic water resulting from acid mine drainage formation in the pit walls. Acidic metals contaminated lakes should not be permitted. Therefore, the environmental assessment and reclamation plan should consider this possibility and identify how acidic pit water would be prevented and/or reclaimed.	Predictions based on currently available information indicate it is unlikely that water in pits will be acidic. However, NovaGold agrees that the uncertainties that exist regarding pit lake water quality can be addressed as mining proceeds. The configuration of the site offers opportunities to ensure that contaminated water does not reach the receiving environment either on the surface or in groundwater. The pits are all upstream of the tailings impoundment which will ensure drainage from the pits is captured and treated if needed. Commitment: NovaGold has committed to monitor water quality after closure until regulatory agencies determine that conditions are stable and predictable and to regularly monitor the water quality of Galore Creek, and the Scud River, Iskut and Stikine rivers during operations and after closure to confirm modeling and ensure discharges meet permit criteria until regulatory agencies determine that conditions are stable and predictable.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Closure	3.1.1.12	The reclamation assessment parameters (14.3.6.1) require that specific standards be developed for each feature being evaluated. The reclamation plan should also identify contingency plans to meet those standards if evaluation indicates that they are not being met. Further, the reclamation plan should identify a duration (at least ten years) of successful reclamation assessment (see 14.3.6.2) before reclamation can be considered successful and the reclamation security returned. This is particularly important because it can take many years for problems/failures to develop or become evident. Examples include the years it takes for acid mine drainage to develop and be recognized/measurable; the potential for materials placement failures (mass wasting, piping, slippage); and revegetation failures. Regulatory oversight must continue until the reclaimed mine site is deemed reasonably stable.	NovaGold will prepare a reclamation plan as part of the *Mines Act* permitting process. The plan will evolve during operations as NovaGold gains experience with the site. The reclamation plan will detail reclamation objectives and will be subject to consultation with the Tahltan as a condition of the Participation Agreement. The reclamation plan and related security will be reviewed by the MEMPR every five years as a matter of policy. Commitment: NovaGold will prepare a reclamation plan as part of the *Mines Act* permitting process. Tahltans will be consulted on the development of the *Mines Act* permit as a condition of the Participation Agreement.	See response for 3.1.1.4.
Closure	3.1.1.13	14.6 Closure Cost Estimate The total estimated closure and monitoring costs associated with the Galore Creek project is $19.75 million Canadian dollars	The costing for the closure and monitoring costs was estimated using a standard spreadsheet developed by	MEMPR notes the financial security is ultimately determined by the Chief

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		(2006). Table 14.6-1 provides a summary of estimated closure costs. The reclamation cost estimate presented in Table 14.6-1does not give the public enough information to comment on the adequacy of the estimate.	MEMPR. The Ministry will establish a security amount based on its own calculations after consideration of NovaGold's estimate during the *Mines Act* permitting process. The Tahltan are assured of consultation on the application as a condition of the Participation Agreement. Commitment: NovaGold will consult the Tahltan on the application as a condition of the Participation Agreement.	Inspector of Mines after reviewing the *Mines Act* permit application.
Cumulative Effects	4.1.1.1	9.9 Archaeological and Heritage Resources page 9-70, 9.9.3 Effects of Other Human Activities ' Resource use activities such as hunting, trapping and fishing may increase within the general area as a result of access improvements, representing a source of potential additional disturbance to archaeological resources, both known and unknown. Exploration throughout the Galore/More valleys will be the primary source of potential additional disturbance to archaeological resources. This large region has not been thoroughly examined for archaeological resources, and it is quite likely that additional sites are present; however, all evidence suggests that this particular area was peripheral to the intensive-use areas of Mt. Edziza, the upper Stikine drainage system and the Klappan Plateau. Therefore, although some potential effects are predicted, they are anticipated to be minor. The potential for significant cumulative effects is therefore negligible.' Page 9-70 The cumulative impact assessment acknowledges that opening up access to this regions and increased human activity will result in disturbance to known and unknown archaeological resources. The environmental assessment states the region has not been thoroughly examined for archaeological sites and that there is likelihood that there are additional unknown sites. However, they dismiss analyzing the significance of disturbance of known and unknown sites because the cumulative impacts study area was 'peripheral to the intensive-use areas of Mt. Edziza, the upper Stikine drainage system and the Klappan Plateau.' We do not agree that the cumulative impacts study area was peripheral to intensive use areas.	The assessment that the cumulative impacts study area was peripheral to intensive use areas was based on the information supplied to NovaGold by the Tahltan at the time of the archaeological study. Commitment: None required.	The Ministry of Sports, Tourism and the Arts (Archaeology Branch) notes that within the limits of current knowledge, the Proponent's conclusions are not unreasonable related to the intensity of use of the Project area. However, the results of the archaeological assessment cannot preclude the possibility that at some time in the past, a group lived in the area at locations removed from but still near the study area.
Cumulative Effects	4.1.1.2	Volume 3, Section 9 Cumulative Impacts One of the primary concerns of the Iskut and Tahltan First Nations is the cumulative impact of all past, present and future industrial activities in their whole traditional territory. The traditional territory of the Tahltan people is larger than the designated cumulative assessment study area. The study area should be expanded to include all culturally important historical use areas.	The traditional territory of the Tahltan people shown on the cumulative effects assessment study area maps was based on established ethnographic data. NovaGold recognizes that the territory boundary illustrated in the cumulative effects assessment differs in places from that provided by TCC. The total cumulative effects assessment study area includes all the Tahltan	See response to 4.1.1.1.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			traditional territory provided by the TCC with the exception of (i) an area along the Alaskan border at the western extent of the study area, (ii) an area along Turnagain River, (iii) an area at the eastern extent of the study area to Thutade Lake. The Tahltan traditional territory provided by the TCC is recognized; however, expanding the study area would not alter the results of the cumulative effects assessment for the Project. Commitment: None required.	
Cumulative Effects	4.1.1.3	The cumulative assessment considered a study area that encompasses most of the Stikine, Iskut and Scud watersheds (Figure 9.2-1). However, in practice, each individual analysis within the cumulative impact assessment was done on isolated areas, (for example Figure 9.3-2 Cumulative Effects Assessment Linkage Map for Surface Water Quality, Figure 9.5-1 Cumulative Effects Assessment Linkage Map for Aquatic Resources). The spatial and temporal definitions of the cumulative assessment are applied in a manner that limits the analysis a great deal. The limitation on the scope of the cumulative impact assessment results in the artificial segregation of individual areas (river sections, wildlife habitats) from the entire study area. This method of analysis sets up a circular argument. The spatial and temporal definitions are so restrictive that they, by definition, result in a finding of no over lap. This is interpreted as there being no cumulative impact. This method of analysis limits the scope of the cumulative assessment greatly - to the point of it being ineffective. The assumptions the cumulative impact assessment is based on need to be revised to solve this problem and the analysis needs to be conducted again.	Temporal boundaries were established based upon CEA Agency guidance documents. NovaGold selected examples that provided a longer, and therefore more inclusive, time span. The study areas shown on the Linkage Maps were developed based upon where the residual effects of the Project are predicted to occur, and demonstrate how these areas might directly overlap with the effects of other activities. It is acknowledged that the assumption that there has to be a direct spatial overlap for a cumulative effect to occur is limiting. However, the mandate and available resources for a cumulative effects assessment for a single project are restrictive, and as such the cumulative effects assessment focussed on the environs immediately surrounding the Project. In addition, it is difficult for a single proponent to obtain what may be confidential information about other activities. Mineral and energy exploration is one example, where the timing and location of future exploration work is not known, and available information about the impacts of individual exploration projects is limited. To fully evaluate cumulative effects, a strategic assessment at a regional scale, e.g., of the Cassiar Iskut-Stikine Land and Resource Management Plan area, would need to be undertaken by government. Commitment: None required.	CEA Agency notes the cumulative effects assessment prepared by NovaGold followed federal guidelines and the approved Terms of Reference for the Galore Creek project.
Cumulative Effects	4.1.1.4	All previous and existing industrial activity (from all industry sectors), including all projects in the exploration and development phase, must be included in the	The developments selected for inclusion in the CEA were based on the requirements of the approved Terms	See response for 4.1.1.3.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		cumulative impact study to adequately assess cumulative impacts. All potential resource development, including on-line staked areas, must be included in the cumulative assessment to fully analyze potential impacts. The NovaGold analysis states that they did not include all future development '...because the probability of these events occurring is unknown at this time' (page 9-43). Mineral extraction projects have been proposed in the study area-this is certain. The cumulative impact assessment must assume these projects will go forward as proposed. As it stands, the cumulative impact assessment says it will be inclusive, but then systematically eliminates from analysis the very items that could cause cumulative impacts. This is a fatal flaw of the impact assessment, and severely limits its usefulness. This cumulative impact assessment does not meet the needs of the Iskut First Nation. NovaGold should amend the cumulative impact assessment to include all industrial activity (from all industry sectors), including all projects in the exploration and development phase. NovaGold should conduct a data gap analysis on the cumulative impact assessment to assess what information is missing. The missing information needs to be collected and incorporated into the next version of the cumulative impact assessment.	Of Reference and CEA Agency guidance documents. The 'Reference Guide: Addressing Cumulative Environmental Effects' (CEA Agency, 1994) states: 'This implies that, at a minimum, (only) projects or activities that have already been approved must be taken into account. The environmental effects of uncertain or hypothetical projects or activities need not be considered. Nevertheless, it would be prudent to consider projects or activities that are in a government approvals process as well.' The cumulative effects assessment considered all potential developments within the study area that were in the BC *Environmental Assessment Act* process at the time of submission, and also included the proposed Schaft Creek Project - not in the BC environmental assessment process at the time of submission - due to it's proximity to Galore Creek. Exploration projects since 2001 were also recognised (e.g., Volume III, Figure 9.2-3). This approach was agreed at a meeting between NovaGold and the CEA Agency on 19 January 2006. It is beyond the mandate of the Galore Creek cumulative effects assessment to consider the effects of regional development over the long term. Such an evaluation would require government assessment at a strategic level. Commitment: None required.	
Cumulative Effects	4.1.1.5	Table 9.2-2, pg 9-5. Summary of Closed Mining Projects in the CEA Study Areas. Several properties were not included in Table 9.2 including, but not limited to Sulphurets Creek mine, Anyox Slag Heap, Mt. Klappan Exploration, Cassiar Mine, Cateer and others. This table is an incomplete listing of the previous mining activity in the study area. A source like MINFILE can provide a lot of info (http://webmap.em.gov.bc.ca/mapplace/minpot/minStats.cfm#). Industrial impacts should not be limited to just mining. Oil and Gas exploration and hydroelectric developments should be included in the assessment of previous industrial impacts.	The purpose of Table 9.2-2 is to summarize mining projects within the study area since 1964 (the past temporal boundary) that proceeded to full operation. Cassiar mine is on the boundary of the CEA study area; its omission is acknowledged. Anyox Slag Heap is outside of the study area. Major mineral exploration projects since 2001 (as per BC Mineral Exploration Reviews), including Mount Klappan, are shown on Figure 9.2-3. It is acknowledged that some smaller and older locations of mineral exploration activity, and oil and gas exploration, are not shown. NovaGold is not aware of any previous hydro-electric projects in the study area. The proposed Forrest Kerr hydro-electric	See response for 4.1.1.3.

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			project is included in the cumulative effects assessment. Commitment: None required.	
Cumulative Effects	4.1.1.6	Table 9.2-4, pg 9-6. Summary of Reasonably Foreseeable Future Projects within the Cumulative Effects Assessment Study Areas Industrial impacts should be expanded to include all mining exploration and development, Oil and Gas exploration, access road development, and hydroelectric developments.	The developments selected for inclusion in the cumulative effects assessment were based on the requirements of the approved Terms Of Reference and CEA Agency guidance documents. The 'Reference Guide: Addressing Cumulative Environmental Effects' (CEA Agency, 1994) states: 'This implies that, at a minimum, (only) projects or activities that have already been approved must be taken into account. The environmental effects of uncertain or hypothetical projects or activities need not be considered. Nevertheless, it would be prudent to consider projects or activities that are in a government approvals process as well.' The cumulative effects assessment considered all potential developments within the study area that were in the BC *Environmental Assessment Act* process at the time of submission, and also included the proposed Schaft Creek project - not in the BC environmental assessment process at the time of submission - due to it's proximity to Galore Creek. Exploration projects since 2001 were also recognised (e.g., Volume III, Figure 9.2-3). This approach was agreed at a meeting between NovaGold and the CEA Agency on 19 January 2006. It is beyond the mandate of the Galore Creek cumulative effects assessment to consider the effects of regional development over the long term. Such an evaluation would require government assessment at a strategic level. Commitment: None required.	See response for 4.1.1.3.
Cumulative Effects	4.1.1.7	9.3.1 Surface Water Quantity; 9.3.1.1 Residual Project Effects 'Project components within the More Creek, Sphaler Creek, Scotsimpson Creek and Iskut River watersheds did not produce any residual environmental effects on surface water quantity.' Pg 9-17. This statement negates any impacts of mixing zones on surface waters. Please see our comments under sections 5.7.2.3 and 7.6.4.1.	Consistent with the cumulative effects assessment methodology, environmental effects were not considered in the cumulative effects assessment unless they were identified as having a residual effect in Volume II, Section 7.	See response for 4.1.1.3.

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			Commitment: None required.	
Cumulative Effects	4.1.1.8	9.3.1.3 Linkage with Other Human Actions 'Exploration activity, however, does not affect surface water quantity.' Pg 9-17. This statement is too broad. Exploration can divert water from streams and rivers and wetlands into treatment works.	Comment noted. Exploration activity can affect surface water quantities, but not to the same extent as operational mines. Commitment: None required.	No response required.
Cumulative Effects	4.1.1.9	9.3.1.4 Residual Cumulative Effects 'There are no anticipated linkages between the residual effects of the project and of other human actions with regard to surface water quantity. Therefore, there is no potential for cumulative effects.' Pg 9-17. There are a tremendous number of stream diversions associated with this project and river crossings. Is the environmental assessment really claiming that none of these will have affects on water quantity?	Consistent with the cumulative effects assessment methodology, environmental effects were not considered in the cumulative effects assessment unless they were identified as having a residual effect in Volume II, Section 7. The environmental effects of the various projects components on surface water quantity are considered in Volume II, Section 7.5. Infrastructure such as the access road will have some effect on surface water quantity, but the assessment concluded that these effects were not significant. As a result the effects were not carried forward to the cumulative effects assessment. Commitment: None required.	See response for 4.1.1.3.
Cumulative Effects	4.1.1.10	Table 9.3-2 doesn't find any links with past, present or proposed industrial activity because of the definition of the spatial boundary of the assessment area, not because of an overall assessment of impacts. The Iskut Nation wants to know what the overall cumulative impacts of all development will be on all valued ecosystem components in the whole area defined for cumulative assessment. Please revise the cumulative impact assessment accordingly.	The study areas shown on the Linkage Maps were developed based upon where the residual effects of the Project are predicted to occur, and demonstrate how these areas might directly overlap with the effects of other activities. It is acknowledged that the assumption that there has to be a direct spatial overlap for a cumulative effect to occur is limiting. However, the mandate and available resources for a cumulative effects assessment for a single project are restrictive, and as such the cumulative effects assessment focussed on the environs immediately surrounding the Project. In addition, it is difficult for a single proponent to obtain what may be confidential information about other activities. Mineral and energy exploration is one example, where the timing and location of future exploration work is not known, and available information about the impacts of individual exploration projects is limited. As suggested by Tahltan Heritage Resource and Environmental Assessment Team comments, it is	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			the Crown's responsibility to take the lead in cooperation with Tahltans to better understand the implications of developments in Tahltan territory. Commitment: NovaGold will participate with the Crown and Tahltans to help expand collective knowledge of potential cumulative impacts of all development on all valued ecosystem components.	
Cumulative Effects	4.1.1.11	'Filter plant effluent will only be discharged into the Iskut River during operations, when concentrate is being produced. Therefore, the temporal boundary for filter plant effluent effects is only until 2029 (i.e., 22 years from the start of the mine in 2007).' Page 9-29 Filter plant effluent will likely discharge some solids into the Iskut River which may build up over time. These sediments will contain heavy metals and could be a source of metal contamination over time, continuing after the mine stops operation. The temporal timeframe needs to be expanded to include this possibility and the possibility of sediment contamination needs to be integrated into the cumulative impact assessment and ecological impact assessment.	The effluent from the filter plant will contain only 0.5 milligrams per litre of suspended solids (see Appendix 5-H). The grain size of the suspended solids will be < 0.45 microns; clay sized particles. Given the flow regime in the Iskut River these particles will be carried downstream and mixed with the natural suspended solid load in the river (up to 170 milligrams per litre in freshet, 7 milligrams per litre under low flow conditions). It is very unlikely that the particles will be deposited close to the diffuser or will form accumulations of sediment with high metal content. Commitment: None required.	EAO notes that NovaGold has committed to monitor the water quality of Galore Creek and the Scud, Iskut and Stikine rivers during operations and after closure to confirm modelling and ensure discharges meet permit criteria until regulatory agencies determine that conditions are stable and predictable.
Cumulative Effects	4.1.1.12	Terrestrial Ecosystems -- A clear overall scope of the residual project effects on valued ecosystem components is not provided in this section. Nor is it provided in relevant sections pertaining to specific valued ecosystem components such as chapter 7. What is expected is a table that provides an area summary by valued ecosystem component for ecosystem units potentially influenced by all development types (road, filter plant, aerodrome and mine area) and what percentage that relates to with respect to the regional and local Project area.	Residual project effects were identified in Volume II, Table 7.12-5 of the effects assessment. Volume III, Section 9.7.1 of the cumulative effects assessment identifies the residual effects on valued ecosystem components that are discussed in the cumulative effects assessment and why they were selected. Area summary tables of the nature described in the comment are provided throughout Volume II, Section 7-12 (e.g. Tables 7.12-7, 8, 9, 11, 12, 14, 15, and 16). Effects identified in Section 7-12 focus on those associated with the project. The effects discussed in the cumulative effects assessment cannot be as quantitative due to the lack of specific information on the potential impacts of other developments. Commitment: None required.	EAO notes a table summarizing potential residual effects has been included in the Joint Report prepared by the EAO and Federal Authorities and CEA Agency.
Cumulative Effects	4.1.1.13	Application Page 9-45 Residual Project Effects -- 'Residual effects are predicted to occur through the permanent loss of terrestrial ecosystems in the Galore	NovaGold agrees with the comment. Effects were not assessed at a regional scale because NovaGold	The Ministry of Forests and Range (MOFR) notes the Special Use Permit

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		Creek valley due to the submergence of the pits and tailings area, and the loss of terrestrial ecosystems in the medium term as a result of the construction and operation of the access road. These residual effects were assessed as being significant.' Residual effects are considered significant on a local scale, but not a regional scale. If the road is kept open beyond the life of the mine, there is the possibility that residual effects could become regionally significant.	intends to close the road after mine operations have finished. Should this intention change, then a reassessment of the residual effects of the road at a broader (regional) scale will be considered. NovaGold recognizes that, as holder of the Special Use Permit for the access road, NovaGold has an obligation to meet the conditions of the Special Use Permit. If the access road is to be kept open after it is no longer required for the project, then the new proponent should conduct a reassessment of the residual effects of the road at a regional scale.	will require the road to be decommissioned when the mine closes.
Cumulative Effects	4.1.1.14	Page 9-45 Temporal Boundaries - We do not agree with the statement 'ecosystems will recover given sufficient time'. In some cases, ecosystem may never recover depending on the nature of the disturbance or may be altered significantly resulting in an altered or degraded ecosystem, particularly high elevation alpine areas.	NovaGold agrees that the long term ecosystems may not be identical to those that exist at the site today. This idea is alluded to in Volume III, Section 9.7.2.2 which states that "residual effects will be apparent for approximately 200 years following decommissioning and reclamation activities". However, the long term ecosystems will be equivalent in terms of overall productivity. Commitment: None required.	No response required.
Cumulative Effects	4.1.1.15	Application Section 9.8, Wildlife and Wildlife Habitat -- Grizzly Bear The cumulative effects assessment focused on the potential residual effects to coastal grizzly bear population, salmon habitats, and the potential ability to not secure adequate fat reserves to ensure survival and reproductive success. While this is not disputed, it is suggested that the interior grizzly bear populations should have been included due to higher impacts from the habitat loss and the direct and indirect impacts as a result of higher than reported traffic during construction and mine operations, and the potential cumulative impacts from future human activities east of More Creek. The spatial boundary is too small an area and should be the same area as defined for mountain goats which would allow the inclusion of the interior grizzly bear population.	In response to comments received during the Application review, NovaGold prepared a separate assessment of potentially cumulative effects for interior grizzly bears. Pursuant to the Participation Agreement, the Tahltan will be consulted about the draft Wildlife Mitigation and Monitoring Plan.	MOE notes the Wildlife Mitigation and Monitoring Plan will include all aspects of project effects to wildlife and their habitats. The plan will deal with surveys, continuous inventory requirements, time windows and compensation. EAO notes that Appendix F and Schedule B of the EA Certificate contain a number of commitments related to wildlife.
Cumulative Effects	4.1.1.16	The Tahltan Nation Development Corporation holds the tenure to harvest timber in the Bob Quinn area; the area has a recent history of timber harvesting; there is easy access to highway 37; and the Tahltan Nation Development Corporation has a licence that allows for log exports through Stewart. It is very likely that if saw log timber became marketable again from Bob Quinn that logging could	Forest management practices in BC are regulated by Ministry of Forests and Range; with input from MOE The practices include extensive consideration of wildlife conservation, including that of grizzly bears. It is therefore anticipated that concerns relating to the	See response for 4.1.1.15.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		occur. This would have an effect on interior grizzly bears from habitat loss, habitat fragmentation, and direct/indirect effects from increased access and road building. In addition, given the pace of mineral exploration in the area, potential power requirements, and the power needs for the Red Chris project and Galore Creek, it is possible that an upgraded transmission line will be constructed through the Bob Quinn area to Iskut or Dease Lake. It will be considerably larger than the existing line and would require a wider Right of Way than currently exists and may not be able to follow the same Right of Way. This would be another effect on the interior grizzly bear population and should be considered when finalizing the monitoring plan. In addition, the sampling of hair should be continued in forest and alpine habitats to determine the impact on the interior grizzly bear population.	potential effects of any future logging on interior grizzly bears would be addressed by the forest development plan. Similarly, a new or upgraded power line and associated right of way would be subject to their own environmental effects assessment should the proposal go ahead. It is anticipated that this assessment would include interior grizzly bears, and provision would be made for mitigation and management of any identified effects to this species. With regard to the potential for cumulative effects of these projects with Galore Creek. In response to comments received during the Application review, NovaGold prepared a separate assessment of potentially cumulative effects for interior grizzly bears. Logging and power development were included in this assessment as effects that could act in combination with the effects of the Project to produce cumulative effects. Pursuant to the Participation Agreement, the Tahltan will be consulted about the draft Wildlife Mitigation and Monitoring Plan. Commitment: A Wildlife Mitigation and Monitoring Plan will be completed for review by regulators and, consistent with the Participation Agreement, by Tahltan Central Council representatives.	
Cumulative Effects	4.1.1.17	Application Section 9.8, Wildlife and Wildlife Habitat -- Mountain Goats The impacts to mountain goats are not the residual effects as described in the environmental assessment. It is our opinion that due to overestimation of suitable high value habitats, the underestimation of impacts from aircraft, and the number of unknown effects to mountain goats, residual effects will be much higher than reported.	NovaGold assessed the potential for significant adverse residual effects to be considerable for mountain goats. Although the significance of these adverse residual effects was assessed as uncertain, it remains that there is considerable potential for them to be significant. Commitment: NovaGold will prepare a monitoring program for mountain goats as an important component of the overall Wildlife Mitigation and Monitoring Plan for the Project.	See response for 4.1.1.15.
Cumulative Effects	4.1.1.18	Application Section 9.8, Wildlife and Wildlife Habitat -- Mountain Goats While there are concerns to the amount of suitable mountain goat habitat estimated for the study area, the locations of both the RDN and Foremore properties are on mountain blocks with very high mountain goat habitat areas. It is likely that	Exploration at the RDN and Foremore properties was considered for the mountain goat cumulative effects assessment. Should activities increase for any of the exploration projects mentioned, certainly to the point of	See response for 4.1.1.17.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		effects are occurring, and if the Project were to increase its activities while construction was ongoing then the distribution of serious effects from blasting, aircraft, and sensory disturbances would be at a landscape level.	proposed operations, each project would be required to undergo formal environmental effects assessments. The effects of the projects on mountain goats, the scale of effects, and the cumulative effects would be determined at that time. Commitment: None required.	
Cumulative Effects	4.2.1.1	9.3.2 Surface Water Quality 'Effluent discharge from the tailings facility and the filter plant has the potential for residual effects on water quality. However, these effects were judged to be not significant based on the magnitude, geographic extent and duration of effect (see Section 7.6).' pg9-20. 'Effluent from the filter plant will be discharged into the Iskut River via a diffuser. Potential effects to water quality are limited to a localized area (<100 meters) of the Iskut River downstream of the diffuser based on annual average flow (average over 12 months). However, during the annual seven-day low flow (average seven lowest flow days in one year), potential effects, related mainly to total copper concentrations, extend downstream approximately 6 kilometres to the confluence of Iskut River and More Creek. As a result of the additional volume of water from More Creek, the effects do not extend below the confluence and therefore do not extend to the Stikine River (see Section 7.6).' pg 9-19. We do not agree that there are no effects from the proposed effluent discharges, nor do we agree that there will be no cumulative impacts. Please see our discussion of this issue under sections 5.7.2.3, 7.6.4.1, and Section 9.	According to the definition of significant residual effects, and based on the magnitude, geographic extent and duration of effect, the residual effects on water quality will not be significant due to their limited spatial scale. Commitment: NovaGold has committed to monitor the water quality of Galore Creek and the Scud, Iskut and Stikine rivers during operations and after closure to confirm modelling and ensure discharges meet permit conditions until regulatory agencies determine that conditions are stable and predictable.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Cumulative Effects	4.2.1.2	9.3.2.1 Residual Project Effects, 9.3.2.2 Assessment Boundaries, Spatial Boundary, page 9-20 The environmental assessment restricts its analysis by just focusing on 'Galore Creek and the Scud River, from below its confluence with Galore Creek to above its confluence with Contact Creek. Effects will not extend to the Stikine River (see Section 7.6).' page 9-20. This spatial boundary of cumulative impacts is too narrow to address the concerns of the Iskut First Nation.	Comment noted. Commitment: None required.	No response required.
Cumulative Effects	4.2.1.3	9.3.2.2 Assessment Boundaries, Temporal Boundary, page 9-20 The environmental assessment assumes that tailings impoundment water quality will improve at mine closure. This is not necessarily true. Solids and associated contaminants can become re-suspended in the tailings impoundment waters through wind induced wave action in the impoundment. Avalanches into the	Calculations based on wave forecasting curves (US Army Corps of Engineers Shore Protection Manual) suggest a bottom current of 0.09 meters per second at five meter depth with 15 meters per second (about 30 knot) wind. Only 0.3 % of the time do winds in the	NovaGold has committed to monitor and manage drainage from the tunnel, not-potentially acid generating dumps, ore storage stockpiles, pits, seeps and other mine areas, including the

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		tailings impoundment can also re-suspend solids. Re-mobilization of solids and associated contaminants could enter surface waters through released tailings impoundment water post mine closure. These impacts need to be accounted for and included in the cumulative impact assessment and long-term environmental assessment for this project. The environmental assessment states 'a conservative estimate for the future temporal boundary of effects from tailings effluent is 20 years from closure, or 2049.' (page 9-20) This is not an adequate temporal boundary if the issue addressed above is accounted for. The temporal boundary for the estimation of impacts from the tailings impoundment needs to be extended to the life of the tailings impoundment, which is in perpetuity.	Galore Creek valley exceed 7.5 meters per second. These calculations suggest that re-suspension of tailings at an eight meter depth from wind-induced waves is unlikely. During operations NovaGold will have an active avalanche program to minimize the size and consequence of avalanches affecting the tailings impoundment. Post closure there is potential for large avalanches to enter the impoundment from time to time. The dam is designed to withstand the forces of an avalanche-induced wave without damage. A large avalanche may re-suspend tailings within the impoundment. However, calculations of settling time for characteristic tailings particles using Stokes equation indicate that tailings will re-settle in about 1.23 hours. Since avalanches are most likely during the winter when flows from the impoundment will be lowest, the amount of suspended tailings that would escape from the impoundment would be minimal. Commitment: None required.	impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the *Environmental Management Act effluent discharge* permit limits and federal Metal Mining Effluent Regulation discharge criteria that are applicable at the time.
Cumulative Effects	4.2.1.4	The impacts from the project's proposed 200-plus stream crossings needs to be included in the cumulative assessment of surface water impacts.	NovaGold acknowledges the importance of proper road crossing design and measures to control sedimentation to surface waters. NovaGold will implement erosion and sediment control practices during construction to ensure that water quality is protected. Commitment: NovaGold will implement Erosion and Sediment Control plans during construction to ensure that water quality is protected. Additionally there will be an Aquatic Effects Monitoring Program to assess the effects of construction.	EAO notes that NovaGold has committed to ensuring that water quality is protected. Additionally there will be an Aquatic Effects Monitoring Program to assess the effects of construction.
Cumulative Effects	4.2.1.5	9.5.2.2 Temporal Boundary 'The rate of recovery of aquatic communities in the Galore Creek project area will depend on the particular effect. Effects related to tailings effluent discharge into Galore Creek will most likely be highest during operations and should decrease in magnitude and extent as the aquatic species adapt to the altered environment. This assumes that discharge concentrations of contaminants of concern during post-closure will not increase, based on adaptive management and monitoring that will continue through operations and beyond closure to protect water quality. Because no additional tailings will be	Predictions of water quality within the tailings storage facility are described in Volume XV, Appendix 7-D. In addition, NovaGold is undertaking additional model runs for the closure period and these will be reported in a memo. Commitment: NovaGold will undertake additional model runs of water quality for the closure period and the	See response for 2.1.1.3.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		deposited in the tailings facility after closure, tailings pond water quality is expected to gradually improve over time. Natural silt deposition from upstream glacial till will gradually cover the tailings, reducing contaminant transfer to the water column. Some metal leaching from waste rock is predicted to continue, but acid rock drainage should be controlled by the sub-aqueous submergence of high-risk acid rock drainage waste rock and tailings. Water quality modeling predicts that water quality in the tailings facility will improve to levels approaching baseline conditions within 10 years. Therefore, a conservative estimate for the future temporal boundary of effects from tailings effluent is 20 years from closure, or 2049.' Page 9-29 These conclusions contain many assumptions. There is no data or analysis provided for these conclusions. NovaGold must justify all such conclusions about long-term performance of mine facilities with adequate, concrete and transparent analysis of data.	results of this modelling will be reported in a memo.	
First Nations Consultation	5.1.1.1	The discussion about a reclamation and closure plan (Section 14) is largely a plan to develop and submit a reclamation plan. NovaGold and the regulatory agencies should give First Nations and the public an opportunity to review and comment on this document before it is approved.	The Participation Agreement ensures that the TCC will have an opportunity to review all permit applications and management plans. Commitment: NovaGold commits to consult with the Tahltan on all permits, mitigations and management plans.	Addressed
First Nations Consultation	5.1.1.2	Overall the consultation that NovaGold directed has been satisfactory for Tahltan standards.	Comment noted. Commitment: None required.	Addressed
First Nations Consultation	5.1.1.3	Special Assembly: NovaGold did not ‘host’ a special assembly in Dease Lake in January 2005; it was a TCC special assembly on the Galore Creek project. NovaGold was invited to the assembly and sponsored it by covering the costs (see p. 3-1 and section 3.1.3).	Comment noted. Commitment: None required.	Addressed
First Nations Consultation	5.1.1.4	Participation Agreement: The Participation Agreement was presented to the Tahltan leadership that includes the board of directors of the TCC, and the chief and council for both the Tahltan and Iskut bands in October 2005. In the application on page 3-7 it states that only the TCC board and the Tahltan band council were present; the Iskut band council was also present.	Comment noted. Commitment: None required.	Addressed
First Nations Consultation	5.1.1.5	The transcripts from the special assembly should have been made available at the open houses.	NovaGold will provide transcripts of the January 2005 Special Assembly if requested by the TCC. Commitment: NovaGold will provide transcripts of the January 2005 Special Assembly if requested by the TCC.	No response required.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
First Nations Consultation	5.1.1.6	NovaGold newsletters should be mailed to Tahltan members on the TCC mailing list for broader distribution.	As outlined in the Participation Agreement, the parties will maintain effective communications between each other and will develop plans to ensure that Tahltan members remain informed. Commitment: As outlined in the Participation Agreement, the parties will maintain effective communications between each other and will develop plans to ensure that Tahltan members remain informed.	No response required.
First Nations Consultation	5.1.1.7	The TCC finds that the consultation with the Crown was not up to Tahltan standards because: the environmental assessment process did not adequately address Tahltan concerns around the social and cultural impacts assessment; the TCC is being overwhelmed by the volume of land and resource referrals, including environmental assessments, without being adequately resourced by the Crown; The province has not come to an agreement with the Tahltan on what a deep consultation process will look like and how the environmental assessment process fits into this larger consultation process. The Crown has not provided any accommodation on the Galore Creek project.	Comment noted. This issue is beyond the scope of NovaGold's application under the environmental assessment process and must be resolved between the TCC and the Crown. Commitment: None required of NovaGold.	EAO notes the Province and Tahltan are having discussing related to socio-cultural/socio-economic impact assessment that is beyond the Project. Through these discussions, it is anticipated that approaches for assessing these types of impacts will be agreed to. The federal Responsible Authorities note that the Tahltan Central Council will be consulted by federal and provincial government agencies during the permitting stage.
First Nations Consultation	5.1.1.8	5.5.5.2 potentially acid generating and non-potentially acid generating Segregation The criteria that will be used for delineating potentially acid generating from non-potentially acid generating waste material are not clearly stated in the environmental assessment. For example, it is stated: 'The possibility of using total carbon as a surrogate for carbonate will be evaluated. Initial muck samples from blasting will be screened to obtain samples of blast rock size fractions. These samples will be analyzed for the same parameters to determine if partitioning of sulphide or carbonate minerals into the fines is occurring. This approach may lead to adjustment of management criteria.' and; 'Management and disposal will be determined using the following criteria: - upland disposal within containment area above final flood level - neutralization potential/acid generation potential>2, and paste pH or Cu/S>x. - dam construction rock - paste pH>6, neutralization potential/acid generation	NovaGold has proposed criteria in the environmental assessment based on information available at the time the environmental assessment was prepared. The main waste rock criterion is 2.0, the development of which has been described in detail. The actual procedures for implementing waste rock classification as part of mining will be specified in the *Mines Act* Permit. Requirements to report results of analysis and monitoring will also be specified in the permit. The Participation Agreement commits NovaGold to consulting with the Tahltan on the permit application, which will detail NovaGold's proposed procedures, monitoring and reporting. Pursuant to the Participation Agreement, NovaGold will consult with the Tahltan on the *Mines Act* permit application.	EAO notes this commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		potential>3, Cu/S<x. The value of x is currently being evaluated by leach column tests.' [p. 5-104, 5-105] While more data will undoubtedly make the choice of the parameters that define potentially acid generating from not-potentially acid generating waste material more dependable, this means the procedures defining this segregation process are still under study, and that the both the information leading to the final choice of parameters will not be available to the public, and the rationale for the parameters will likely be made behind closed doors by a selected few individuals, with little or no opportunity for experts from the public to review or comment on these critical decisions. Conservative potentially acid generating non-potentially acid generating segregation criteria should be developed based on the information available, and if changes are to be made to these important criteria, then both the data and information should be made available to the public before any changes to the criteria are made.	Commitment: NovaGold has committed to using a conservative neutralization potential ratio of 2 to segregate potentially acid generating from not-potentially acid generating material subject to adaptive management as more information is gained from the site.	
First Nations Consultation	5.1.1.9	The Tahltan must be involved in the development of a suitable fish habitat compensation plan.	The Fish Habitat Compensation Plan will be developed in conjunction with the Department of Fisheries and Oceans. The Participation Agreement requires that NovaGold involve the TCC in the development of environmental monitoring and management plans. As such the TCC will be consulted in the development of the fish habitat compensation plan. Commitment: The TCC will be consulted in the development of the fish habitat compensation plan.	Fisheries and Oceans Canada and MOE note that the Tahltan will be consulted as the fish habitat compensation plan is developed.
Fish	6.1.1.1	The most serious impacts of concern on fish are likely to result from changes in water and quality, rather than the loss of physical habitat (see our comments on water quality).	Comment noted. Commitment: None required.	No response required.
Fish	6.1.1.2	As for impacts on the Porcupine River with respect to aerodrome construction, use, and maintenance, this facility will be sited on the drier portion of the floodplain well removed from the active floodplain and so impacts on habitat and fish populations will in all likelihood be minimal. However, as a cautionary comment, in a highly braided system like the Porcupine, the distribution of channels and dominant flows can change markedly with major floods, which could result in major bulldozer works and siltation downstream in efforts to divert flows away from the aerodrome site.	NovaGold has designed the aerodrome to be above the active floodplain. If remedial earthworks are required, sediment and erosion control plans will be utilized to minimize any impacts on the Porcupine River. As part of the Participation Agreement, Tahltans will be consulted regarding all permits for such work. Commitment: Sediment and Erosion Control Plans will be utilized to minimize impacts from any remedial earthworks to protect the aerodrome near the Porcupine	EAO notes this commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			River. As part of the Participation Agreement, Tahltans will be consulted regarding all permits for such work.	
Geotechnical Issues	7.1.1.1	It is noted in Section 12.5.3 (Mitigation Measures): 'The waste dump slopes will be designed to resist earthquake forces as well by allowing for deformations without catastrophic failures. During operations and closure, the slopes will be designed with a safety factor for the 1:475 year return period earthquake, which has a peak ground acceleration of 0.097g. All final outer slopes will be designed to withstand the Maximum Credible Earthquake without allowing catastrophic failure.' [p. 12-24] There is some ambiguity in the statements above. Will the final waste dump design be based on the Maximum Credible Earthquake or the 1:475 year event?	Intermediate (i.e. temporary) slopes will be designed for 1:475 year event, however final (i.e. permanent) slopes will be designed for the Maximum Credible Earthquake. Commitment: None required.	Issue has been addressed.
Geotechnical Issues	7.2.1.1	5.5.3 Mine Design The avalanche dangers described at 5.5.3 (p.326) do not adequately consider avalanche dangers/impacts after the mine closes. A large avalanche or rockslide could significantly harm the tailings impoundment. The regulatory agencies should require a contingency plan - including a means to pay for to implement it, if the tailings impoundment is harmed by an avalanche or rockslide after mine closure.	Effects of a snow avalanche impacting the tailings impoundment and generating a wave was addressed in NovaGold's feasibility reports. This analysis showed that freeboard is sufficient to withstand snow avalanche generated waves. During operations, there will be an O&M manual in place that will describe avalanche management. The tailings dam will be included in the avalanche management plan. At closure, there will be yearly inspections of the dam. Equipment will be left in the vicinity of the dam in a covered facility for dam maintenance Commitment: During operations, there will be an Operations and Maintenance manual in place that will describe avalanche management for the tailings dam. At closure, there will be yearly inspections of the dam. Equipment will be left in the vicinity of the dam in a covered facility for dam maintenance.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Geotechnical Issues	7.2.1.2	5.9.4.5 Geomembrane Liner The environmental assessment states that a: 'Coletanche bituminous geomembrane liner has been proposed on the upstream dam face as a temporary measure to ensure the dam can store tailings in a timely fashion.' [5.9.4.5, p.5-189] The remainder of the tailings impoundment design calls for a: '...rockfill structure with an impervious (i.e. clay till) central core and a synthetic liner on the upstream face.' [5.9.4.3, p.5-165] These liners will only protect the integrity of the dam itself. They will not prevent seepage from the tailings impoundment from migrating into groundwater below and beyond the dam. Since this dam will impound material that can generate metals either through acid generation or metals leaching, the most protective approach	The BGC report 'Waste and Water Management - Feasibility Geotechnical Report' issued in April 2006, (Volume VII, Appendix 5-I) states that a geomembrane liner has been proposed on the upstream dam face as a temporary measure to ensure the dam can store tailings in a timely fashion. The liner will hold water, while the impervious core will be constructed downstream. The till core will be relied on to minimize seepage through the dam for the entire life of the mine with the exception of the first year of operations. High-density polyethylene	EAO notes that NovaGold has committed to install groundwater wells downstream of the main dam to intercept any seepage exceeding effluent permit limits.

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		would be to line the entire tailings impoundment to minimize seepage from the impoundment. The tailings impoundments should employ both compacted clay liner and a double-synthetic liner with leak detection system - over the entire tails impoundment - in order to provide maximum protection from metals contamination. This is the closest design available to ensure that the impoundment survives in perpetuity - that is, forever. The need for double liners is further supported by the seepage analysis presented in section 5.9.4.10. A double liner would also enhance the visual surveillance described in section 8.4.3 - because visible inspection can only observe the surface or dam face, which is not where leaks are most likely to occur. The compacted material underlying the high-density polyethylene liner should be specified/required as swelling clays, compacted to a minimum permeability of 1x10-8 centimetres per second. Using a double-synthetic liner with leak detection system, and underlying it with compacted swelling clays, increases the chance that if a leak occurs it will be more quickly detected, and that the underlying material may be able to re-seal, limiting the distribution/extent of contamination. This is particularly important because of the significant faulting identified in Section 5.9.4.2. The liner design should further employ a sand layer below and above the synthetic liner to protect it from compacting rock-punctures or human error (driving over the liner with heavy equipment or other vehicles).	was not recommended for the liner on the upstream slope of the tailings dam. A Coletanche bituminous geomembrane liner was proposed instead because it meets the rupture criteria for the anticipated working load of five MPa; has a better longevity than high-density polyethylene; and meets all the constructability constraints expected at Galore Creek. To minimize the risk of rupture of the liner from the underlying 76 millimetres minus waste rock shell material and prevent the migration of tailings through the liner in the event of a leak, a cushion/filter of select waste rock will be placed over the 76 millimetres minus waste rock and a geotextile will overlie this cushion/filter layer. The Coletanche membrane will then be installed on top of the geotextile. During operations, tailings will eventually be deposited on top of the geomembrane. The gradation of the cushion/filter is 19 millimetres (¾ inches) gravel to meet filter criteria between the tailings and the 76 millimetres (three inches) minus waste rock. The cushion/filter layer will be approximately four meters thick (horizontal thickness) to facilitate placement, and will be compacted to minimize deformations. To further protect the Coletanche liner from damage due to tailings deposition off the dam crest, a geotextile may be required under the slurry pipelines where the lines rest directly on the liner. As for lining the entire basin, this option has not been considered because it is assumed that the seepage out of the tailings dam and foundations will be dischargeable. As a contingency, in case seepage water quality is poorer than predicted, a seepage collection and pump back system has been designed immediately downstream of the dam. Commitment: None required.	
Geotechnical Issues	7.2.1.3	An omission in the avalanche discussion was the possibility of avalanche release being inadvertently initiated through ground/air vibrations generated by large mass explosive use to fracture rock in the pit operations. Such releases have been documented in: Russian-Norwegian project on seismicity-induced	Closure of the snow avalanche danger zones during winter open pit blasting operations would be standard operating procedure. During operations the Operations and Maintenance manual will have procedures outlining	Issue addressed.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		avalanches P. Chernouss et. al., Proceedings, International Snow Science Workshop, 2002, Penticton, BC Canada.	closure of snow avalanche danger zones affected by winter open pit blasting operations.	
Geotechnical Issues	7.2.1.4	Re Avalanches -- The development of a safety and operating plan covering every aspect of the feasibility study findings and recommendations is essential, and I would say necessary to be in place as a working document before the development permitting is granted. This would help insure that sufficient funding resources will be available to affect the program which to share holders and investors, would seem to be superfluous to the mining venture itself. As for environmental concerns, they really pale in the face of the mining/processing elements of this massive Project. However an effective avalanche mitigation program is essential to protect from spills of hazardous/toxic materials and maintain a safe workplace which is conducive to maintaining environmental controls. Worker health and safety is also a paramount concern, even more so as native/local persons are being asked to work for the company and insure its success. This avalanche project is probably the greatest undertaking of this nature, thus far in North America, and must be conducted conservatively to protect both the environment and human resources.	During operations, there will be an O&M manual that will contain the avalanche management plan.	Comment addressed by NovaGold.
Geotechnical Issues	7.2.1.5	Table 4.1 shows that debris-related hazards affects a total road length of 14.9 kilometres (11.5%) while snow avalanche hazards affects 22.9 kilometres (17.3%) of total road length. Combined, these geohazards affect 37.8 kilometres (29.3%) of the road length. The annual probability for pipeline rupture is 0.81 (an annual event would be 1.00). With mitigation, this figure is reduced to 0.01 for a reduction of 99%. Mitigation is defined as burial in a ditch on the upside of the road to a depth of 1.6 meters (Section 4.3).'The burial will protect the pipe from snow avalanches except where suspended above ground for river crossings. ... At locations where the pipe is exposed, a reinforced design (e.g. as steel or concrete) could be considered. Specific impact forces should be calculated in final design. Alternatively, the pipeline could be suspended above dense-flow avalanches and reinforced for powder avalanche impacts.' (Section 6.0) Where the pipeline is suspended for river crossings it appears to be integrated into bridge design, at least at this stage of feasibility and analysis documentation. I concur that, at this level of analysis and proposed mitigation, that pipeline rupture probability is as described: negligible where buried.	Comment noted. Commitment: None required.	No response required.
Geotechnical Issues	7.2.1.6	The nature of avalanche dynamics are such that flowing, sliding and entrained snow does not incorporate significant material at the sliding surface though avalanches can entrain some rock and soil which deposited in the debris cone. Significance is measured in contrast with debris flows which entrain rock from	NovaGold agrees that there are differences in entrainment characteristics between avalanches and debris flows. BGC specified the sections of debris flow channel crossings where burial depth is to be	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		pebble though gravel and cobble to boulder size from their paths and create channels and levee walls which may form on debris fans. These channels will not always form at the same location and may develop adjacent to earlier channels or at the margins of debris fans. These channels may or may not carry perennial water flows. I believe that channels can incise to the level of the buried pipeline and may threaten its integrity. It is possible that the disturbance created by the burial process (ditching) could exacerbate the tendency for debris flows to downcut from the surface disturbance to the level of the buried pipe.	exceeded. BGC is not aware of any cases where the ditching has exacerbated the propensity of scour. Since the pipeline ditch is running perpendicular to the channel direction there will be no changes in slope geometry. Commitment: NovaGold has committed to bury the pipeline except where it crosses streams on bridge structures, with deeper burial in areas assessed as having high geohazard potential.	
Geotechnical Issues	7.2.1.7	Other hazards to the pipeline not mentioned in the document would include. 1. ditch (road) maintenance which may uncover the pipeline; 2. frost heaving; 3. earthquake (this may be covered in another document) 4. failure of road bed due to earth movement, caused by slope integrity compromised from road construction, or plugged culverts.	The pipeline will usually be buried below average frost penetration depth. Regardless, the heat of the pipeline will likely keep the soil from freezing thus preventing frost heave. Pipeline burial will be maximized in "native" soil (not fill) to minimize the risk of movement. Pipeline markers will be installed and marker tape buried in the trench above the line to warn diggers of the pipe. The pipeline will not be installed in areas where liquefaction is a risk (i.e. earthquakes) and special burial design (commercially proven around the world) will be incorporated at any potentially active fault. Earthquake is a very low risk/impact to the buried pipeline. Pipeline operation will include regular right of way patrols to monitor for any earth movement which might jeopardize the pipeline. The patrols would identify plugged culverts, road bed movement, etc. Routine minor earthworks repairs are anticipated for the life of the project for road/pipeline integrity. Commitment: NovaGold will ensure that pipeline installation will address potential earth movements due to frost, earthquake and road settling. The pipeline location will be marked and a marker tape will be laid in the trench above the pipes to warn diggers of the proximity of the pipe. NovaGold will prepare an Operations and Maintenance manual, that will include pipeline inspections, for operation of the pipeline.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Geotechnical Issues	7.3.1.1	5.9.3.2 Hydrologic Design Criteria Overflow/overtopping the dam would release contaminated water into the environment via the emergency spillway. The dam	There is an error in Section 8.4.2.2 pg 8-53. It says that the tailings dam is sized to contain the Probable	Comment addressed by NovaGold.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		is designed to contain the 1 in 200 wet year discharge volume. 'For every year of operation, contingency will be provided to allow storage of all water inflows such as tailings supernatant, winter flows and freshet runoff for a nine month period (16th October to 15th July), if required. ... The dam is designed to contain the 1 in 200 wet year volumes.' [p. 5-158] However, for reclamation and closure the dam will be sized to contain the Probable Maximum Flood. [Section 8.4.2.2, p. 8-53] If the final dam design is one that will contain the Probable Maximum Flood, and there is non-potentially acid generating material available throughout the mine life (which will be stored in external waste dumps), why not build out the tailings dam so that it will also contain the Probable Maximum Flood during operation, instead of using a 1 in 200 year event as the dam design basis storm [see 5.9.3.2 Hydrologic Design Criteria)? Since there should be adequate construction material available to extend the height of the dam the few feet additional feet that would be necessary to contain the Probable Maximum Flood during mine operation, it would add significant safety and very little additional cost to provide this measure of safety. The dam and impoundment should be designed to hold water generated by the Probable Maximum Flood, plus residual snowmelt, not only for final closure, but also during the operational life of the mine.	Maximum Flood. This is incorrect; the tailings dam is sized to pass the Probable Maximum Flood through the emergency spillway on the east abutment. The Galore Creek tailings facility is designed to be able to retain water without discharge from 15th October to 15th July (i.e., nine months) in any year of mine operations, under runoff conditions up to 1 in 200 wet year conditions. These design criteria were chosen as the winter months were considered the critical months for water quality in the Galore Creek watershed. The design criteria provide for a very large volume of available storage within the tailings facility (>45 cubic millimetres for most of the operational life of the mine). Figure 7.5-13 (Volume II) of the environmental assessment illustrates the available storage volume within the storage facility and compares it to the volume of water produced in a 1 in 200 year storm event. It is clear that the facility will easily store a Q200 with no discharge through the spillway. For most of the lifetime of the mine (Year 2 to closure) the facility will be able to store between 85 to 100 % of the volume associated with a Probable Maximum Flood. In the first year of operations around 50 % of the volume would be able to be stored. Commitment: None required.	
Mine Plan	8.1.1.1	Filter Plant - 5.7.2.4 Concentrate Storage This section of the environmental assessment (5.7.2.4, p. 5-146-47) provides for concentrate storage but does not provide for storing concentrate water, which would be necessary if the treatment plant failed, froze, or otherwise could not treat water being sent thru the pipeline and separated from the concentrate. Therefore the concentrate storage facility and treatment plant both should include water storage capacity. The concentrate storage capacity is based on seven-days of production (p. 5-146, p.380) and therefore a comparable storage is necessary for the slurry water. Moreover, the mine should commit to not discharging untreated water to the Iskut or any other location should the treatment plant not clean water to the permitted/required standards. That commitment must be maintained even if it necessitates stopping slurry transport.	Commitments: The final design for the filter plant will incorporate sufficient redundancy and storage capacity to deal with any equipment maintenance and unplanned shutdowns. NovaGold commits to not discharge effluent which does not meet permit standards. Commitment: NovaGold commits to ensure that the final design for the filter plant will incorporate sufficient redundancy and storage capacity to deal with any equipment maintenance and unplanned shutdowns. NovaGold commits to not discharge effluent which does not meet permit standards.	EAO notes that NovaGold's commitments are included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Miscellaneous	9.1.1.1	5.7.3.2 Spillage and Dusting Control System -- Trucking It is proposed that the trucks that will carry concentrate from the filter plant to the port site will use	Tarpaulins are used successfully by several BC mines. It is in Nova Gold's best interests to not lose	EAO notes that NovaGold's commitment is included in Appendix F

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		tarpaulins or composite covers to keep the concentrate from blowing off the trucks during transit. 'Concentrate trucks and trailers will have tarpaulin or composite covers to reduce loss of concentrate due to dusting while underway.' [p. 5-148] Tarpaulin-covered trucks have a notoriously poor record for keeping finely ground concentrate from contaminating road corridors. Heavy metals from ore movement can accumulate along the haul roads and create long-term contamination problems with country foods and fish and wildlife impacts. Concentrate trucks should not use tarpaulins, which are notoriously 'leaky.' Hard-top covers should be used on concentrate trucks.	concentrate to dusting and the company does not intend to use a concentrate cover type that promotes loss of concentrate. Commitment: NovaGold will ensure that appropriate covers are used for concentrate trucks to minimize the loss of concentrate due to dusting. NovaGold has committed to participate with other industrial users of Highway 37 and government agencies to monitor for potential metals contamination resulting from contaminant dusting along the highway.	of the Joint Report and Schedule B of the EA Certificate.
Miscellaneous	9.1.1.2	5.11.2.1 Hazardous Wastes --Transportation The environmental assessment provides that during bad-weather lower speed limits and transportation of hazardous wastes may be enforced. (5.11.2.1, p.5-200). The mine should establish a detailed and concise travel plan that identifies conditions when restrictive speed limits or restrictive travel will be implemented, how they will be enforced, and a plan to handle/resolve unforeseen travel situations or events.	Once the access road construction is complete NovaGold will develop a management plan for use of the road. This plan will be adapted over time based on experience. Commitment: NovaGold will develop Emergency Response and Spill Contingency Plans for all aspects off the Project, including the access road, filter plant, tunnel and processing plant.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Miscellaneous	9.1.1.3	The environmental assessment should identify exactly how specific wastes created at the mine will be stored, transported, and otherwise handled - on an item (waste) by item basis. This is generally described in Table 5-11.2 and is discussed in more detail in Section 5.12.1.9 but neither sufficiently identifies or considers restrictions on timing (when amount of wastes allowed to be delivered or stored in individual locations or in removal areas), transport, containment measures, emergency spill response, spill notification triggers and protocols, etc. There are no clear limits and restrictions on hazardous waste handling, storage, and/or disposal. This is necessary and appropriate to minimize human and decision-making errors. These steps also provide a measuring-stick against which the mine's performance may be compared.	Commitment: NovaGold will develop Emergency Response and Spill Contingency Plans for all aspects off the Project, including the access road, filter plant, tunnel and processing plant.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Miscellaneous	9.1.1.4	Catastrophic Dam Failure -- Naturally, the potential for a catastrophic failure of the tailings and waste rock impoundment dam is of great concern to us. It is likely that such a failure would result in severe, largely unmitigable impacts on the Stikine River system, including the salmon that are such a central part of our culture and way of life. We do not believe that NovaGold has provided an adequate description of the potential consequences of such a failure in their Application, and request that they provide such a description as a supplemental	Commitments: NovaGold has committed to: • establish an ongoing initiative with the Tahltan and relevant Canadian and U.S. federal and B.C. and Alaska state agencies to assess, at a conceptual level, the effects of a catastrophic dam failure and to develop a program for remediation of those effects;	EAO notes that NovaGold's commitments are included in Appendix F of the Joint Report and Schedule B of the EA Certificate.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		report.	• construct the tailings dam to Canadian Dam Association guidelines (1999) to withstand a 1 in 10,000 year earthquake and avalanche induced wave and to safely pass a Probable Maximum Flood; • equip the dam with instrumentation to monitor geotechnical performance during operations and after closure; • maintain earthmoving equipment near the dam to support inspection, maintenance and repair functions after closure; and • develop a long term maintenance and mitigation strategy for the dam and spillway for both operations and closure, including inspections annually and after significant events such as floods and earthquakes, and dam safety inspections, following Canadian Dam Association guidelines, every five years.	
Monitoring	10.1.1.1	It is proposed that 'A modified environmental effects monitoring program will commence at closure and extend into post-closure, until it can be determined that no effects to water quality are occurring' (Page 7-256 of the Application). Furthermore, it is stated on Page 7-311 that, following closure, 'Discharge or water use management may be required, and if these measures were unsatisfactory then treatment may be used, based on the environmental effects assessment program results'. Is NovaGold making a commitment to do the post-closure environmental effects monitoring (perhaps for many years until the onset of acid rock drainage generation from pit walls) and to implement any measures that might be required to mitigate potential water quality issues that might develop?	Commitment: NovaGold will undertake post-closure environmental effects monitoring as per permit conditions. Monitoring is expected to continue until regulatory agencies are confident that the site has achieved a stable and predictable condition.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Monitoring	10.1.1.2	Section 7.13.3.3 -- The access route does come close to some important ridges (mountain goat survey units 6A, 6B, and 9) that have summer and winter observations of mountain goats. While a local effect, it should be part of the monitoring plan for the road.	Commitment: A detailed wildlife monitoring plan will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Monitoring	10.1.1.3	8.7.9 Post-Closure Monitoring Post-closure monitoring can be a very important element of waste management. If critical conditions, like impending dam or waste dump failure, or the onset of acid mine drainage, are not detected in a	The five-year monitoring frequency applies only to mine area seeps. Post-closure monitoring will be a component of the closure and reclamation plan that will	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		timely manner, the costs of remediation can escalate exponentially. It is stated in the environmental assessment: 'The post-closure monitoring program will be designed to continue the sampling of seeps monitored during operations. Monitoring will be relatively infrequent, possibly every five years, immediately after mine closure. Depending on possible indications of accelerating oxidation and potential acid rock drainage onset, such as increased metal leaching, monitoring may be done more often, perhaps yearly. This program would be combined with the overall monitoring program for the tailings and waste rock impoundment following closure.' [p. 8-114, emphasis added] Monitoring once every five years, especially immediately after mine closure, will not be adequate to detect problems in time to devise and implement effective remediation measures. A detailed post-monitoring plan should be devised that adequately outlines the monitoring required to detect environmental and structure-related maintenance issues and the budget needed to support these activities incorporated into post-closure funding.	also define dam safety inspection frequency. The dam safety inspection program will be consistent with the Canadian dam safety guidelines. Commitment: Post-closure monitoring will be a component of the closure and reclamation plan that will also define dam safety inspection frequency. The dam safety inspection program will be consistent with the Canadian dam safety guidelines.	the EA Certificate.
Monitoring	10.1.1.4	The Application indicates that fish (Dolly Varden) flesh will be monitored for mercury every three years or more frequently if the discharge water from the Galore Valley impoundment has a mercury concentration of 0.1 micrograms per litre or more. It is not clear in the Application whether other metal concentrations in fish flesh will be measured at this time, but we believe they should be. The Tahltan expect to be involved in finalizing the monitoring plan for this aspect of the Project.	Commitment: NovaGold has committed to monitor fish health and tissue quality, including but not limited to, analysis of the full suite of 30 metals used in the, in Galore Creek and other potentially affected rivers as part of the Aquatic Effects Monitoring Program pursuant to the Environmental Management Act and the federal metal Mining Effluent Regulation.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Monitoring	10.1.1.5	Application Section 10.5, Wildlife and Wildlife Habitat The monitoring program for focal species needs to be able to determine whether a change has occurred, whether that change is the result of the project, and whether the mitigations described in Section 8 are effective. The way it is currently described, it does not provide enough detail on the types of monitoring techniques being employed, the degree of rigour of the techniques, and to what extent the results are measurable. It would be beneficial to have it better defined. For example, winter moose population surveys are proposed for both coastal and interior populations but it is not indicated what type of survey technique would be used. In regards to mountain goats, the surveys for population status should be in summer and given that sightability estimates are unknown, repeated surveys of the same units would be good to see variability of baseline estimates. Winter surveys should be considered for adjusting habitat mapping with existing survey data and to better determine whether lower elevation habitats are being used to greater extent in winter. It is described but more detail is required. In addition,	Commitment: A Wildlife Mitigation and Monitoring Plan will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives.	EAO notes that NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.

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		monitoring on the effects of noise and other effects on mountain goats needs to be included to determine whether reproductive stress or habituation is occurring at the local and landscape level. The monitoring for western toads needs further clarification to better understand whether the methods proposed will provide the desired results. The continued DNA collection for grizzly bears of both populations is great and can add to the long term monitoring of both populations. Although it may not be statistically feasible to estimate separate coastal/interior population sizes in the north study area, absolute numbers of coastal vs. interior bears should be reported in future for ease of trend comparison. Will the same sites be used or will another sampling scheme be used? It would be beneficial to capture movements across the access route for the interior bear population. Further detail on the proposed monitoring for grizzly bears would be useful. It would be useful to have additional monitoring for grizzly bears identified and detailed for the Porcupine River and Sphaler Creek. Collection of plant and animal material for environmental contaminants should continue to occur in the mine and access footprint but also within the study area. This could be accomplished through support of the Tahltan Environmental Contaminants Collection Program. Periodic monitoring for waterfowl, raptors, and songbirds should also be considered, given they are valued ecosystem components, and an important obligation under the *Migratory Bird Convention Act*.		
Navigable Waters	11.1.1.1	Flood Events and Water Crossings/Conveyances The roads discussion proposes to use the 100-year flood event for road design. This is not an adequate safety standard, in particular because the roads will be used to transport hazardous and toxic materials, and some of the bridges may be used for concentrate pipe and diesel pipe crossings. The mine should employ at least the 500-year event flood as the basis to design any water crossing where anything less than the 500-year event could significantly damage a road or pipe crossing. At a minimum, the inadequacy of the 100-year flood standard is supported by the use of the 200-year event level for navigable water crossings. (See 5.12.1.9, p.5-236). The same comment applies to culverts and other water conveyances. The mine will operate for approximately 25 years. The 100-year event is not sufficiently protective of natural resources in this unspoiled area.	The road has been designed to standards consistent with or exceeding those used for other resource roads in BC. Commitment: None required.	Ministry of Forests and Range notes that it is satisfied with standards being used to design the access road.
Navigable Waters	11.1.1.2	The goal of any bridge spanning a fish-supporting water body should be to set the span of the bridge sufficiently back from the water body so that no water diversion or containment (including rip-rap) is required. In other words, rather than contain the water to accommodate the bridge, the bridge should be longer and/or higher, thereby avoiding entirely contact with the footprint of the water body. This will eliminate the impacts from riprap and other 'protective' measures. (See 5.12.2.4, p.5-247).	All Commitment: All crossings will be designed to span and not encroach upon the bankful width of the stream. Riprap will be used to protect bridge abutments.	EAO notes that NovaGold has addressed the comment.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
Pipelines	12.1.1.1	5.7.1 Concentrate Pipeline, 5.7.1.1 Pumping System, Alignment, Specifications and Operations The mine proposes to install pipelines from the mine to the Junction of Highway 37. 'The pipeline will be buried over its entire length to a depth in compliance with ASME B31.11. Depths will range from 1.6 to three meters depending upon the geotechnical risks at each site, with deeper burial proposed for sites, such as potential debris flow channels, with higher risk. The alignment will generally be under the access road ditch, but minor diversions will be required to maintain appropriate grades to avoid the settlement of solids in low points during shut downs. Directional drilling will be used to install the pipeline under four streams and it will be attached to bridges for another 19 crossings (Table 5.7-1). Elsewhere it will be buried in a trench under the crossing. Where the pipeline is attached to bridges it will be insulated to prevent freezing.' [5.7.1.1, p.5-135]. There is a presumption that the company would protect its concentrate, because that is the value extracted from the mine, but this significant pipeline network (both concentrate and diesel fuel) warrant physical protection beyond just burial (such as double-wall pipe with leak detection). This is supported by the euphemistic statement, 'Control of the system will be automatic in the steady state mode with operator intervention required during process upsets' (p.5-137) which essentially translates into 'the system is monitored and controlled in the field and there is little or no monitoring or control from the control room.' There is no indication that the 'control room' control can even indicate minor leaks. Nor is there any plan to access the pipeline if it leaks in winter and is covered by snow/ice. The suggestion that air and nitrogen will be used to evacuate the pipe does not indicate its ability to successfully remove liquids and solids, particularly during freezing weather and/or in low points, which could freeze/crack and release contaminants into the environment. There should also be a pre-planned pipeline inspection and maintenance program to ensure that the pipelines both maintain integrity. Finally, there should be a contingency plan to ensure a timely, adequate, and complete response to leaks. A full contingency and response plan should be developed and implemented to ensure that in any season any leak will be detected, the pipelines are shut-down, the pipelines are emptied, and leaked materials are extracted from the environment. The pipeline monitoring systems should be completely independent, so that a failure of one of the monitoring systems does not impair the monitoring of the other. Even with the independent monitoring systems, in the event of unplanned shutdown of one pipeline, the other pipeline should also be shut down to ensure that the disturbance/event that injured one pipeline did not injure the other.	NovaGold proposes independent pipeline monitoring systems for the concentrate and diesel pipelines as described in the PSI report on the pipelines posted to the EAO website under Concurrent Permitting. Commitment: A program of regular inspection and maintenance will be implemented and contingency and emergency response plans will be developed. Pursuant to the Participation Agreement, the TCC will have an opportunity to comment on the draft pipeline permit application.	EAO notes that NovaGold has committed to equipping the pipelines with leak detection systems to permit rapid detection and response to leaks or ruptures due to erosion of the pipe or damage from external sources such as debris flows. NovaGold has also committed to providing shutdown procedures, shutoff valves, a spill response plan and an emergency drainage sump at the low point of the slurry pipeline alignment to minimize the extent and consequence of any spillage from the pipeline following a breach to the line.
Pipelines	12.1.1.2	5.7.1.2 (Slurry Pipeline) Protection System There are several potentially	Commitment: NovaGold will provide comprehensive	See response to 12.11.1.1.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		problematic issues with the slurry pipeline protection system that need further analysis in the environmental assessment. It is stated: 'The pipe would have five pressure monitoring stations, one at the mine pump station, three at intermediate monitoring stations and one at the terminal station to support pipeline operations and for leak detection. The monitoring stations will be powered by independent propane-fuelled generators (two kilowatts each). The leak detection system will issue a warning and predict the location of a leak within two to fifteen minutes of an occurrence. The principles of leak detection are a comparison of the flow rates, pressures and densities along the pipeline based on the flow regime in the line and the position of the pipeline valves. Isolation valves will not be installed along the line. Experience elsewhere has shown that isolation valves in concentrate slurry pipelines disturb the flow pattern of the slurry, causing extensive scouring and abrasion leading to pipe failures.' [p. 5-138, emphasis added] There is no discussion of how much material could be lost during the fifteen minutes it might take to discover the presence and location of a pipeline break, or how much material would be lost in a worst case situation if a portion of the pipeline ruptured with no check valves in the system. A rupture of the slurry pipeline at a stream crossing could result in the discharge of the equivalent of (how) many truckloads of concentrate into the environment. Unlike dried concentrate, the slurry concentrate would be highly mobile. In this particular location, with avalanche danger of avalanches and rock slides, the slurry pipeline could actually pose more potential environmental danger than trucking the concentrate in hard-topped trucks. The environmental assessment needs more analysis of these potential failure situations.	plans for management of the pipeline as part of the permitting process under the *Pipeline Act*. NovaGold will assess potential pipeline failure scenarios and their consequences as part of emergency response planning prior to start up.	
Pipelines	12.1.1.3	The environmental assessment describes a 1,200 cubic meter internally supported covered tank to collect the concentrate pipe’s contents in an emergency [5.7.1.2, p.5-138]. An emergency-tank/system (multiple locations if necessary) should be available to passively (gravity) empty/contain the entire pipeline content and also separately for the diesel fuel pipeline.	The current design calls for an emergency drain tank for the concentrate pipeline with capacity to hold all of the concentrate in a worst case scenario. The much smaller diameter diesel pipeline will be equipped with more check valves and has been designed to operate independently of the concentrate pipeline. Details of these systems can be found in the PSI report posted on the EAO website under Concurrent Permitting. Commitment: None required.	See response to 12.11.1.1.
Social and Cultural Effects	13.1.1.1	The reader should refer to Section 5.7 of the document 'Tahltan Comments on the Application by NovaGold Canada Inc. for an Environmental Assessment Certificate for the Galore Creek Project, October 18, 2006' for general background information on the comments in this section of the Issues Tracking Table.	Comment noted. Commitment: None required.	No response required.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
Social and Cultural Effects	13.1.1.2	Under the BC Environmental Assessment process, the Terms of Reference for an Environmental Assessment do not adequately address social and cultural effects.	Comment noted. This is an issue for discussion between the Tahltan and the provincial government. Commitment: None required.	See response to 5.1.1.7.
Social and Cultural Effects	13.1.1.3	The proposed project will result in a loss of pristine traditional land, which will adversely affect our cultural connection to the land.	It is recognized that development can have temporary impacts on the landscape. However, these impacts can be offset by economic benefits through the creation of jobs and business opportunities leading to more sustainable communities. For the Tahltan, the Participation Agreement includes measures to mitigate and enhance culture and heritage. Commitment: None required.	EAO notes that the Participation Agreement with the Tahltan is intended to address potentially negative effects of the Project. As part of the Tahltan-BC reconciliation table, the EAO is participating on a Social/Cultural Working Group to: discuss existing processes for addressing potential socio-cultural effects of resource developments within the Tahltan traditional territory; and identify the Tahltan's interests in socio-cultural effects assessment environmental assessment process. The EAO anticipates these discussions will lead to improvements in social cultural effects assessments for reviews of other projects in the Tahltan traditional territory.
Social and Cultural Effects	13.1.1.4	We recognize that the Project will have some positive economic effects (e.g., more jobs and income) on the Tahltan	Comment noted. Commitment: None required.	No response required.
Social and Cultural Effects	13.1.1.5	It is likely that the Project will contribute to a variety of adverse social and cultural impacts on the traditional structures and communities of the Tahltan, including: increased level of domestic violence; increased gambling and substance (alcohol and drugs) abuse; increased property crimes; marginalization of the elders; decreased interest in obtaining higher level education (or even basic literacy and numeracy skills) as young people choose immediate high paying employment at mine; changes in social status and structures within families and communities; loss of support systems through loss of Tahltan members to employment at mine; reduced interest and engagement in traditional activities, and resulting loss in ability to pass on this knowledge; Increased inter-generational dissociation; more single-family homes; loss of adult male role models in families; increased family stress as a result of two-week rotation fly-in-fly-out schedule at mines; loss of females to employment at	It is agreed that a range of impacts, both positive and adverse, may occur as a result of the Project. These have been considered and assessed as part of the Galore Creek effects assessment (see Volume II, Chapter 7 and Appendix 6-S). Baseline conditions show the existence of some issues and trends which may be compounded by a new development, such as the Project, in Tahltan territory. The actual nature and extent of some of the potential Project effects are difficult to assess and predict, however, due to their dependency on individuals, their histories, their capacity to cope with change and choices made. As a result, the extent of change and cumulative nature of effects is	See response to 13.1.1.3.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		the mine, and decreased practice of traditional lifestyles; influx of non-Aboriginal migrant workers into communities resulting in increased pressure on housing and community services (e.g. educational, policing, child welfare, drug and alcohol counselling, family counselling, justice systems, medical support, etc,) and dilution of traditional lifestyle and activities; greater likelihood of non-Aboriginals marrying or fathering children with Aboriginal women, leading to greater dissolution of the Tahltan Nation, an increase in the number of single parent households, and the loss of *Indian Act* status for children that arise from such unions; increased demand for intervention by front line community workers; loss of language, culture, and participation in traditional and historic activities; increased stress and stress related illnesses; increased prevalence of sexually transmitted diseases; increased incidence of Fetal Alcohol Syndrome; increased consumption of less healthy foods and increased incidence of diseases such as diabetes; increased accidents from heavier traffic along Highway 37; and increased deaths from accidents and suicides The specific adverse social and cultural effects that result from the Project will act cumulatively those adverse effects from other development projects in the Tahltan territory.	often beyond prediction. Where the environmental assessment has considered a high likelihood of effects, mitigation and management measures have been proposed. NovaGold is also aware that new or different issues and effects may arise at different stages of project development. Therefore, the Participation Agreement ensures on-going monitoring and assessment of social, cultural and heritage issues alongside environmental issues. The Participation Agreement aims for collaborative work with the Tahltan Nation to enhance socio-cultural and socio-economic elements. To this end, mechanisms such as the Human Resources Committee, workplace commitments, Tahltan Heritage Trust, and a scholarship fund have been agreed with the Tahltan. Commitment: NovaGold will honour the conditions of the Participation Agreement that provide avenues to mitigate social and cultural impacts of the Project on the Tahltan people.	
Social and Cultural Effects	13.1.1.6	The Application quotes the 2005 socio-economic overview assessment as stating that '...the effect of one mining development may be significant, while the impact of a second or third mining development would be less so.' This statement is not supported by any evidence that we are aware of, and is in fact contrary to our experience and common sense. As more mines and other development activities occur in Tahltan territory, there are clearly predictable cumulative impacts on our environment, health, social and cultural indicators.	This quote is from a report prepared for the provincial government and the context refers to employment. It is a secondary source for the environmental assessment Application. The statement has been used in the environmental assessment to highlight that the effects of projects subsequent to the first will not be experienced with the same level of intensity. With greater awareness of project components and processes, potential impacts and potential benefits from mitigation and enhancement measures, individuals and communities may be better placed to cope with the changes brought about by subsequent projects. Commitment: None required.	See response to 13.1.1.3.
Social and Cultural Effects	13.1.1.7	The NovaGold assessment of social and cultural effects was limited by the lack of an appropriate model for determining and measuring socio-cultural impacts. We recommend that the provincial government assist the Tahltan Nation to develop a specific and unique model should be developed for determining and measuring socio-cultural impacts that can be used both within and outside of	The NovaGold assessment was developed after extensive methodological research and development across the disciplines. The model used covered both bio-physical and human environments and was developed to meet *BC Environmental Assessment Act*	As part of the Tahltan-BC reconciliation table, the EAO is participating on a Social/Cultural Working Group to: discuss existing processes for addressing potential socio-cultural

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		future development assessment processes such as the environmental assessment process. Such a model could be a process for determining what needs to be part of an environmental assessment's Terms of Reference, and could also be used in cases where the environmental assessment process doesn't apply, or more broadly in helping the Tahltan Nation to determine their own vision. The development of a comprehensive social impacts assessment model would include: establishment of a 'baseline' of social conditions in the community, including community consultation and research; identification of those social indicators that will be used to assess the impacts of the development; measurement and monitoring of social indicators; preparation of initial reports and recommendations; and delivery of recommendations to developer.	and *Canadian Environmental Assessment Act* requirements. The Participation Agreement was structured such that the Tahltan Heritage Trust is a funding mechanism to address and mitigate social and cultural impacts of the project. Commitment: NovaGold will honour the conditions of the Participation Agreement.	effects of resource developments within the Tahltan traditional territory; and identify the Tahltan's interests in socio-cultural effects assessment environmental assessment process. The EAO anticipates these discussions will lead to improvements in social cultural effects assessments for reviews of other projects in the Tahltan traditional territory.
Terrestrial Ecosystems	14.1.1.1	The only reference to field sampling with respect to predictive ecosystem mapping is on page 3-12 of Appendix 6-J; it states that: 'There is no minimum field sampling requirement for predictive ecosystem mapping, however, efforts were made to collect sufficient data throughout the area to gain a reasonable understanding of the spatial relationship between site series and landscape features.' Table 3.6-1 indicates that no surveys were conducted. The documentation (i.e., Application and appendices) does not provide any indication of map reliability. Given that the project area is in previously un-described terrain, with unclassified ecosystems, the potential for predictive ecosystem mapping to be accurate is lower than most, for example compared to areas that are well documented and, provincially classified and described. It is recommended that the ground truthing for the predictive ecosystem mapping component of the mapping be described in more detail.	Table 3.6-1 reports applicable survey intensity level. In this case of predictive ecosystem mapping, N/A means not applicable, indicating that although surveys were completed, there is no standard level required. It does not mean that plots were not conducted for use in the development of the predictive ecosystem mapping. In the field, surveys are the same, regardless of the map base (terrestrial ecosystem mapping/predictive ecosystem mapping). The plots conducted for the Project served a dual purpose. 1) to thoroughly describe areas that were to be disturbed by mine activities, and 2) to try to reach the survey intensity levels outlined for terrestrial ecosystem mapping. All field plots fed into the models and relationships used to develop the predictive ecosystem mapping. Similarly, travel to/from sites during the day were also used as opportunities to make notes that would be fed into the predictive ecosystem mapping Commitment: None required.	EAO notes that this issue was discussed at a meeting on November 23, 2006 and the Tahltan Nation participated in that discussion.
Terrestrial Ecosystems	14.1.1.2	It was noted that at the end of Appendix 6-J, a long table of plots was provided for both terrestrial ecosystem mapping and predictive ecosystem mapping. This means that the reader must go through this table line by line to count the number of predictive ecosystem mapping plots. This method of reporting is not acceptable. A summary table should be provided indicating the number of plots, distribution of plots and a prediction or estimate of map reliability and/or limitations.	Plot details (numbers, distributions) are provided in Figures 4.3-2 and 4.3-3). The use of this field data to estimate map reliability is not appropriate as the information was used to refine the map. Map reliability assessments are separate undertakings, usually conducted by someone independent of the party that developed the map.	See response for 14.1.1.1.

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			Commitment: None required.	
Terrestrial Ecosystems	14.1.1.3	Rare ecosystems -- It is not clear how rare ecosystems will be impacted overall. What is the status of these rare elements on a local perspective? Or a regional perspective? What is the predicted cumulative impact on these sensitive areas? Are certain projects such as mining project more likely to impact sensitive areas such as alpine areas in comparison to say forestry operations? What is the threshold of sensitive communities within a regional landscape to withstand certain influences by humans whether it be mineral exploration, mining, or recreation and tourism?	Details pertaining to the effects of the Galore Creek project on rare ecosystems and alpine areas have been provided throughout Section 7.12. The local and regional perspectives of these elements are unknown. Rare ecosystem status has been provided by the CDC. Those identified in the Project are blue-listed and have therefore been identified elsewhere in the province. Cumulative impacts on these sensitive areas would be similar for those discussed generally in the cumulative effects assessment. Specific mention of the potential increase in disturbance of parkland/alpine areas due to the access road has been identified. It is not reasonable to compare the mining and forestry sectors because of the significant variability in the potential locations of these resources. Sensitive community thresholds are entities that require definition and are currently unknown at all scales (local to provincial and beyond). Thresholds can be defined as much by society as by ecology. The concept of thresholds encompasses an area of ecological study and theory that goes way beyond the scope and requirements of the current effects assessment. Commitment: None required.	See response for 14.1.1.1.
Water Quality	15.1.1.1	We require more information on the analyses that were used to conclude that impoundment water will be suitable for direct discharge to the environment after mine operations have ceased. We also believe that the permitting for any discharge from the Galore Creek valley impoundment must clearly lay out the circumstances, and the decision making process, under which various types of mitigation, including water treatment, would be triggered. We anticipate that these triggers would be based primarily on monitoring information. We also expect that the Tahltan would be involved in developing the triggering conditions during permitting, and in the decision making process that might lead to additional types of mitigation.	Details of the water quality prediction model for the Tailings Impoundment are provided in Appendix 7-D. In addition, NovaGold is preparing a report outlining additional modeling of pit lake and tailings facility water quality. As per the Participation Agreement, the TCC will be consulted on all permits. Commitment: NovaGold will prepare a report outlining additional modeling of pit lake and tailings facility water quality. As per the Participation Agreement, the TCC will be consulted on all permits.	See response for 2.1.1.3.
Water Quality	15.1.1.2	Page 7-219 - Some rock faces exposed in the excavation of the eastern diversion channel may be potentially acid generating. It is not clear how these	Commitment: Acid generation of excavated faces will be assessed during diversion channel construction. An on-	EAO notes that NovaGold has committed to assessing acid rock

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		potentially acid generating rock faces, if found during the building of this diversion channel, will be remediated in a way that mitigates potential future acid rock drainage issues.	site laboratory will be available for characterization of excavated rock. Appropriate long term mitigation will be developed for potentially acid generating rock encountered during construction.	drainage potential of excavated faces during access road and diversion channel construction, using an on-site laboratory, and develop appropriate mitigation, including mitigation for closure, for any acid rock drainage encountered. Will continue to collect hydrological data within the study area throughout the life of the project to update the water balance and hydrological models.
Water Quality	15.1.1.3	We note that the location of the Filtration, Storage and Loadout facility has changed since the Application was submitted. We would assume that this would result in a new effluent discharge location in the Iskut River. Has the diffuser and water quality modeling been revised to look at the potential impacts of the discharge at this new location?	The location of the filter plant discharge has not changed; therefore modeling is based on correct information. Commitment: None required.	NovaGold has addressed the comment.
Water Quality	15.1.1.4	7.6.4.1 Effluent Discharge - Galore Creek Water quality in Galore Creek will be maintained by storing effluent during the winter low-flow periods and scheduling release during high-flow periods (mid-May to mid-October). [see p. 7-231] There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River [see 7.6.4.1 Effluent Discharge, p. 7-231]. The Scud River will be used as a mixing zone for the mine effluent discharge starting at the junction with Galore Creek. Galore Creek is now totally ‘utilized’ for dilution. In addition to Galore Creek, the Scud River will be used as a mixing zone for ammonia, selenium and cadmium the mine effluent discharge. There is no treatment proposed for the tailings pond discharge to Galore Creek/Scud River, which requires a mixing zone in the Scud River for many constituents, most notably ammonia, lead, zinc and cadmium. [see Galore Creek Application, 7.6.4.1 Effluent Discharge, p. 7-231, and Table 7.6-16] The Scud River already has metals levels that occasionally or always exceed regulatory guidelines. The metals that are always in excess of guidelines are aluminum, cadmium, copper, iron and lead. The metals that occasionally exceed guidelines are arsenic, cobalt, selenium and zinc. [see Table 7.6-12] As shown by the calculation for zinc in Table 7.6-11, the increase in the levels of contaminants can be significant. In addition, there is no prediction of the length of the 'mixing zone' required for the Scud River: 'As the geographic limit of the water quality model is Scud-2, there are no water quality predictions downstream of this point. In the absence of this information, it has been conservatively estimated that effects could potentially extend as far as the	Detailed modeling of mixing within the Scud River was outlined in Volume II, Section 7.6. This modelling work was undertaken using the MIKE-21 hydraulic model. The model predicted that full mixing was obtained before the Scud-2 monitoring station. Potential toxic effects to aquatic life (benthos, fish, algae) were calculated using the hazard quotient method. It was concluded that the potential exists for low level effects to aquatic life within the mixing zone. Commitment: None required.	MOE notes that background conditions are taken into consideration and in some cases; proponents develop site-specific water quality objectives. There are certain restrictions (e.g., cannot be acutely toxic). Also have chronic toxicity and acute test work is required. The location of the compliance point will be determined during the permitting stage. . MOE has asked the Proponent to identify possible water treatment options As part of the permitting stage. EC notes the following: 1) The final discharge point under the Metal Mining Effluent Regulation (MMER) would be the discharge from the tailings impoundment. MMER effluent requirements must be met at this point. The MMER require non-acutely lethal effluent, and limit the deposit of deleterious substances. 2) EC does not recognize a mixing

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		confluence of Contact Creek (approximately six kilometres downstream of Scud-2), the first significant tributary after Scud-2. It has been calculated that Galore Creek flow comprises 0.3% of the Stikine River flow (Appendix 6-C). Therefore, effluent release to Galore Creek is anticipated to not affect water quality in the Stikine River.' [p. 7-256] The limits for the mixing zone in the Scud River need to be defined, and the potential impacts on aquatic life in the mixing zone thoroughly discussed.		zone where regulated limits may be exceeded in the receiving environment. All effluent must meet MMER requirements and be non-acutely lethal. 3) In practical terms, effluent obviously mixes with receiving environment waters. CCME water quality guidelines, or any site specific guidelines that are established, are recommendations, and the way effluent mixes will be a factor in how the guidelines are applied. 4) Aquatic life site specific guidelines are derived to be protective of indigenous organisms under site conditions to which they are adapted. The CCME provides guidance regarding how to derive site specific guidelines. 5) The MMER include requirements for environmental effects monitoring (EEM) in Schedule 5. A regulated facility is required to determine the extent, magnitude, and cause of any effluent effects it may cause on fish, fish habitat, or the use of fish resources. If effects are deemed unacceptable, further management actions may be required. 6) As there is a risk that the proposed discharges may not attain site specific guidelines (or provincial water quality objectives) or may cause environmental effects, Environment Canada recommends that the proponent develop contingency plans. Point 5 is somewhat theoretical as no regulated facilities have progressed to this point in their EEM programs, but there are precedents (e.g., Eurocan

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
				(taint) and Port Alberni (low D.O.)).
Water Quality	15.1.1.5	The discussion of nitrate contamination in section 7.7.3.1 states that: 'During the construction and operation phases, the amount of ammonium nitrate/fuel oil expected to be used is estimated to be approximately 221 Mkg (Hatch, 2005). With application of best practices to ensure maximum consumption of ammonium nitrate/fuel oil in the explosions, expected amount of undetonated ammonium nitrate/fuel oil is estimated to be 2.21 Mkg or 1% of the total. This undetonated amount of ammonium nitrate/fuel oil is significant and will contribute a significant amount of nitrate and ammonia to the surface and ground waters. However, since all surface and groundwater flow from the pit areas will be directed into the tailings impoundment, it is expected that most ammonium nitrate/fuel oil contaminated water will be captured and diluted to low concentrations in the tailings impoundment.' [7.2.8.3, p.315] Based on nitrate contamination and persistence at many other mines, these predictions are suspect. A contingency plan for dealing with nitrate-based compounds in surface or ground water should be developed.	Residual ammonium nitrate concentrations in the impoundment were modeled based on the mass balance model used for all water quality predictions. The amount of residual ammonia-N, nitrate-N and nitrite-N were derived using the modified EC model developed by Pommen MOE and modified by Ferguson and Leask EC. The projected total amount of ammonium nitrate used during the three year construction period and the 22 years of operation is 221 million kg (Hatch Feasibility Study). The predicted split of ammonium nitrate explosive as ammonium nitrate/fuel oil (dry-water soluble) and slurry (wet-waterproof) is 1:1. The amount of residual explosive loss as nitrogen based on the Environment Canada model was 0.94% for ammonium nitrate/fuel oil and 5.1% for slurry. The apportion of inorganic nitrogen load for predicting concentration in the impoundment was 87% as nitrate-N, 11% as ammonia-N and 2% as nitrite-N. Based on the above assumptions, the predicted concentrations for various nitrogen species in the impoundment were assessed downstream in lower Galore Creek and the Scud River. The levels predicted were well within safe levels for aquatic life in the receiving environment. The method used to derive the concentrations was based on MOE and EC methodology which is very conservative. The statement that the predictions are suspect is unfounded and not warranted. There will be an extensive monitoring program which will include regular sampling and analysis for nitrate, nitrite and ammonia in pit dewatering, waste dump runoff, tailings, and the impoundment. This monitoring will provide an early warning system of any changes from the model prediction. The main area of concern with explosive residue is primarily housekeeping, i.e., handling around drill pattern and during infilling of the drill holes. Appropriate loading of wet holes with water insoluble slurry explosive versus dry ammonium nitrate/fuel oil	MOE notes that nitrite, nitrate and ammonia levels will be set in the EMA permit. EAO notes that NovaGold has committed to use emulsion explosives as required to minimize ammonia and nitrate losses and contamination. NovaGold has also committed to address potential for ammonia leakage from the explosives manufacturing and storage facility by using measures such as non-corrosive silos, an impermeable apron and a Spill Management Plan.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			water soluble explosive is a key factor in minimizing the amount of residual explosive. Fine tuning explosives handling procedures will be the main contingency plan in the event that residual species of nitrogen exceed the predicted concentrations in the impoundment. Commitment: NovaGold will address potential ammonia leakage from the explosives storage facility through mitigation measures including non-corrosive storage silos, an impermeable apron and a spill management plan.	
Water Quality	15.1.1.6	The tailings impoundment's impacts to water quality over time could be significant. The environmental assessment states that: 'Seepage of water from the tailings impoundment to the groundwater regime is expected since the K value of the underlying rock is estimated to be 10-5 meters per second to 10-7 meters per second (Table 7.7-4). The potential of groundwater contamination from the tailings impoundment is an issue if seepage below the impoundment dam is in fact carrying contaminants and the flow is not captured before discharging into Galore Creek or the Scud River.' [7.7.3.1, 7-287-88, p.318-19] The environmental assessment then goes on to describe methods to limit seepage below the tailings impoundment dam. As discussed elsewhere in this document, the best method to prevent seepage is to install proper liners to fully contain the tailings inside of the impoundment. Natural rock and other materials proposed are important but they are not substitutes for proper clay and geosynthetic liners and leak detection systems. Methods for this are described elsewhere in this document but simply stated, in addition to sub-liner protections (grout, monitoring, pumpback if necessary, etc) the tailings impoundment should at a minimum include a thick compacted swelling clay liner with a double synthetic liner incorporating a leak detection system. To be fully protective and able to respond to future leaks/problems, the tailings impoundment should also include a drainage collection system. This could be a sand layer below the impoundment with a network of perforated pipe to collect seepage, or a more complex system.	The BGC report 'Waste and Water Management - Feasibility Geotechnical Report' issued in April 2006, (Volume VII, Appendix 5-I) states that a geomembrane liner has been proposed on the upstream dam face as a temporary measure to ensure the dam can store tailings in a timely fashion. The liner will hold water, while the impervious core will be constructed downstream. The till core will be relied on to minimize seepage through the dam for the entire life of the mine with the exception of the first year of operations. To minimize the risk of rupture of the liner from the underlying 76 millimetres minus waste rock shell material and prevent the migration of tailings through the liner in the event of a leak, a cushion/filter of select waste rock will be placed over the 76 millimetres minus waste rock and a geotextile will overlie this cushion/filter layer. The Coletanche membrane will then be installed on top of the geotextile. During operations, tailings will eventually be deposited on top of the geomembrane. The gradation of the cushion/filter is 19 millimetres (¾ inches) gravel to meet filter criteria between the tailings and the 76 millimetres (3 inches) minus waste rock. The cushion/filter layer will be approximately 4 meters thick (horizontal thickness) to facilitate placement, and will be compacted to minimize deformations. To further protect the Coletanche liner from damage due to tailings deposition off the dam crest, a geotextile may be required under the slurry pipelines where the lines rest	In case seepage water quality is poorer, NovaGold has designed a seepage collection and pump back system immediately downstream of the dam as a contingency measure.

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			directly on the liner. As for lining the entire basin, this option has not been considered because it is assumed that the seepage out of the tailings dam and foundations will be dischargeable. As a contingency, in case seepage water quality is poorer than predicted, a seepage collection and pump back system has been designed immediately downstream of the dam. Commitment: None required.	
Water Quality	15.1.1.7	7.8.2 Discharges The environmental assessment discussion about mine discharges to water bodies (Section 7.8.2) is an exercise in using natural water bodies to treat untreated or less-than-fully treated mine waste. The environmental assessment makes many assumptions and predictions to support discharging polluted water and sediment from the tailings pond and other sources will not cause environmental degradation. Much of this is based on the ability of the currently healthy ecosystem to sustain degradation but not completely collapse. The environmental assessment discussion should instead focus on how to prevent the mine causing degradation in the first place.	The basis for the effects assessment for water quality is the water quality model which indicated that only some variables would increase, and these increases would not be expected to cause significant effects to aquatic resources. Commitment: NovaGold will ensure that discharge permit levels are not exceeded and that appropriate environmental monitoring is conducted to avoid impacts.	
Water Quality	15.1.1.8	7.8.4 Significance of Residual Adverse Effects The environmental assessment consistently and very optimistically concludes that there will be no adverse impacts from the mine's operations or long-term reclamation. For example, section 7.8.4 states that: 'No significant adverse residual effects to sediment quality were associated with project activities or components. Potentially serious adverse effects relating to catastrophic failures involving the tailings dam (breach or overspill events), pipeline ruptures, or filter plant accidents were all assigned a very low probability of occurrence. Best management practices and monitoring of structures and water quality of discharges by trained personnel will mitigate potential impacts.' [p.7-322] In spite of these predictions, there are virtually no examples of operating mines that have not caused significant environmental impacts onsite and/or offsite. As a result it is difficult to accept the environmental assessment's optimistic conclusions. The agencies should require more stringent environmental safeguards and require that the mine water be fully treated before discharge. To minimize the potential for offsite impacts, the most important thing that can be done is to treat the mine discharge water to meet or exceed the water quality of the receiving water body, or applicable water quality standards. This is underscored because of the many presumptions made in the environmental assessment. A key example is that: 'It is expected that the water quality from the tailings and waste rock impoundment will be suitable for	1. Water from the tailings impoundment will be sampled weekly (Table 10.6-1). The water discharge permit may require daily sampling for certain variables Commitment: 1. NovaGold will take effluent samples on frequency stated in the waste discharge permit. 2. NovaGold is investigating conceptual plans for a treatment facility that could be implemented should the already conservative provisions for water quality management not meet permit requirements.	MOE supports the Proponent's commitments. MOE notes the sampling frequency will be considered during the permitting stage. EC – see response for 15.1.1.4.

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		direct discharge to the receiving environment without treatment. However, as part of NovaGold's proactive Environmental Policy and Operations, Maintenance and Surveillance manual, monthly water samples of the in impoundment water will be collected to monitor the water quality. Samples will be collected from defined collection points, and submitted to the lab for analytical testing. All results will be recorded and reported to the regulatory officials. This monitoring will ensure a track record of the in-impoundment water quality, and advise of any changes to the water quality.' [8.4.4, p.8-58-59] Where discharge is anticipated from the tailings impoundment, water quality samples should be taken weekly or more frequently. The mine should develop a contingency plan identifying how it will treat impoundment water in the event that impoundment water quality is lower than that of the proposed receiving waters.		
Water Quality	15.1.1.9	8.4.8 Surplus Water Discharge The environmental assessment states that the mine will comply with the Metal Mining Effluent Regulations under the *Fisheries Act*, Environment Canada LC50 standard toxicity testing protocols and the regulatory and permits conditions. These standards are not as protective as, and do not comport with, the environmental assessment's statement that: 'NovaGold Canada Inc. (NovaGold) intends the Galore Creek project to be a showcase of sustainable mining practices. Every reasonable effort will be made to minimize long-term environmental impacts and to ensure that the project provides lasting benefits to local communities while generating substantial economic and social advantages for shareholders, employees and the broader community.' [1.3, p.1-9] Based on NovaGold's own intentions, the mine should employ standards that protect pre-existing water quality the fishery, and not just those protected by the LC50 toxicity protocols. If the regulatory agencies allow the mine to proceed with the mine's proposed discharges, then at a minimum the agencies should require (before mining starts) detailed contingency plans describing how the mine will contain, control, and mitigate impacts that exceed the environmental assessment's very optimistic predictions.	Commitment: 1. NovaGold will work with MOE to develop site specific water quality objectives. 2. None required.	MOE notes the Tahltan will have an opportunity to participate in discussions during the permitting stage. The Tahltan will have an opportunity to review and comment on the permit application. EC – see response for 15.1.1.4.
Water Quality	15.1.1.10	11.7 Effluent Discharge Alternatives, Tailings Pond/Mine Water Discharge For purposes of the environmental assessment: 'It assumed that the pond water chemistry will be suitable for direct discharge to the environment after mining has been completed so all water exiting the spillway will be released without collection and treatment.' [see 5.9.7 Closure Concepts, p. 5-158] It is further stated: 'The effluent water quality from the tailings and waste rock impoundment is expected to be meet the quality criteria of the Metal Mining Effluent Regulations regulation discharge limits; therefore, treatment of the effluent is not required. However, throughout the life of the mine, should the discharge exceed the Metal Mining Effluent Regulations discharge limits, NovaGold will take	Commitment: NovaGold will model post-closure water quality and this modelling will assist to determine whether post-closure treatment will be required. Further assessments will be undertaken during the life of the mine so that post-closure water quality should be predicted with a high degree of confidence by the time that the mine closes. Appropriate bonding will be established, based on this information, for closure.	MEMPR and MOE support the Proponent's commitments. See response for 3.1.1.13. EC – see response for 15.1.1.4.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		immediate action to ensure the effluent does not enter the receiving environment. This will involve whatever combination of measures necessary for containment (accelerated dam construction, construction of containment berms, emergency containment impoundments, decreasing the water inflow to the tailings and waste rock impoundment, decreasing water inflow from the process plant) and treatment of the primary tailings and waste impoundment water.' [see 8.4.11 Contingency for Non-Compliant Effluent, p. 8-67] Since the discharge from the tailings pond might have to be treated, a cost estimate for treatment, and an appropriate financial surety should be held, until it is demonstrated that the discharge from the tailings pond will meet Water License standards.		
Water Quality	15.1.1.11	14.4.1.4 Tailings and Waste Rock Containment Facility The discharge scenario for mine operations relies on the use of mixing zones. Will a mixing zone for Galore Creek/Scud River also be needed for closure?	Water quality in the Galore/Scud River mixing zone is expected to improve post-closure as no new tailings inputs will be added, old tailings will be submerged, and tailings will be gradually covered with natural total suspended solid loads. So eventually water quality will improve and no mixing zone will be needed. Commitment: None required.	Addressed
Water Quality	15.1.1.12	9.5 Aquatic Resources, 9.5.1 Residual Project Effects 'Discharge of filter plant effluent into the Iskut River will cause some mortality and sub-lethal effects. Effects to water quality are limited to a localized area.		Addressed
Water Quality	15.1.1.13	5.5.8 Marginal Ore Storage Ore being stored (5.5.8-5.5.9, p.5-109) should be underlined and water that contacts the ore should be sent to the tailings impoundment or otherwise tested/treated to ensure that it does not contain acid or leached metals - particularly copper. The ore contains very high levels of copper which could leach-out and contaminate surface and/or ground water. Further, the buffering capacity and acid production discussion above underscores that the ore could cause contamination. The stockpiles will contain high volumes of ore and will be frequently disturbed, potentially increasing the potential for leaching/acid production. Therefore, stored ore should be protected from water and a water capture and containment/treatment system employed.	The calculated time of over 22 years before acid generation is initiated exceeds the expected residency in the stockpile by many years. It is in NovaGold's interests to minimize oxidation in the ore stockpile in order to maximize mineral recovery in the process plant. The ore storage area will be located adjacent to the impoundment and all drainage will be directed to the impoundment. Commitment: If drainage from the ore storage area adversely affects the overall chemistry of the impoundment it will be contained and treated.	MEMPR and MOE support the Proponent's commitment.
Water Quality	15.1.1.14	Mine Site -- 7.6.3.1 Metal Leaching and Acid Rock Drainage The Scud River and the undisturbed portion of Galore Creek will be used as the mine's treatment system - essentially diluting mine pollutants until water quality is achieved. The discharge from the mine workings - including but not limited to the tailings or	The aquatic resource and fisheries effects assessments (Volume II, Section 7.9 and 7.10) concluded that given the predicted concentrations in the Galore Creek and Scud River, that there would be no adverse effects on	MOE notes discharge limits will be set out in the EMA permit.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		waste rock impoundments, or waste rock piles - could meet existing water quality for toxic contaminants at the point of discharge if appropriate water treatment were utilized. All such planning should include specific standards/levels that will trigger water treatment, pumpback, etc. - not only during mine operation but after the mine is being reclaimed and into perpetuity. Moreover, it is not appropriate to use rivers, streams, and other water bodies as mixing zones for water quality 'treatment' when mine water treatment is technically and economically viable.	aquatic life. However, an aquatic effects monitoring program will be in place during mine operation, which will monitor for any downstream impacts. Commitment: NovaGold commits to meeting all regulatory requirements for effluent discharge.	
Water Quality	15.1.1.15	The environmental assessment states: 'ML/acid rock drainage from pit walls will be influenced by groundwater seeping through the northern and western walls. Static test results have shown that some areas of the pit walls are potentially acid generating. Water from the open pits will be routed to a pond adjacent to the process plant and used as plant makeup water. Metal leaching rates were assumed to be those of waste rock.' [7.6.3.1, p. 7-218, p.256] This does not consider what happens to the pit and water when the mine stops operating, the pit fills to the level of the water table, and the then-contaminated pit water is no longer used for mine processes. When pit water is no longer pumped from the pit to the tailings impoundment then the pit could become a lake contaminated with acid mine drainage and possibly nitrates. It would not be appropriate to leave a contaminated pit in perpetuity. A contingency plan to prevent or mitigate contamination of the pit water should be developed. A plan/contingency plan for how ground water discharging from the pit would be treated should also be developed - both in the ground and where that ground water comes to the surface as springs or seeps. The hydrologic connectivity is not clear, and could be significantly impacted by existing faulting and the mine’s blasting and other operations.	Predictions based on currently available information indicate it is unlikely that water in pits will be acidic. However, NovaGold agrees that uncertainties exist regarding pit lake water quality which can be addressed as mining proceeds. The configuration of the site offers opportunities to ensure that contaminated water does not reach the receiving environment either on the surface or in groundwater. The pits are all upstream of the tailings impoundment which will ensure drainage from the pits is captured and treated if needed. Commitment: NovaGold will monitor during the mine life to model water quality and ensure that water quality objectives are achieved at closure.	MEMPR and MOE note the issues raised will be assessed during closure planning.
Water Quality	15.1.1.16	Filter Plant -- 5.7.2.2 Plant Layout and Process One of the statements in this section is somewhat misleading: 'The filter plant will be equipped to de-water the concentrate and treat all water received at the plant through the slurry pipeline prior to discharge. Consequently, the filter plant will include water treatment facilities to ensure that the discharge water is clean and readily meets discharge criteria.' [p. 5-140, emphasis added] The discharge from the water treatment plant at the filter plant will not meet aquatic water quality standards, so a mixing zone for contaminants in the Iskut River will be required. The statement that refers to 'discharge water is clean and readily meets discharge criteria' should be deleted.	1. Discharge permit limits are less stringent than guidelines for the protection of aquatic life (water quality standards). Guidelines for the protection of aquatic life do take into consideration mixing, as they are used for the receiving environment. The Iskut River (receiving environment) already exceeds guidelines (Table 7.6-19) for 13 variables, therefore site-specific water quality objectives will have to be developed. 2. The words "is clean and" may be deleted from the statement. Commitment: 1. NovaGold will ensure that filter plant effluent will meet discharge permit limits, water quality guidelines where baseline variables do not exceed	See response for 15.1.1.4.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			guidelines, and water quality objectives that will be developed for variables that currently exceed guidelines. 2. The words "is clean and" may be deleted from the statement.	
Water Quality	15.1.1.17	It appears that a dilution of 120 in the Iskut River will be required for copper, which is highly toxic to fish. [p. 5-144] The copper load discharged daily, which could be very important given the naturally high background concentration, is not discussed. [see Table 7.6-12] In addition, the total load of copper discharged, compared to the present 'load' of copper being carried in the Iskut, should be disclosed along with the potential impacts on aquatic resources, fish and wildlife.	The diffuser will discharge water with a total copper content of less than 0.17 milligrams per litre at a rate of about 0.016 cubic metres/second. This discharge will add about 0.24 kilograms of copper to the Iskut River each day. The Iskut River during freshet has an annual peak flow of about 750 cubic metres/second with a total copper content of abut 0.00871 milligrams per litre, translating to a total copper load of about 564 kg per day. At average flows of about 110 cubic metres per second and averaging freshet and non-freshet total copper values, the average natural total copper load in the Iskut River calculated to be about 47 kilograms per day. The additional total copper loading from the diffuser is small relative to the total natural copper loading in the river. Commitment: NovaGold will regularly monitor the water quality of Galore Creek, and the Scud River, Iskut and Stikine rivers during operations and after closure to confirm modeling and ensure discharges meet permit criteria until regulatory agencies determine that conditions are stable and predictable.	EAO notes NovaGold's commitment has been included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Water Quality	15.1.1.18	Filter Plant -- 5.7.2.3 Water Treatment and Discharge The environmental assessment states that: 'The clean water will be pumped through a 15 cm diameter high-density polyethylene pipeline, buried for much of its length alongside the concentrate pipeline, to the Iskut River where it will be discharged through a pipeline and diffuser system.' [5.7.2.3, p5-144] It is a misnomer to call this water clean, because in reality it is too toxic to meet standards and therefore requires that the Iskut River be used as a mixing/dilution zone. It is technologically possible, and probably economically feasible, to treat the contaminated pipeline water so that copper and other contaminants discharged to the Iskut River to pre-mine background levels. The two factors identified in the environmental assessment as critical to discharging to the Iskut River are when the copper concentration is high and when the Iskut River's flow is low. The	NovaGold acknowledges that there exists the potential for low level toxic effects to aquatic life (benthos, fish, algae) within the mixing zone. Commitment: NovaGold will regularly monitor the water quality of Galore Creek, and the Scud River, Iskut and Stikine rivers during operations and after closure to confirm modeling and ensure discharges meet permit criteria until regulatory agencies determine that conditions are stable and predictable.	See response for 15.1.1.17.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		environmental assessment states that: '... To meet the receiving water quality criterion of 0.002 milligrams per litre during the critical low flow period, a dilution of approximately 120:1 is required for an effluent at 0.02 milligrams per litre. There will be two operating conditions: one during which the pipeline flush water will be discharged at 90 cubic meters per hour (25 litters per second) and the other during which treated filtrate water will be discharged at about an average rate of 59 cubic meters per hour (16.5 litters per second). The more critical condition for dilution is the discharge of treated filtrate water when the total copper concentration is projected to be between 0.17 and 0.25 milligrams per litre. The Iskut River above More Creek has an annual predicted low flow of about 10.6 cubic meters per second with an average flow of 110 cubic meters per second and a maximum of 750 cubic meters per second. At annual low flow, a potential overall dilution (ratio of the entire river flow to filtrate plant discharge) of 10.6/.0165 or 642:1 is available. In actuality, mixing only occurs with part of the river flow.' [5.7.2.3, p5-144] As the calculations in section 5.7.2.3 (and Appendix 5-H) demonstrate, the mine will use up to 700 meters of River to treat its mine effluent. The proposed discharge does not sufficiently protect water quality or the fishery because the mixing zone itself will essentially be a toxic zone for fish, especially near the mine's diffuser. As a result, it will be a chemical barrier to fish migration and use. Moreover, the river should not become the mine's treatment facility. The mine is building a treatment facility, but building it to only minimally treat the mine effluent. The mine should be required to minimize or eliminate the need for any dilution by the Iskut River. The mine should actually discharge 'clean water,' not water that meets standards only after being sufficiently diluted by (thereby polluting) the Iskut River. The return on investment for this project is short and the overall economics appear favourable. NovaGold should install adequate treatment of all discharges from this project so that aquatic resources, fish and wildlife are fully protected.		
Water Quality	15.1.1.19	Discharges from Filter Plant and Tailings Impoundment - Although a proposed treatment scheme is discussed for the slurry filter plant, the technical feasibility and cost of constructing and operating a treatment plant(s) for the effluent discharges from the tailings impoundment and from the filter plant were not evaluated for either their technical feasibility or cost.	Commitment: NovaGold will assess the need for water treatment for operations, closure and post closure, including but not limited to, a water treatment plant during permitting.	EAO notes this commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Water Quality	15.1.1.20	Page 7-197, Table 7.5-22 - All three residual adverse effects in respect of surface water quantity have been rated as 'Non-Significant'. According to our interpretation of Table 7.1-5 (Effects Assessment Significance Ratings), the first two residual effects (alteration of baseline flow pathways; seasonal flow distribution at mouth of Galore Creek) should have been rated as being 'significant'.	The submission should have included an additional significance ranking table for surface water hydrology that noted that changes to the Galore valley (local) were not considered significant. A discussion of the assessment methodology for surface water hydrology is provided in Volume II Section 7.5.1.3	EAO notes this table was provided to the technical working group.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			Commitment: None required.	
Water Quality	15.1.1.21	Pages 7-212 to 7-214, Table 7.6-4; and Page 303-304, Table 7.8-3 - The long list of effects related to water quality and sediments in these tables are all related to the construction or operation periods. There does not appear to have been a systematic approach to looking at the environmental effects on water quality during the post-closure period. This may be one of the most serious deficiencies in the Application related to water quality. There is an assumption in the Application, as stated on Page 8-67, that '... the impoundment water chemistry will be suitable for direct discharge to the environment after mining has been completed ...' and that treatment will not be required. The last paragraph on Page 7-316 does not provide as much certainty in respect of this assumption, stating that 'The free flow of surface waters from the tailings pond to the downstream environment will be contingent on water quality which will be assessed by the Environmental Monitor on site'. There does not appear to be a clear rationalization of the assumption that the water chemistry of impoundment water will be suitable for direct discharge to Galore Creek in the Application. Neither does there appear to be any modeling of water quality post-closure.	Commitment: NovaGold will conduct environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project. .	EAO notes NovaGold's commitment is included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Water Quality	15.1.1.22	The water quality modeling that was done was for the operational period, when water affected by the mine project would be stored in the tailings impoundment/waste rock dump over the winter low flow period and released during the summer high flow period. Under these conditions, the modeling indicates that settling of particulates will result in a dramatic drop in total suspended solids in the receiving environment as compared to baseline conditions, along with a drop in total metal concentrations and metal loadings to downstream sediments. But the conditions in the post-closure environment will be far different. The tailings impoundment/waste rock dump will have continuous flow-through. The retention times within the 'reservoir' behind the dam are likely to be much shorter (at least in the winter) and particulate settling may not be as efficient. The flow from the entire Galore Creek watershed will have been re-routed to pass through this impoundment, including high flows with high total suspended solids levels. NovaGold should model the post-closure discharge water quality conditions and clearly define the water quality objectives they will be trying to achieve at the discharge from the impoundment.	Commitment: NovaGold will: • conduct further water quality modelling during operations to characterize pit and impoundment water quality after closure; • conduct environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project; and • assess the need for water treatment for operations, closure and post closure, including but not limited to, a water treatment plant during permitting as possible mitigation measures to address water quality concerns	EAO notes NovaGold's commitments are included in Appendix F of the Joint Report and Schedule B of the EA Certificate.
Water Quality	15.1.1.23	In respect of the discharge from the tailings impoundment, the potential need for	See response for 15.1.1.22.	See response for 15.1.1.22.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		mitigation in the future after the mine closes needs to be considered in the calculations of the amount of bonding to ensure that proper mitigation (i.e., water treatment) takes place if necessary.		
Water Quality	15.1.1.24	Will dissolved metal concentrations in the discharge from the impoundment change after the mine is closed? While most potential for acid rock drainage would seem to have been mitigated by underwater storage of tailings and potentially acid generating waste rock, will there not still be some exposed pit walls above the pit overflow levels that might be potentially acid generating, maybe not for some time into the future (i.e., > 22 years)? How will this affect pit water chemistry and subsequently, water that is discharged from the tailings/waste rock impoundment to Galore Creek?	Potential for acid generation from pit walls was considered in the water quality predictions. Pit lake chemistry was assumed to be non acidic for the water quality modelling. See response for 15.1.1.22.	See response for 15.1.1.22.
Wetlands	16.1.1.1	There seems to be a discrepancy in relation to the exact numbers of hectares of wetland loss. The report on page 7-428 states that 4.4 hectares will be lost due to the More Creek Access and 7.9 hectares due to the mine site. A total of 12.3 hectares (4%) as stated on page 7-444. Yet, in Appendix 6-H on page 4-1 it states that 2.9 hectares on the proposed road route and 16.9 hectares within the mine footprint will be lost. Again on page 4-20 is states that 'approximately 16.9 hecatres (7%) of wetland in this region is found within the mine footprint'. It is not clear exactly how much wetland area will be lost.	Since the wetland baseline report (Volume XIII, Appendix 6-H) was completed the wetland area within the mine footprint was reassessed using data regarding the soil types of the area. Through this reassessment it was determined that the extent of wetland area within the mine footprint had originally been overestimated. The new calculated value, which considered all available data including the soil data, was 7.9 hectares. The discrepancy in the area for wetland loss due to the access corridor reported in the baseline report and Chapter 7 is due to changes in the road alignment that occurred between the completions of the reports. The wetland area within the access corridor has since been recalculated using the most current road alignment. The most current and accurate value for wetland loss due to the access corridor is 3.0 ha. Commitment: None required.	Comment has been addressed by NovaGold.
Wetlands	16.1.1.2	22% of wetland area is down slope of the road route and 2% of the wetland area is downstream from the proposed Porcupine airstrip. What effect will this have on these wetlands? Will the hydrology change? Will this be included in the monitoring plan?	While NovaGold will attempt to minimize changes to natural water flows, it is acknowledged that the hydrology of wetlands down slope of development could be altered which in turn may result in a change in the dominant vegetation type. Commitment: None required.	EAO notes that NovaGold has committed to monitoring water levels in Porcupine River and design a flood protection barrier adjacent to the Porcupine aerodrome.
Wildlife	17.1.1.1	A central critique is that some impacts of development on wildlife species appear to be underestimated. For example, In Table 7.13-25, the significance of	Comment noted. NovaGold concluded that there is considerable potential for significant adverse residual	EAO notes that NovaGold has committed to incorporating information

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		adverse effects is rated as uncertain or insignificant for all potential effects, even though the magnitude of all effects but one are rated as moderate (for example, where blasting for mine development and avalanche control will occur). Further emphasis is needed with regards to new road access and mine development in a relatively undeveloped wilderness area. The significance of such areas to populations of wilderness-dependent species such as grizzly bears, wolverine and other carnivores is very important. The overall impact of this project in combination with the cumulative effects from further exploration will surely have more than insignificant impacts on focal species.	effects for mountain goats and grizzly bears. Although the significance of these adverse residual effects were for the most part assessed as uncertain, it remains that there is considerable potential for them to be significant. Commitment: None required.	derived from monitoring in an ongoing process of adaptive management.
Wildlife	17.1.1.2	5.5.1 Wildlife Habitat Suitability The legends for habitat mapping in this chapter indicate 'Very High' and 'High' rated habitats and the lumping of 'Very Low' and 'Nil' rated habitats but the standards do not lump these categories. The document states that standards were followed. However, it is not clear in this chapter or from Appendix 6-Q if this legend suggests a different ranking approach than provincial standards or just renaming of the six-class scheme.	The provincial 6 class ratings scheme was renamed, in part, for the Galore habitat suitability mapping studies as shown in the table below. RISC # RISC Term environmental assessment Term 6 Nil Nil 5 Very Low Very Low 4 Low Low 3 Moderate Moderate 2 Moderately High High 1 High Very High The terms ‘very high’ and ‘high’ (as opposed to ‘high’ and ‘moderately high’) were considered more appropriate for the Galore habitat suitability mapping work, both in terms of reflecting the value of the habitat in the study area, and for the effective communication of the models to a wide range of stakeholders. The remaining terms used in the Galore environmental assessment (Moderate, Low, Very Low and Nil) correspond to the same terms used in the RISC standards for the 6 class scheme. While technically their may be Nil rated habitat, it was anticipated that lumping very low and nil rated habitats would be more reflective of actual use. The lumping of these two classes had no bearing on the assessment. Commitment: None required.	EAO notes that NovaGold has addressed the comment.
Wildlife	17.1.1.3	Mountain Goat Enhanced Habitat Model (includes material in Appendix 6-Q) The enhanced model includes topographic variables to better define mountain goat habitat with an emphasis on escape terrain. Aspect and elevation are other variables included in the enhanced model. This is a consistent with other projects to define mountain goat habitat in the Skeena Region (Keim 2003; Keim 2004; Keim and Pollard 2005). The model appears to be cumulative with equal weighting to each variable. This approach is different than other mountain goat habitat models applied in the Skeena Region where escape terrain and the distance from escape terrain is weighted the highest component to estimate	Criteria for defining topography and the ratings scheme were presented, and agreed to, by the Galore Wildlife Working Group in Smithers at the MOE office on February 3, 2005. The mathematical mechanics of the model internally emphasize escape terrain. For example, habitat between 451 and 650 m can only achieve a wildlife habitat rating of 4 or less quality. Regionally, snow packs experienced along the Bell Irving River near Bell II are greater than those in the	See response for 17.1.1.1.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		winter habitats (Keim 2004; Keim and Pollard 2005). In these models, elevation was the lowest weighted variable. The criterion used for defining escape terrain is similar to the above models, with a buffered approach to assign a value. The only question for this variable is assigning a value of two for distance of escape terrain >350 to 450 meters. Mountain goat winter surveys completed in the Bell II and North Coast areas, had no goat observations greater than 350 meters from escape terrain with >90% of locations within 150 meters of escape terrain (Keim 2004; Keim and Pollard 2005). This is not to suggest that goats may not be found greater than 300 m from escape terrain particularly in summer, but that it should not be ranked as high as it is in this model. For winter a value of four or five might be more applicable and a value of three for summer.	Galore study area (Rescan 2006, in prep). The observed habitat use cited by the THREAT reflects this regional difference, but does not necessarily justify extension of the observed results to the Galore study area. Commitment: None required.	
Wildlife	17.1.1.4	Mountain Goat Enhanced Habitat Model Another issue is that northerly aspects may be rated too high, with a rating of two in the winter. Mountain goat winter habitat surveys for the Bell II, North Coast and the Nass had a low percentage of mountain goat observations on aspects 280 degrees. Similarly, the adjusted winter habitat models had these aspects rated as of low habitat value (Keim 2004; Keim and Pollard 2005). For winter, a value of four or five is more applicable. The summer rank is fine and a value of three for southern aspects could be used for summer.	It is important to note that, although north aspects are considered by the reviewer to have been rated higher than necessary for the Galore models, in relative terms, north aspects were consistently rated lower than south aspects. Thus the higher ratings do not affect the outcome of the model in predicting the relative importance of north aspects in winter. Commitment: None required.	See response for 17.1.1.1.
Wildlife	17.1.1.5	Mountain Goat Enhanced Habitat Model Our main concern with the model is that mountain goat habitat value is overestimated for both summer and winter habitat. This ranking is of greater concern in terms of winter range. By using a cumulative approach for these values, i.e. distance from escape terrain and aspect, there are cases where habitat is ranked as high or moderate and should actually be ranked lower. This would mean that habitats are more restricted than modeled and potential disturbance to mountain goats could be higher than reported. Typically winter range is more restricted than summer range and it is therefore important that both seasonal habitat models be used to consider adverse effects on mountain goats.	Field observations within the Galore study area suggest that an extensive area of escape terrain (and thus mountain goat habitat) exists; the habitat suitability model reflects this observation. It is, however, acknowledged that there may be some overestimation of habitat due to the conservative approach taken when developing the model. The conservative approach was taken for a number of reasons, as follows: 1. Local knowledge of goat habitat use is far from complete, and the literature available from other regions or areas is not necessarily relevant or directly applicable to the Galore study area. 2. Development of a conservative and broad model ensured no potential areas of impact associated with project development were overlooked. 3. It was assumed that topographic features capable of supporting goat habitat (i.e., escape terrain) were equally available in areas that will be impacted versus areas that will not be impacted within the study area. The conservative approach was therefore applied	See response for 17.1.1.1.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			throughout the entire study area. 4. Digital data available for habitat modeling has inherent inaccuracies which limit the detail that can be confidently used to model habitat. A conservative and simple approach to model development assisted in limiting the compounding effects of digital error on the final model. Commitment: None required.	
Wildlife	17.1.1.6	Mountain Goat Enhanced Habitat Model The best measure of the suitability of habitat is where goats are located. Mountain goats show a high degree of site fidelity (Taylor and Brunt 2003; Nichols 1985). We suggest that greater weight be given to high-quality survey data that is available. The models do appear to identify the important or very high seasonal habitats (Appendix 6-Q, Table 1) but very high habitats should be separated from high habitat in the assessment to allow for a more accurate assessment of the effects to mountain goats. It would be useful to see the percentage of winter observations within 100 meters (to account for location error) of very high winter habitats similar to how summer observations are reported in Table 1.	NovaGold agrees that actual observations of goat use are much better for determining important habitats in a location than theory-based models. For example, surveys in the study area revealed highly suitable habitat available that is not occupied by goats, and occupied habitat that is not rated as highly suitable. Survey results were a major consideration in the development of the model, and a combination of digital habitat modelling and survey data was used when assessing effects. As noted on page 2-31 of Appendix 6-Q (Volume XIV), 45% of winter observations were within 100 meters of the enhanced suitability rating 1 rated winter habitat and 85% were within the area rated as enhanced suitability rating 1 and 2. Commitment: None required.	Addressed
Wildlife	17.1.1.7	Mountain Goat Enhanced Habitat Model Although natal ranges are not defined at a large scale for the project, natal ranges could be considered as part of the winter range given the importance of escape terrain during that period. Winter range could also be considered as a surrogate in the short term.	Comment noted. Commitment: None required.	Addressed
Wildlife	17.1.1.8	Grizzly Bear Enhanced Habitat Model (includes material in Appendix 6-Q) It would be useful to have had the habitat mapping separated for the coastal and interior grizzly bear populations. It would then be easier to determine effects to the two populations since the DNA analysis suggests two isolated populations.	Comment noted. Commitment: None required.	Comment noted.
Wildlife	17.1.1.9	Grizzly Bear Enhanced Habitat Model It is not clear why only habitats rated for grizzly bears are shown in the buffered footprint and not for the complete study area like mountain goat, moose, hoary marmot, American marten, and western toad. It is considered necessary to evaluate grizzly bear habitats outside the footprint to consider the degree of adverse effects.	Grizzly bear chronological models for early and late spring, and phenotypic models for spring, summer and fall, using the predictive ecosystem mapping data (i.e., the complete study area), are part of Appendix 6-Q (see Maps 6 to 9 and Map 11) in Volume XIV.	

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			Commitment: None required.	
Wildlife	17.1.1.10	Section 7.13 of Application, Wildlife and Wildlife Habitat -- This section is not well organized and difficult to read. It would read easier if all effects were summarized by individual species and not the effect summarizing for all species. It requires you to keep flipping back and forth to understand total effects and also check appendices to see if the interpretations are correct.	Comment noted. Commitment: None required.	Comment noted
Wildlife	17.1.1.11	Section 7.13.2 -- Table 7.13-15 indicates the amount and percentage of suitable habitat loss by valued ecosystem component species and its relative amount in the predictive ecosystem mapping study area. It would be useful to have it broken out by habitat rank so how much very high or high habitat can be evaluated for adverse effects on the landscape and local level.	Comment noted. Commitment: None required.	Comment noted
Wildlife	17.1.1.12	There is too much reliance on using the regional context to assess an adverse effect. It should be looked at within the study area first before relating it to the Land and Resource Management Plan boundary. Also, it is not clear how much grizzly bear habitat is being lost given the maps in the application. Same comment as above for terrestrial habitat loss to grizzly bears and therefore it is hard to consider degree of adverse effects. Given the comments regarding the habitat modeling for mountain goats, it is expected that winter range will be smaller and more restricted than summer range and needs to be treated separately. In addition, if winter ranges are accepted as a surrogate for natal ranges then the adverse effects to winter range needs to be reviewed as loss of natal range. The degree of the overall effect needs to be reconsidered in light of the suggested overestimation of mountain goat habitats that could increase the geographic extent to a landscape level.	Assessment of habitat loss within the local study area boundary (i.e., project footprint and one kilometre buffer) alone is not considered an appropriate scale over which to assess impacts for grizzly bears. Grizzly bears are a ‘landscape species’, hence the delineation of a large study area for the Galore Creek Project, and in turn the assessment of habitat loss in terms of the availability of suitable habitats remaining in the study area. NovaGold's assessment identified considerable potential for significant adverse residual effects for mountain goats. Although the significance of these adverse residual effects was assessed as uncertain, it remains that there is considerable potential for them to be significant. A monitoring program for grizzly bears and mountain goats will form important components of the overall wildlife monitoring program for the project. One of the purposes of the program is to enable the actual wildlife effects to be compared with those predicted in the environmental assessment (Volume III, Section 10.5). Commitment: A wildlife monitoring program will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives.	EAO notes that NovaGold has committed to establishing a grizzly bear monitoring program will as part of the wildlife monitoring program that will be reviewed by regulators and the TCC. NovaGold has also committed to incorporating information derived from monitoring in an ongoing process of adaptive management.
Wildlife	17.1.1.13	Section 7.13.2.2 -- For all the species indicated in this section, what percentage of very high and high habitats are lost at the local and landscape scale? The information presented does not provide adequate detail for the reader to assess	Section 7.13.2.2 describes wetland and riverine habitat loss. A conservative approach was taken when calculating wetland habitat loss for each valued	

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		the degree of habitat loss.	ecosystem component. Regardless of the habitat value of each wetland type for wildlife valued ecosystem components (as reported in Volume XIII, Appendix 6-H), the amounts of wetland habitat loss provided in Section 7.13.2.2 were based on the calculations of total wetland loss in the local project area (as presented in Section 7.11, Wetland Functions Effects Assessment [Volume II]). Wetland habitat loss was not calculated at a landscape scale, as the wetlands effects assessment focused on the local project area only. Commitment: None required.	
Wildlife	17.1.1.14	Section 7.13.3.2 -- Other models such as risk models can be more effective in evaluating the consequences of human land use on wildlife populations. For example, work on population viability analysis of grizzly bears has shown that incidental mortality models more accurately reflect impacts on this species than do models relying on habitat loss (Maraj 2006; Nielsen 2005). This is because mortalities associated with increased human access such as human safety kills, road kills, and legal and illegal hunting have greater impacts on grizzly bears than the direct loss of habitat from roads or mines. The section does not include access effects during construction and the degree of effect on bears.	Comment noted. As stated in Volume II, Section 7.13.2.3, many authors consider the effects of indirect habitat loss for some species to be greater than those attributed to direct habitat loss (Jalkotzy et al., 1997). Hence, emphasis for the Galore environmental assessment was placed on assessing these indirect effects on wildlife valued ecosystem components, including disturbance and mortality. Commitment: None required.	EAO notes that NovaGold has addressed the comment.
Wildlife	17.1.1.15	Section 7.13.4.4 -- Is there a reference that indicates grizzly bears will habituate to aircraft over time? In Alaska, oil field companies plan their flight patterns to minimize disturbance to grizzly bears from aircraft. It should be considered an effect in Table 7.13-18. The adverse effects to mountain goats from aircraft noise are noted in this section but may not be negligible and it appears that aircraft noise during construction was not considered as part of the effects.	McLellan and Shackleton (1989) suggest that the moderate responses of grizzly bear to aircraft activity (including intensive periods of helicopter activity) observed in their study are attributable to habituation. The authors also cite literature pertaining to the rapid habituation of wolves to aircraft, and suggest that similar behaviour may be expected with bears. Table 7.13-18 (Volume II) assessed the effects on mountain goats of aircraft associated with the Porcupine River valley to be negligible given the distance of the valley from suitable habitat. It is true that aircraft noise during construction (in the Galore Creek valley in particular) is unlikely to be negligible. This was taken into account when concluding that there is considerable potential for significant adverse effects on mountain goats for the project.	EAO notes that NovaGold has committed to following the approach identified in the Application for avoiding or minimizing disturbances to mountain goats by helicopters and incorporated in the Wildlife Mitigation and Monitoring Plan. Nova Gold has also committed to include pertinent noise monitoring as part of the Wildlife Mitigation and Monitoring Plan.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
			Commitment: None required.	
Wildlife	17.1.1.16	Section 7.13.4.5 -- It would be useful to provide a reference to the statement regarding displacement of grizzly bears dependent to habitat quality and the eventual habituation to the noise. It does not seem to make sense that bears will not be stressed or displaced from industrial noise if the bears are using high value habitats. It also is a concern that their habituation is the management strategy that makes the effect negligible.	The statement made in Section 7.13.4.5 relates to a general behavioural concept, where the decision of whether or not to move away from disturbed areas will be determined by factors such as the quality of the site currently being occupied, the distance to and quality of other suitable sites, the relative risk of predation or density of competitors in different sites and the investment that an individual has made in a site (for example, in establishing a territory, gaining dominance status or acquiring information) (Gill et al., 2001). (Full citation: Gill, J. A., K. Norris and W. J. Sutherland. 2001. Why behavioural responses may not reflect the population consequences of human disturbance. Biological Conservation, 97(2): 265-268). It is not to say that disturbance will not result in stress in high quality habitats. The individual may still be stressed, but the relative energetic benefits of the higher-quality forage outweigh the energetic-costs associated with the stress of the disturbance. So the animal may choose to remain in the high-quality habitat adjacent to the source of disturbance Commitment: None required.	EAO notes that Nova Gold has committed to include pertinent noise monitoring as part of the Wildlife Mitigation and Monitoring Plan and to incorporate information derived from monitoring in an ongoing process of adaptive management.
Wildlife	17.1.1.17	The effect to mountain goats from industrial noise is indicated in Table 13-18 and mountain goats are sensitive to noise disturbance. It is hard to assess whether mountain goats will become habituated to it. Foster and Rahs (1983) found little or no evidence of habituation. Physiological stress has also been reported for animals that do show visual signs of habituation (Macarthur et al. 1982; Stemp 1983). Joslin (1986) showed association between industrial activity and reduced rates of productivity in mountain goats even when range was not abandoned for less productive sites. Given the necessary blasting for avalanche control and mine construction, the buffer distance of one kilometre could be too small. As an example, the guideline for commercial recreation use of helicopters is to stay greater than two kilometres away from known goat winter ranges in BC (Wilson and Shackleton 2001). We wish to see a buffer distance of at least two kilometres applied.	There is no reference to a one kilometre buffer distance for disturbance to goats in Volume II, Section 7.13.4.5. It is noted in this section that the salt lick identified is located outside the 1 km buffer along the access road; however, this distance is not related to the buffer distances proposed for minimizing disturbance to goats. Rather, as outlined in Section 8.13 (Volume III), tunnel construction and blasting (pg 8-242), and flight paths (pg 8-253) will be avoided within two kilometres of occupied goat habitat and/or kidding areas where possible. Commitment: The Wildlife Mitigation and Monitoring Plan will identify measures to mitigate potential effects on mountain goats.	EAO notes that NovaGold has committed to avoiding occupied goat habitat and/or kidding areas within two kilometres for flight paths and during tunnel construction and blasting where possible.

APPENDIX E - FIRST NATIONS COMMENT TRACKING TABLE

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
Wildlife	17.1.1.18	Section 7.13.4.6 -- Same comments for mountain goats apply as suggested for section 7.13.4.5 (above).	There is no reference to a one kilometre buffer distance for disturbance to goats in Volume II, Section 7.13.4.5. It is noted in this section that the salt lick identified is located outside the 1 km buffer along the access road; however, this distance is not related to the buffer distances proposed for minimizing disturbance to goats. Rather, as outlined in Section 8.13 (Volume III), tunnel construction and blasting (pg 8-242), and flight paths (pg 8-253) will be avoided within 2 km of occupied goat habitat and/or kidding areas where possible. Commitment: Tunnel construction and blasting, and flight paths, will be avoided within 2 km of occupied goat habitat and/or kidding areas where possible.	See response to 17.1.1.17.
Wildlife	17.1.1.19	Section 7.13.5 -- The effect to mountain goats from disturbance to feeding, breeding, and rearing habitats is indicated in Table 13-20 and mountain goats are sensitive to these effects. It may be higher if the area of winter and natal range are lower than currently estimated.	A monitoring program for mountain goats will be an important component of the overall wildlife monitoring program for the project. One of the purposes of the program is to enable the actual wildlife effects to be compared with those predicted in the environmental assessment (Volume III, Section 10.5). A wildlife monitoring program will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives. Commitment: A Wildlife Mitigation and Monitoring Plan will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives.	EAO notes that NovaGold has committed to completing a Wildlife Mitigation and Monitoring Plan to be reviewed by regulators and the TCC.
Wildlife	17.1.1.20	Section 7.13.10 -- Table 7.13-25 indicates the assessment of residual adverse effects to grizzly bears and mountain goats. All of them are indicated as an uncertain significance except the effect from industrial noise to mountain goats. The residual effects on mountain goats are based on the assumption that mountain goats have a high capability of habituation to mining and industrial activity. However there is not sufficient research to support this assumption. And in actual fact, the literature suggests a higher sensitivity to disturbance (see Foster and Rahs 1983; Wilson and Shackleton 2001). With the information provided in the chapter and with the potential underestimation of mountain goat habitats it is likely the Residual Adverse Effects for mountain goats are higher than reported and until monitoring can indicate habituation or lesser adverse	Volume II, Section 7.13.10.2 states that there is a high likelihood of habituation to industrial noise (not including noise associated with blasting, helicopter traffic, and avalanche control). The residual effects of industrial noise alone were therefore assessed as insignificant. However, this section, and section 7.13.5.2, also outline that while goats may habituate to one source of disturbance in some instances (e.g., Weech et al., 2003), they are unable or unlikely to habituate to the cumulative effects of more than one source of disturbance (e.g., industrial noise combined with	MOE notes that mitigation measures will be identified in the Wildlife Mitigation and Monitoring Plan.

Parameter		Comment Received	Proponent Response/Mitigation Measure/Commitment	Government Responses
		effects, the species should be managed at that higher status.	helicopter traffic and blasting, for example). NovaGold therefore assessed the potential for significant adverse residual effects to be considerable for mountain goats. Although the significance of these adverse residual effects was assessed as uncertain, it remains that there is considerable potential for them to be significant.	
Wildlife	17.1.1.21	Application Section 8.13, Wildlife Management Plan -- The wildlife management plan provides sufficient information on the type of mitigations measures but it is hoped that further participation will occur and better define how and where the mitigation measures should be applied. This will link to the monitoring plan to ensure mitigations can be effectively measured.	A detailed wildlife monitoring plan will be completed for review by regulators and, consistent with the Participation Agreement, by TCC representatives. Commitment: A Wildlife Mitigation and Monitoring Plan will be completed for review by appropriate government agencies and, consistent with the Participation Agreement, by TCC representatives.	EAO notes the commitment is reflected in Appendix F (Table of Proponent's commitments) and Schedule B of the EA Certificate.
Wildlife	17.1.1.22	We have a concern with regards to the location and proximity of borrow, and gravel pits in relation to high value habitats.	Borrow and gravel pits will be temporary features, and the sites will be reclaimed to appropriate habitat when they are no longer required. The pits will be sited adjacent to the access road which has been designed to avoid important wildlife habitats where possible. Commitment: Borrow and gravel pits will be sited adjacent to the access road which has been designed to avoid important wildlife habitats where possible. Borrow and gravel pits will be temporary features, and will be reclaimed to appropriate habitat when they are no longer required.	No response required.

APPENDIX F - SUMMARY OF NOVAGOLD CANADA INC.'S COMMITMENTS FOR THE GALORE CREEK COPPER-GOLD-SILVER PROJECT

Component		Commitment
Overall Commitments	1.	Will establish an Environmental Management System for the Project after commencing commercial operations and use best efforts to obtain ISO 14001 certification or any other equivalent independent certification.[1]
	2.	Is committed to the concept of sustainable development, which requires balancing good environmental stewardship with economic growth and social well being.
	3.	Will use NovaGold's Environmental Policy to guide all phases of the Project.
	4.	Will finalize the various management plans identified in Volume III, Section 10 of NovaGold Canada Inc.'s Application for an environmental assessment certificate.
	5.	Will develop, in collaboration with the Tahltan Central Council, local communities and Canadian and U.S. federal and B.C. and Alaska State government agencies, and implement monitoring that meet provincial and federal requirements.
Community Relations, Community Consultation, Community Involvement	6.	Will build long-term relationships with the Tahltan Nation and local communities.
	7.	Will provide transcripts of the January 2005 Special Assembly if requested by the Tahltan Central Council.
	8.	Will report back to the Tahltan communities on how their input shaped project decisions.
	9.	Will maintain ongoing communications and consultation programs with the Tahltan communities during the life of the mine.
	10.	Will consult with the Tahltan Central Council on all draft permits and management plans, consistent with the conditions of the Participation Agreement.
	11.	Will hold information sessions in Telegraph Creek, Dease Lake, Iskut, Stewart, Terrace and Smithers to provide information on project planning, business, training and employment opportunities.
	12.	Will organize further discussions and/or meetings with potentially affected guide outfitters and trap line holders to discuss potential effects, mitigative measures and compensation.
Recruitment, Employment and Training	13.	Will give hiring priority to Tahltan Nation people, residents of northwestern British Columbia residing in a primary community, and then to other Canadians.
	14.	Will develop a long-term recruitment, employment and training strategy, whose success depends upon cooperation and commitment of the Tahltan Central Council, local communities and provincial and federal governments.
	15.	Will implement a hiring strategy that will include a workforce education and skill assessment, capacity survey of primary communities, mine employment orientation program, open pit mine heavy equipment training program, specific on-the-job

[1] ISO is the International Standard Organization and 14001 is the certification program for environmental management.

		training programs and apprenticeship programs.
	16.	Will ensure that all employees receive site-specific safety and environmental awareness training.
Business Opportunities	17.	Will develop a long-term business opportunities strategy involving structuring contacts so they can be accessed by a variety of different sized local businesses.
	18.	Will implement a business opportunities strategy that will require contractors to disclose their policies and practices for providing opportunities to the members of the Tahltan Nation and residents of northwestern British Columbia.
Health and Safety, Air Quality and Noise	19.	Will develop a safety plan which will outline and describe appropriate procedures and protocols to effectively deal with hazards including hazard evaluation, appropriate control procedures and protocols, personal protective equipment to be used, air and water monitoring protocols and specifications, confined space entry procedures and detailed fire-fighting procedures.
	20.	Will implement a program of risk reduction to provide protection from accidental losses for all personnel and physical assets.
	21.	Will use the Loss Control and Risk Reduction Policy to guide all phases of the Project.
	22.	Will use monitoring programs to ensure healthy work environments and protection of other biological receptors.
	23.	Will locate the explosives facilities and related access roads in safe sites relative to other mine facilities and geohazards.
	24.	Will consider installing a gravity-fed fire suppression water system in addition to the pump-supported system proposed in the Application for an environmental assessment certificate.
	25.	Will develop and implement an Air Emissions and Fugitive Dust Management Plan.
	26.	Will use appropriate emissions control equipment such as scrubbers.
	27.	Will use high-efficiency technologies for diesel mining equipment.
	28.	Will develop and implement a site-wide air monitoring program during permitting to assess the effectiveness of mitigation strategies employed.
	29.	Will use appropriate control methods such as road watering and vehicle speed regulations to minimize the generation of fugitive dust.
	30.	Will use preventative maintenance to ensure optimum performance of light-duty vehicles, diesel mining equipment, aircraft and the incinerator.
	31.	Will make reasonable efforts to use post-2005 diesel equipments to minimize air emissions.
	32.	Will use the lowest sulphur-content fuel reasonably available on the market.

	33. Will implement a recycling program to reduce the amount of incinerated wastes and hence CO_2 emissions. 34. Will segregate waste prior to incineration to minimize toxic air emissions. 35. Will develop a dust deposition monitoring program to measure dust/chemical deposition from mining activities. 36. Will use a dust suppression system for the primary crusher to reduce fugitive dust and keep ore drop height to a minimum. 37. Will cover the conveyors and ore stockpile to reduce fugitive dust. 38. Will inform employees, contractors and subcontractors about policies for managing air quality (e.g., trucking contractors will be informed of the requirements for speed limits and no idling). 39. Will implement dust control at the intersection of the access road and Highway 37. 40. Will use appropriate covers for concentrate trucks to minimize the loss of concentrate due to dusting along Highway 37. 41. Will, if tarpaulins are used to cover concentrate trucks, develop an operating procedures manual for correct tarpaulin use and provide training for transportation contractors. 42. Will participate with other industrial users of Highway 37 and government agencies to monitor for potential metals contamination resulting from concentrate dusting along the highway. 43. Will participate with other Port of Stewart users and the Ministry of Environment in a joint air quality monitoring program. 44. Will monitor workplace contaminants to ensure compliance with occupational health exposure limits pursuant to permitting requirements. 45. Will abide by the British Columbia Open Burning Smoke Control Regulation. 46. Will monitor noise levels in the accommodation complex once operations begin, in order to ensure appropriate noise levels. 47. Will compare the results of noise monitoring in the accommodation complex to noise levels related to sleep disturbance in the World Health Organization Guidelines for Community Noise (1999), and in the event that noise levels exceed these guidelines then mitigation measures that are technically and economically feasible will be undertaken. 48. Will install monitoring wells to monitor groundwater plume and assess potential impacts to drinking water in the event of a chemical spill near wells supplying drinking water to camps.
Traditional Knowledge	49. Will continue to work with the Tahltan Central Council on the development of Traditional Knowledge studies and the continued application of Traditional Knowledge to the Project. 50. Will develop environmental monitoring programs that incorporate both Traditional Knowledge and science.

	51. Will participate with the Crown and Tahltan Central Council to help expand collective knowledge of potential cumulative impacts of resource development on all valued ecosystem components.
Climate	52. Will use pipelines for moving concentrate and diesel fuel to reduce the number of haul truck trips and the consequent amount of diesel emissions and fugitive dust. 53. Will continue to examine energy reduction programs to minimize CO_2 emissions. 54. Will implement various methods of power reduction and energy conservation. 55. Will consider energy efficiency when purchasing new and replacement equipment. 56. Will consider energy efficiency policies of outside service providers when acquiring services. 57. Will monitor fuel and electrical consumption. 58. Will replace land area cleared by deforestation during reclamation. 59. Will conduct glacier mass balance monitoring starting in 2007 with a monitoring plan to be developed and reviewed by relevant agencies and the Tahltan Nation.
Surface Water and Groundwater Quality and Quantity and Sediment	60. Will retain an independent consultant to determine the Probable Maximum Flood snow depth for the Galore Creek basin, the Probable Maximum Flood hydrograph using a defensible snow-melt rate, and, by the end of January 2007, prepare a technical report that summarizes the assessment and provides a recommended Probable Maximum Flood hydrograph. The report will be provided to the Ministry of Environment, Ministry of Energy, Mines and Petroleum Resources, Environment Canada and Tahltan Central Council. 61. Will establish and staff a field laboratory for the construction phase, capable of analysing paste and rinse pH, conductivity, total sulphur and carbon and modified neutralization potential. 62. Will employ and train environmental monitors to monitor construction of the access road, mine site facilities and transmission line. 63. Will treat initial waste rock blasts as potentially acid generating and test to evaluate the possible preferential enrichment of sulphide minerals in the fine fraction of blasted rock. Whole rock and the -2 mm fraction will be analyzed to determine whether adjustment to the $IC_{Ca, Mg}$ /AP is needed. An annual program will be designed to continually re-evaluate this distribution. 64. Will conduct additional comparative testing of not-potentially acid generating and acid base accounting to refine the not-potentially acid generating pH boundaries and ensure that there are no biases related to rock type and mineralogy. 65. Will conduct additional testing prior to mining to refine the adjustment of neutralization potential to estimate $IC_{Ca, Mg}$, using the same methods used in the environmental assessment, which were Rietveld X-ray defraction, carbonate analyses and

microprobe testing on mineral particles. This program will be repeated until the $IC_{Ca, Mg}$ can be accurately estimated.

66. Will maintain a database of analytical results, truck counts and disposal locations to provide an inventory of rock management.
67. Will continue some of the humidity cell tests started during the environmental assessment review to monitor the progress of neutralization potential depletion, continue on-site barrel tests and bi-annual monitoring of toe seeps from upland dumps, maintain an overall up-to-date site water and load balance to compare predictions of metal loadings with actual conditions, and conduct annual audits of management potentially acid generating and non-potentially acid generating rock at the drill face in pit.
68. Will use a conservative neutralization potential ratio of 2 to segregate potentially acid generating from not-potentially acid generating waste rock for underwater disposal. Will continue to monitor to verify pre-mining conditions and update the operational management plan for waste rock, tailings, low grade ore and construction materials as more information is gained from the site. This document will be a living document with updates submitted to the Ministry of Energy, Mines and Petroleum Resources and the Ministry of Environment for review and approval whenever significant changes occur.
69. Will use construction material with an NP/AP>3 and paste pH>6 and metals <2 x crustal abundance and Cu/S<y (where y is still being determined by leach column tests), for the downstream dam fill and all other fill requirements located outside of the dam containment area.
70. Will restrict the use of potentially acid generating rock for construction to areas that will be submerged behind the dam.
71. Will assess acid rock drainage potential of excavated faces during access road and diversion channel construction, using an on-site laboratory, and develop appropriate mitigation, including mitigation for closure, for any acid rock drainage encountered.
72. Will stockpile excavated rock from tunnel construction and characterize excavated rock for metal leaching/acid rock drainage potential during construction. If the rock is potentially acid generating, it will be transported to the Galore Creek valley for proper disposal after tunnel construction is finished.
73. Will divert drainage from the tunnel into the tailings and waste rock impoundment.
74. Will continue test work during mine operations to identify means to reduce the volume of waste rock requiring subaqueous disposal, thereby reducing the required impoundment size and dam height.
75. Will eventually submerge all potentially acid generating rock as an acid generation control measure.
76. Will submerge any remaining marginal ore stockpiles in the waste rock storage impoundment at closure.

77. Will conduct further water quality modelling during operations to characterize pit and impoundment water quality after closure.
78. Will use emulsion explosives as required to minimize ammonia and nitrate losses and contamination.
79. Will address potential for ammonia leakage from the explosives manufacturing and storage facility by using measures such as non-corrosive silos, an impermeable apron and a spill management plan.
80. Will control total suspended solids at 15 mg/L during operations to meet federal Metal Mining Effluent Regulation for discharge.
81. Will pace discharge into Galore Creek generally between May 15 and October 15 to mimic the natural hydrograph.
82. Will have pumping capacity to discharge up to 20 m^3/s during high flow periods.
83. Will have the ability to store freshet flow behind main dam up to July 15 of each year as a contingency in event water quality is not acceptable for discharge in May or June.
84. Will monitor pumped outflow rates during operations.
85. Will install groundwater wells downstream of the main dam to intercept any seepage exceeding effluent permit limits.
86. Will monitor groundwater levels and quality outside of the Galore Creek valley of wells at the Porcupine aerodrome camp site, Round Lake heliport camp site and the filter plant site.
87. Will design the watercourses and the diffuser to accommodate navigable water requirements.
88. Will design main diversion channel to 200-year flood event.
89. Will construct the diversion channel with an impermeable liner in areas of high permeability.
90. Will design other diversion structures around the mine to 100-year flood event.
91. Will decommission pit de-watering wells at closure.
92. Will, during the permitting stage, assess water treatment options for operations and post closure, including, but not limited to, a water treatment plant.
93. Will maintain diversion channels as outlined in the environmental assessment to minimize mine-contact water inflows into the impoundment.
94. Will continue to collect hydrological data within the study area throughout the life of the Project to update the water balance and hydrological models.
95. Will prepare and implement a Maintenance and Surveillance manual for all water management structures, diversion channels and stream crossings.
96. Will prepare an Operations, Maintenance and Surveillance manual for dewatering of the pits and the manual will include steps on how to respond during a probable maximum flood.

97. Will develop and implement Sediment and Erosion Control Plans and will monitor sediment transport in Galore Creek during construction and operations.
98. Will establish Environmental Management Plans for all earth work structures and stockpiles.
99. Will meet or exceed all water quality criteria established in permits to maintain water quality downstream.
100. Will apply best management practices throughout the construction, operation and closure of the Galore Creek mine.
101. Will, during operations and after closure, monitor and manage drainage from the tunnel, not-potentially acid generating dumps, ore and marginal ore storage stockpiles, pits, seeps and other mine areas, including the impoundment, and manage or treat problematic water sources as required to ensure site discharges meet both the Environmental Management Act effluent discharge permit limits and federal Metal Mining Effluent Regulation discharge criteria that are applicable at the time.
102. Will plug wells and drains at mine closure.
103. Will monitor water quality after closure until regulatory agencies determine that conditions are stable and predictable.
104. Will incorporate sufficient redundancy and storage capacity in the filter plant to accommodate any equipment maintenance and unplanned shutdowns.
105. Will monitor water levels in Porcupine River and design a flood protection barrier adjacent to the Porcupine aerodrome.
106. Will undertake a flood risk assessment during the final design for the Porcupine aerodrome which will include consideration of potential impacts of climate change.
107. Will monitor pertinent glaciers to predict effects on mine safety and water management. Consideration will be given to monitoring of firn layer hydrology as part of the glacier monitoring program.
108. Will ensure that discharge from the diffuser to the Iskut River meets federal Metal Mining Effluent Regulation criteria.
109. Will modify the current 3D MODFLOW regional model used for pit dewatering predictions to accurately represent long-term post-closure conditions in the groundwater flow system.
110. Will conduct revised local-scale numerical modelling to predict seepage from the Galore Creek impoundment.
111. Will build sections of the access road located within floodplains atop a berm at least 1.2 metres in height to reduce the potential for road submergence.
112. Will construct all culverts and bridges to a 100-year design flood, with major bridge crossings designed to the 200-year flood.
113. Will place rip-rap at the inlet and outlet of the bridges and culverts to protect structures from erosion.

	114. Will incorporate at least 1.5 metres of clearance above the design flood elevation into bridge design to allow for debris passage and prevent bridge washout. 115. Will develop an Emergency Response and Spill Contingency Plans for all aspects of the Project, including the access road, tunnel, pipelines, processing plant and filter plant.
Aquatic, Fisheries and Wildlife Resources and Related Habitat	116. Will maintain intensive receiving environment, aquatic, fisheries and wildlife monitoring programs, throughout the life of the mine and developed in cooperation with university researchers, Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council, to ensure water quality, aquatic, fisheries and wildlife resources are not impacted by the Project and are protected for future generations. 117. Will continue conducting environmental monitoring (collection and analysis of water, sediment, and biota, combined with chronic and acute toxicity testing of appropriate organisms in the receiving waters) throughout the life of the mine to ensure that downstream environments are not impacted by effluent discharged from the Project. 118. Will add an additional monitoring site downstream on the Stikine River in Alaska at a depositional site to be determined during the permitting stage. 119. Will monitor for polycyclic aromatic hydrocarbons in the lower Galore drainage and on the Stikine River below the mouth of the Scud River annually and more frequently in the event of an uncontained spill. 120. Will provide annual reports and raw data from monitoring to appropriate Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council. 121. Will provide raw data from baseline surveys to appropriate Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council. 122. Will establish criteria, in conjunction with appropriate Canadian and U.S. federal, B.C. and Alaska State government agencies and the Tahltan Central Council, for assessing potential significant biological effects to the receiving environment identified by the monitoring programs. 123. Will work with the Fisheries and Oceans Canada, Transport Canada and Tahltan Central Council, to ensure the design of the diffuser minimizes potential impacts on fisheries resources and waterborne traffic. 124. Will incorporate information derived from monitoring in an ongoing process of adaptive management. 125. Will participate in a winter 2007 low flow assessment of fish habitat in Galore Creek.

126. Will investigate low flow conditions in the lower reaches of Galore Creek in 2007- 2008 to establish mean flows and will supplement baseline flows in Galore Creek to maintain critical water levels for fish in extreme low flow periods.
127. Will further investigate the cumulative effects of the additive aspects of mixtures of metals and their effect on aquatic life, including testing of actual tailings effluent during the first year of operations prior to discharge to Galore Creek.
128. Will develop comprehensive fish and fish habitat compensation plans in cooperation with the Ministry of Environment, Fisheries and Oceans Canada and the Tahltan Central Council.
129. Will develop environmental management plans for construction of the access road and transmission line.
130. Will design access road stream crossings to not encroach upon the bankful width of fish bearing streams where possible.
131. Will monitor fish health and tissue quality, including, but not limited to, analysis of the full suite of 30 metals used in the baseline studies, in Galore Creek and other potentially affected rivers as part of the Aquatic Effects Monitoring Plan pursuant to federal Metal Mining Effluent Regulation and the *Environmental Management Act*.
132. Will restrict use of the access road to persons on Galore Creek mine business, other legitimate tenure holders pursuant to an access agreement with the Tahltan Central Council and provincial permitting requirements.
133. Will develop and implement a Wildlife Mitigation and Monitoring Plan.
134. Will, where reasonably possible, avoid wildlife sensitive periods for construction activities and, where avoidance is not reasonably possible, will minimize the adverse impacts of these activities.
135. Will conduct production blasting in the open pits at consistent times during daylight hours to minimize adverse impacts on wildlife, particularly mountain goats, pursuant to the Wildlife Mitigation and Monitoring Plan.
136. Will follow the approach identified in NovaGold's application for an environmental assessment certificate for avoiding or minimizing disturbances to mountain goats by aircraft and helicopters, pursuant to Wildlife Mitigation and Monitoring Plan.
137. Will include pertinent noise monitoring as part of the Wildlife Mitigation and Monitoring Plan.
138. Will install electric fencing around residential and cooking/dining facilities at permanent camps and the aerodrome to minimize wildlife interactions.
139. Will modify the filter plant water treatment process if adverse aquatic effects are noted.
140. Will work with the Fisheries and Oceans Canada and use best management practices during the installation, operation and maintenance of the diffuser in the Iskut River.

	141. Will have on-site analytical capacity for water quality during operations. 142. Will endeavour to maintain a 100 metre buffer for Harlequin duck breeding habitat where it is feasible to do so, and will minimize potential impacts and prevent removal of woody debris and riparian vegetation in order to maintain a 50 metre buffer along the road right of way along identified breeding reaches where possible.
Mine Reclamation	143. Will provide a financial security covering the Project pursuant to the Mines Act. 144. Will salvage and stockpile topsoil for use in reclamation and protect topsoil stockpiles through revegetation and other practices as described in the environmental assessment. 145. Will initiate progressive reclamation where possible to control sedimentation around the mine area. 146. Will use adaptive management approaches to ensure advances in reclamation research are included in final closure planning efforts. 147. Will conduct test plots during operations to support appropriate revegetation of reclaimed areas. 148. Will reclaim using plants that will set the stage for natural succession and the establishment of plant communities that reflect the ecology of the area. 149. Will ensure that dump angles create a stable configuration at closure. 150. Will reclaim borrow and gravel pits to appropriate habitat when they are no longer required. 151. Will initiate progressive reclamation where possible to control sedimentation around the mine area.
Wetlands, Terrestrial Ecosystem and Country Foods	152. Will, prior to disturbance, sample water in wetlands in the vicinity of the mine that were not previously sampled due to dry conditions. 153. Will limit disturbance to the vegetation between the access road at the filter plant and the small (no name) lake. 154. Will develop a plan to control and manage invasive and noxious plant species. 155. Will monitor, with Tahltan Central Council participation, surface water, soil and vegetation concentrations of selected metals throughout the period of mine development and operation. A quantitative screening level risk assessment for country foods will be conducted if the quality of these environmental media is shown to decrease and should a specific country food appear vulnerable, monitoring of contaminant levels, if feasible, will be undertaken. In the case that fish tissue quality data obtained from monitoring indicates an increase in contamination levels, potential impacts to human health from fish consumption will be assessed. 156. Will re-evaluate contaminants of potential concern with respect to country foods.

Dam Stability	157. Will construct the tailings dam in accordance with the Canadian Dam Association guidelines (1999) to withstand a 1 in 10,000 year earthquake and the design will consider the effects of an avalanche-induced wave and the ability for the spillway to pass a Probable Maximum Flood.
	158. Will establish an ongoing initiative with the Tahltan Central Council and relevant Canadian and U.S. federal and B.C. and Alaska state government agencies to assess, at a conceptual level, the potential effects of a catastrophic dam failure and develop a program for remediation of those effects.
	159. Will equip the dam with instrumentation to monitor geotechnical performance during operations and after closure.
	160. Will maintain earthmoving equipment near the dam to support inspection, maintenance and repair functions after closure.
	161. Will develop a long-term maintenance and mitigation strategy for the dam and spillway for both operations and closure, including inspections annually and after significant events such as floods and earthquakes, and dam safety inspections, following Canadian Dam Association guidelines, every five years.
Tunnel	162. Will probe drill ahead of tunnel excavation to obtain information on rock geotechnical properties to allow use of appropriate ground support methods and to predict water inflows.
	163. Will implement a tunnel safety program including installation of lighting, fire extinguishers, telephones and refuge stations and a traffic management plan.
Pipeline	164. Will use a high density polyethylene pipe for the concentrate slurry pipeline to protect the pipe from abrasion from the slurry, and will use a coating and cathode protected anti-corrosion system.
	165. Will implement a comprehensive inspection program to monitor performance of the pipelines.
	166. Will bury the pipeline except where it crosses streams on bridge structures, with deeper burial in areas assessed as having geohazard potential.
	167. Will equip the pipelines with leak detection systems to permit rapid detection and response to leaks or ruptures due to erosion of the pipe or damage from external sources such as debris flows.
	168. Will provide shutdown procedures, shutoff valves, a spill response plan and an emergency drainage sump at the low point of the slurry pipeline alignment to minimize the extent and consequence of any spillage from the pipeline following a breach to the line.
	169. Will mark the location of the buried pipeline and lay a marker tape in the trench above the pipe to warn of the location in case of future excavation.
	170. Will design pipeline aerial crossings to reduce the risk of failure in the event of bridge failure.

APPENDIX F - SUMMARY OF NOVAGOLD CANADA INC.'S COMMITMENTS FOR THE GALORE CREEK COPPER-GOLD-SILVER PROJECT

Filter Plant	171. Will provide for a vehicle pullout near the filter plant to maintain opportunities for the public to access Hot Springs Provincial Park. 172. Will bury the effluent pipe from the filter plant approximately 1 metre below the channel bed, with the diffuser ports extending up to the channel. 173. Will design the water crossings and diffuser to accommodate navigable water requirements.
Geohazards	174. Will develop and implement an Operations and Maintenance manual that will include avalanche management and monitoring and mitigation for rock falls and debris flows for the mine site and access corridor. 175. Will ensure that bridges constructed along the access road will have sufficient freeboard to pass anticipated debris flows. 176. Will implement the mitigation measures proposed to reduce geotechnical risks for the Project, as outlined in NovaGold Canada Inc.'s Application for an environmental assessment certificate. 177. Will monitor geohazards at the mine site and along the access road pursuant to permitting requirements.
Archaeology	178. Will, jointly with the Tahltan Central Council, develop an archaeological chance find procedure to protect archaeological sites and artifacts, and implement that procedure. 179. Will follow up with the Tahltan Central Council after the source(s) of obsidian has been confirmed to identify methods for identifying possible routes back to Raspberry Pass (Mount Edziza). 180. Will include monitoring for the presence of cairns or rock piles in future archaeological assessments and will consider the sampling of tephra layers noted during excavations. 181. Will include ice patch archaeology where appropriate within the Project footprint. 182. Will avoid all archaeological and heritage sites where possible. 183. Will include a map of the study area plotted on a Tahltan Traditional Territory map in future archaeology study reports.
Miscellaneous	184. Will develop and implement a Follow-up Program and enter into an agreement with the federal government to implement the Program. 185. Will ensure that appropriate tenure is obtained for the filter plant and will permit non-essential mineral claims to lapse. 186. Will initiate a comprehensive recycling program for the Project to minimize the volume of material going to landfills. 187. Will work with the Kitimat-Stikine Regional District to address concerns with the use of the Iskut landfill. 188. Will develop and implement industrial and domestic waste management strategies. 189. Will ensure that fuel containment areas are adequately protected from excessive precipitation and will design these structures to minimize the amount of snow/water removal required.

190. Will develop and implement a hazardous materials management plan that will include management of de-icing fluids required for the aerodrome, and will consult the Department of Fisheries and Oceans and Environment Canada on the management of de-icing fluids.
191. Will place a berm or protective barrier upslope of the aerodrome to minimize wave energy and debris resulting from a flood that might otherwise cause substantial damage to the facility.
192. Will design pit diversion channels to convey the peak discharge from the 200-year, 24-hour precipitation event. If this flow were exceeded, then runoff will drain to the tailings pond.
193. Will conduct an intersection study and produce design drawings to Ministry of Transport specifications.

APPENDIX G - SUMMARY OF PROVINCIAL AUTHORIZATIONS, LICENCES AND PERMITS REQUIRED FOR THE GALORE CREEK COPPER-GOLD-SILVER PROJECT

Statute	Authorizing Agency	Purpose	Authorization Type
Mines Act	Ministry of Energy, Mines and Petroleum Resources (MEMPR)	mine site, initial development	Permit Approving Work System & Reclamation
Mines Act	MEMPR	pre-production	Amendment to Permit Approving Work System & Reclamation Program
Mines Act	MEMPR	financial security	Amendment to Permit Approving Work System & Reclamation Program
Mines Act	MEMPR	mine plan – production	Amendment to Permit Approving Work System & Reclamation Program
Mines Act	MEMPR	construction and operation of tailings impoundment dam, tunnel and filter plant	Amendment to Permit Approving Work System & Reclamation Program
Mines Act	MEMPR	gravel pit/wash plant/rock borrow pit	Permit Approving Work System & Reclamation Program
Water Act	MOE	application	Water Licence Notice of Intention
Water Act	MOE	storage and diversion	Water Licence
Water Act	MOE	use	Water Licence
Forest Act	Ministry of Forests and Range (MOFR)	mine site and tailings impoundment	Occupant Licence to Cut
Forest Act	MOFR	gravel pits	Occupant Licence to Cut

Forest Act	MOFR	access road	Occupant Licence to Cut
Forest Act	MOFR	borrow areas	Occupant Licence to Cut
Forest Act	MOFR	power transmission line	Occupant Licence to Cut
Forest and Range Practices Act	MOFR	access road	Special Use Permit
Forest and Range Practices Act	MOFR	Devil Creek forest service road	Road Use Permit
Land Act	Ministry of Agriculture and Lands (MAL)	water discharge line	Licence of Occupation
Land Act	MAL	borrow/gravel pits	Licence of Occupation
Land Act	MAL	staging areas	Licence of Occupation
Land Act	MAL	power transmission line	Licence of Occupation / Statutory Right of Way
Land Act	MAL	mine site facilities	Surface Lease
Land Act	MAL	filter plant	Surface Lease
Land Act	MAL	concentrate and diesel pipelines	Right of Way
Pipeline Act	MEMPR	pipeline	Pipeline Permit
Environmental Management Act	MOE	effluent (sediment, tailings & sewage)	Waste Management Permit
Environmental Management Act	MOE	filter plant discharge	Waste Management Permit
Environmental Management Act	MOE	air (crushers, concentrator)	Waste Management Permit
Environmental Management Act	MOE	refuse	Waste Management Permit
Environmental Management Act	MOE	(drinking water, sewage disposal, sanitation and food handling)	Camp Operation Permits
Environmental Management Act (Special Waste Regulations)	MOE	(waste oil)	Special Waste Generator Permit
Wildlife Act	MOE		Firearm Restricted Area

APPENDIX H - APPLICATIONS FOR CONCURRENT REVIEW FOR THE GALORE CREEK COPPER-GOLD-SILVER PROJECT

Statute	Authorization	Authorizing Agency	Purpose
Water Act	Water Licence	Ministry of Environment	Land improvement for the construction of stream diversions
Environmental Management Act	Waste Discharge Approval	Ministry of Environment	Construction of diversion channels and cofferdams commencing in spring of 2007
Environmental Management Act	Application to register three sewage treatment facilities	Ministry of Environment	Sewage treatment for the three camps along the access route
Health Act	Food permit	Northern Health Authority	Construction camps
Forest and Range Practices Act	Special Use Permit	Ministry of Forests and Range	Construction and operation of access road, associated gravel pits, quarries, camps and marshalling areas, the filter plant and related off-site infrastructure
Forest and Range Practices Act	Occupant Licence to Cut	Ministry of Forests and Range	Removal of timber along the access road right-of-way, mine site and tailings and waste rock disposal areas
Forest and Range Practices Act	Road Use Permit	Ministry of Forests and Range	Use of the Devil Creek Forest Service Road
Drinking Water Protection Act	Permit to Construct a Waterworks	Northern Health Authority	Water treatment in the three camps along the road access route
Land Act	Surface Lease	Ministry of Agriculture and Lands	Galore Creek property
Highway Act	Highway Access Permit	Ministry of Transportation	Access to allow equipment and personnel to use Devil Creek Forest Service Road mine site