TASEKO MINES LIMITED
PROSPERITY GOLD-COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT/APPLICATION

VOLUME INDEX

TASEKO PROSPERITY GOLD-COPPER PROJECT

ENVIRONMENTAL IMPACT STATEMENT/APPLICATION

VOLUME 9: ADDITIONAL REQUIREMENTS PURSUANT TO CEAA

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Acronyms and Abbreviations

AIA .... Archaeological Impact Assessment
ARD .... Acid Rock Drainage
BTEX .... benzene, ethylbenzene, toluene and xylenes
BTEX .... benzene, toluene, ethylbenzene and toluenes
CAC .... criteria air contaminant
CEAA .... Canadian *Environmental Assessment Act*
DFO .... Department of Fisheries and Oceans
EA .... Environmental Assessment
EAO .... Environmental Assessment Office
EIS .... Environmental Impact Statement
EPH .... extractable petroleum hydrocarbons
IDF .... Inflow Design Flood
KI .... Key Indicator
LSA .... Local Study Area
ML .... Metal Leaching
MOE .... Ministry of Environment
MOT .... Ministry of Transportation
MPB .... Mountain Pine Beetle
PAH .... polycyclic aromatic hydrocarbons
PAH .... polycylic aromatic hydrocarbons
PEP .... Provincial Emergency Program
PRS .... Project Report Specifications
RCMP .... Royal Canadian Mounted Police
ROW .... right-of-way
RSA .... Regional Study Area
TSF .... Tailings Storage Facility
TSS .... total suspended solids
VEC .... Valued Environmental Component
VH .... volatile hydrocarbons
VPH .... volatile petroleum hydrocarbons

1 Introduction and Summary

1.1 Introduction

Taseko Mines Limited ("Taseko") proposes to develop the Prosperity Gold-Copper Project, (the "Project") a conventional open pit project that would involve a large open pit mine development with a 20 year operating life. Typical large-scale open pit mining equipment and conventional copper porphyry flotation processing would be used. In addition to the mine and associated tailings and waste rock areas, the project includes development of an onsite mill and support infrastructure, an approximately 125 km long power transmission line corridor, and a 2.8 km mine access road.

A vital and necessary step in the development of a project of this nature involves the completion of an environmental assessment. Environmental assessment itself is a process whereby the environmental effects of a proposed project are predicted and assessed before decisions to proceed with development of the project are made. The two key purposes of an environmental assessment are to minimize or avoid adverse environmental effects before they occur and to serve as a vehicle whereby environmental factors are incorporated into project design and decisions are made with respect to project implementation. The environmental assessment for the Project began 16 years ago in 1993.

This Environmental Impact Statement ("EIS") has been prepared in response to and in accordance with the Project Report Specifications ("PRS") issued by the British Columbia Environmental Assessment Office ("EAO") in 1998 and the more recent EIS Guidelines issued by both the provincial EAO and the federal Minister of the Environment in January of 2009. Both the PRS and the EIS Guidelines were subject to regulatory agency, First Nation and public comment and review before being finalized. This volume, ***Volume 9: Additional Requirements Pursuant to CEAA*** is one of a nine volume series of reports that together constitute Taseko's Application for an Environmental Assessment Certificate pursuant to the British Columbia *Environmental Assessment Act* (BCEAA) and an EIS for submission to the Federal Review Panel pursuant to the Canadian *Environmental Assessment Act* (CEAA). The information contained within the volume is complete and comprehensive on the subjects discussed. In Section 2, Accidents, Malfunctions and Unplanned Events there are linkages to information contained and predictions and assessments undertaken in some of the other eight volumes. Accordingly it is important to appreciate that the reader must take into consideration the content and assessments contained within all nine volumes in order to fully consider the complete environmental assessment undertaken thus far. Many of the nine volumes include either directly or indirectly by way of appendices a considerable volume of information collected by Taseko in support of this EIS.

This volume, ***Volume 9: Additional Requirements Pursuant to CEAA*** contains a discussion on accidents, malfunctions and unplanned events and the effects of the environment on the Project. Information presented concerning accidents, malfunctions and unplanned events is further discussed in many of the other volumes where these events are assessed and the significance of any potential environmental effects determined. A summary of this information is provided in Section 1.2 below.

Volume 1: Summary Report is a stand-alone document describing all the environmental effects of the Project and the proposed environmental management and mitigation measures. The significance of each environmental effect and a statement on the Project's overall environmental effect is provided.

Volume 2: Project Planning and Alternatives Assessment provides a historical account of a four year alternatives assessment process that was undertaken to find the most environmentally responsible, technically and economically achievable project plan. It was concluded at the end of this extensive process that the only technically and economically achievable alternative was the Project Plan that is the subject of this current environmental assessment. A 2008 update of economic information is included.

Volume 3: Project Description and Scope of Project contains to a level of detail appropriate for an environmental assessment, Taseko's information concerning the regional and local geology and the project description. Detailed information concerning the mine plan, the proposed road access and transmission line is included. The volume also details the Acid Rock Drainage/Metal Leaching (ARD/ML) investigations and characterization program undertaken by Taseko Mines and includes details of a proposed Fish Compensation Plan developed as an integral part of the overall Project to compensate for the unavoidable loss of fish and fish habitat in the Fish Creek watershed. Taseko's proposed Environmental Management Program is outlined in sufficient detail to provide a framework upon which further, permit level details will be added at the appropriate time. This project description reflects the benefits of having undertaken extensive drilling and investigation of the mineral deposit, completion of two engineering feasibility studies and the filing of Instrument 43101 compliant information to regulators.

Volume 4: Physical Environment considers potential environmental effects of the Project on the atmospheric, acoustic, surface water hydrology and hydrogeological aspects of the environment. A detailed summary of baseline information collected and assessed, key issues, effects assessment, mitigation measures, characterization of any residual project effects, cumulative effects and a discussion of any proposed follow-up monitoring for each of the above mentioned aspects is provided.

Volume 5: Biotic Environment considers potential environmental effects of the Project on stream and lake water and sediment quality, periphyton, zooplankton and benthic invertebrate aquatic ecosystems, fish and fish habitat, terrain and soils, vegetation and wildlife aspects of the environment. A detailed summary of baseline information collected and assessed, key issues, effects assessment, mitigation measures, characterization of any residual project effects, cumulative effects and a discussion of any proposed follow-up monitoring for each of the above mentioned aspects is presented.

Volume 6: Socio-Economics, Human Health and Ecological Risk Assessment considers potential effects of the Project on economic, social, community and health services aspects. Effects of the Project on resource uses including forestry, agriculture and ranching, fishing, hunting, recreation, tourism and trapping are also assessed. Information concerning First Nations cultural heritage including an assessment of Project effects on traditional use is provided. Included in this volume is a human health and ecological risk assessment that considers the potential environmental effects of the Project on human health and ecological health. A detailed summary of baseline information collected and assessed, key issues, effects assessment, mitigation measures, characterization of any residual project effects, cumulative effects and a discussion of any proposed follow-up monitoring for each of the above mentioned aspects is presented.

Volume 7: Archaeological and Heritage Resources includes the results of an extensive Archaeological Impact Assessment (“AIA”) undertaken in the vicinity of the mine site. Archaeological resources within the proposed mine site area are identified and evaluated and the potential effects of the Project on these resources assessed. Recommendations concerning measures to mitigate unavoidable loss of these resources are included. While First Nations representatives were involved in the design and implementation of the AIA regrettably circumstances have not afforded Taseko Mines the opportunity to share the results of this AIA with First Nations before including it in this EIS. Taseko’s understanding concerning the significance of the information reported and how to evaluate it will improve with further dialogue with First Nations and the provincial Archaeology Branch.

Volume 8: First Nations is intended to be a “stand alone” document drawing upon information found throughout many of the other volumes to provide a single source of information thought to be of interest, particularly to First Nations. Included within this volume, in accordance with the terms of the EIS Guidelines, is a historical overview of Taseko’s ongoing efforts to engage and exchange information with First Nations concerning their interests, issues and understanding of the Project. Where available publicly, information concerning First Nations land claims and rights and title matters, their history in the area, traditional knowledge and land use is also included.

1.2 Summary

The Accidents and Malfunctions assessment in this volume determined the potential range of environmental effects that might occur in the unlikely event of an accident or malfunction during the life of the Project. Six potential accidents and malfunctions scenarios are assessed: fuel spill on land and in rivers; failure or major leakage from tailings or the reclaim pipeline; concentrate haul spill on land and in rivers; road culvert failure causing increased sedimentation release into Fish Creek or Taseko Rivers; excessive water in Tailings Storage Facility (TSF) resulting from the failure of dam construction to keeping up with rising water; and the loss of power to TSF seepage recovery resulting in tailings seepage overflowing into the emergency settling pond open pit. The assessment identifies the procedures that will be put in place by Taseko to minimize or avoid the potential for these events to occur; the range of measures that are likely to be employed by Taseko to initially contain and respond to different types of accidents and malfunctions; additional measures that will be employed by Taseko to further contain and clean-up any accidental spills or releases; techniques that will be used by Taseko to rehabilitate affected areas or compensate for these effects; and, follow-up and monitoring programs that would be implemented by Taseko should certain types of accidents and malfunctions occur during the life of the Project

The Effects of the Environment on the Project section of this volume assesses the potential effect that the environment could have on the Project. The assessment examines how natural hazards, such as extreme weather (severe rainstorms, snow storms, wind, drought); forest fires; mountain pine beetle; and seismic activity could adversely affect the Project. Longer-term effects of climate change are also considered. The assessment goes on to provide information on planning, design, and construction strategies for minimizing potential environmental effects.

The final assessment section of this volume examines the possible effects of the Project on the Capacity of Renewable Resources to meet the needs of the present and future generations. The assessment is based on a range of ecological considerations, such as:

ecosystem integrity and carrying capacity, resource productive capacity, and cumulative environmental effects with other projects. Conclusions are drawn from assessments in other sections in this volume of the EIS. After consideration of the Project's design, the best management practices that would be employed, and the project-specific mitigations developed where needed, the determination for all renewable resources is that the project will not have significant effects.

This volume addresses the assessment of three issues pursuant to the CEAA:

- Accidents, Malfunctions, and Unplanned Events
- Effects of the Environment on the Project
- Capacity of Renewable Resources

1.2.1 Accidents, Malfunctions, and Unplanned Events

Six potential accidents and malfunctions scenarios are assessed: 1) fuel spill on land and in rivers; 2) failure or major leakage from tailings or the reclaim pipeline; 3) concentrate haul spill on land and in rivers; 4) road culvert failure causing increased sedimentation release into Fish Creek or Taseko Rivers; 5) excessive water in TSF resulting from the failure of dam construction to keeping up with rising water; and 6) the loss of power to TSF seepage recovery resulting in tailings seepage overflowing into the emergency settling pond open pit. The assessment explains the reason for the selection of these scenarios as representative of the types of events that could potentially take place, the potential consequences; and the Project's capabilities, resources, equipment and plans for responding.

1.2.2 Effects of the Environment on the Project

This section assesses the potential effect that the environment could have on the Project. The assessment examines how natural hazards, such as extreme weather (sever rainstorms, snow storms, wind, drought); forest fires; mountain pine beetle; and seismic activity could adversely affect the Project. Longer-term effects of climate change are also considered. The assessment goes on to provide information on planning, design, and construction strategies for minimizing potential environmental effects.

1.2.3 Capacity of Renewable Resources

The assessment examines the possible effects of the Project on the capacity of renewable resources to meet the needs of the present and future generations. The assessment is based on a range of ecological considerations, such as: ecosystem integrity and carrying capacity, resource productive capacity, and cumulative environmental effects with other projects. Conclusions are summarized in this volume as they are addressed fully in other sections of the EIS.

2 Accidents, Malfunctions and Unplanned Events

The following section of the environmental assessment describes potential accidents and malfunctions that might occur during the life of the Project. The primary objectives of this section were to determine the potential range of environmental effects that might occur in the unlikely event of an accident or malfunction, as well as to identify:

- the procedures that will be put in place by Taseko to minimize or avoid the potential for these events to occur
- the range of measures that are likely to be employed by Taseko to initially contain and respond to different types of accidents and malfunctions
- additional measures that will be employed by Taseko to further contain and clean-up any accidental spills or releases
- techniques that will be used by Taseko to rehabilitate affected areas or compensate for these effects
- follow-up and monitoring programs that would be implemented by Taseko should certain types of accidents and malfunctions occur during the life of the Project

2.1 Regulatory Requirements and Guidelines

In relation to accidents and malfunctions, the CEAA states that

> "every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:
>
> a. 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
>
> b. the significance of the effects referred to in paragraph (a)"

The PRS (1998) provide some guidance on the types of events that might be considered in the assessment, as well as the need to assess the environmental effects of accidents and malfunctions; specifically:

- Section 1.1.2: "identification and assessment of potential effects of accidents and malfunctions that may occur in connection with the project, and contingency plans to deal with such accidents and malfunctions"
- Section 5.1.10 (spill prevention): "operational plans for transportation, storage, containment and spill response for all of the various reagents, fuels, road-de-icing and dust suppression chemicals and other potentially harmful commodities which will be transported to and from the mine site and utilized at the site …."
- Section 5.1.10 (spill prevention): "Provide conceptual plans for dealing with spills, in particular from the tailings pipeline and warning equipment to detect and prevent spills…."

- Section 5.1.10 (spill prevention): Provide conceptual plans for dealing with concentrate spills arising from transport accidents and for dealing with incidents of heavy rain and/or run-off events at loading facilities associated with the project"
- Section 5.1.10 (spill prevention): conceptual assessment of the effectiveness of the designs of various mine development plan components …in dealing with common failures that may result in spills of polluting substances to the environment".
- Section 6.9: mentions the need for contingency plans for events such as "tailing pipeline ruptures, culvert plugging, dam rupture, beaver activity, etc." "back-up plans or redesign of project specifications to address the risks of anticipated, as well as unusual circumstances, accidents, and malfunctions.

The EIS Guidelines (2009) provide further guidance concerning what needs to be considered including:

- The EIS will identify the probability of potential accidents and malfunctions including an explanation of how those events were identified, potential consequences and the worst case scenarios and impacts.
- The EIS will identify the capabilities, resources and equipment available to safely respond to any accidents and malfunctions, describe the planned response and the contingency clean-up or restoration work that would be required following or in the long term after the postulated malfunction and accident.
- The EIS will include an Environmental Protection Plan to address potential accidents malfunctions and unplanned events.

2.2 Approach

2.2.1 Determination of Potential Accidents and Malfunctions

To focus the assessment of potential accidents and malfunctions, the following three step process was followed to develop a suite of scenarios that were then assessed by each of the environmental disciplines:

1. Potential accidents, malfunctions, and unplanned events that might occur during the life of the Prosperity Mine were identified using historical performance data for other similar projects (Appendix 9-2-A). These events included potential risks to the environment, as well as health and safety risks for workers.

   Using this list of events, a suite of possible events involving releases of chemicals, effluents and other products that might be perceived to pollute or contaminate land or water resources was identified. Given the minor nature of atmospheric emissions associated with the Project and the types of chemicals and products that will be used in the concentrate process, no accidental events involving releases of emissions were considered further in this assessment. However, effects on the atmospheric environment from some accidental events were considered.
2. The possible accidents and malfunctions were then screened in terms of whether they could possibly result in a release to the environment based on the proposed Project design. As an example, while a breach of the tailings dike might be a possible accident or malfunction, based on the project design, such a breach would only result in release into the pit, and not to the external environment.

3. For each remaining event, one or more scenarios were developed that described how the event could potentially result in a release to the environment. For example, two scenarios were developed for a diesel fuel spill; one on land and one directly into a watercourse as a result of a highway accident.

The scenarios used for the purpose of this environmental assessment are described more fully in Table 2-1 and Section 2.2.2.

Table 2-1 Description of Possible Accident and Malfunction Scenarios

Risk Events – Description of Possible Scenario	Potential Effect	Mitigation			Monitoring/ Residual Effects
		Preventative Measures	Emergency Response	Clean-up	
1.a Fuel Spill – Land: Loaded fuel (gas or diesel) truck over-turns on dry land along main access road	Localized impacts to soil	• Ensure proper construction and maintenance of site access roads by MOT, including regularly inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent over-turning and/or capture load loss • Enforce speed limits by all mine traffic on roads • Ensure trucking/hauling contractors have driver training, radio contact capabilities vehicle maintenance plan, clean-up kits, and an emergency response plan • Provide haul monitoring and supervision, and a driver feedback plan • Maintain and implement appropriate emergency response and spill contingency training, equipment, materials and procedures at the site to limit the consequences of such spills by prompt containment and clean up actions	• Conduct initial response and notification (mine supervisor, PEP, RCMP) as per emergency response plan. PEP will coordinate additional external notification • Activate emergency response groups	• Activate spill handling procedures including fuel containment, soil clean-up, reporting and soil disposal as identified in spill contingency plans • Complete reporting and disposal procedures • Mobilizing hydro-vacuuming units as appropriate	• Implement soil and groundwater monitoring procedures to assess requirement for additional soil clean-up and disposal • Ensure successful re-vegetation and weed control as required • No residual effect
1.b Fuel Spill – Water: Loaded fuel (gas or diesel) truck over-turns and releases load into water body, such as a) low flowing tributary to Taseko River or b) high flowing Chilcotin River	Release of petroleum products to water body /ways affecting water quality, aquatic habitat degradation		• As above, and include DFO in emergency contacts • Initiate immediate monitoring and assessment procedures	• Assess feasibility of containment and clean-up based on water body and flow rates. Activate spill handling procedures including: diverting fuel away from water; absorbent booming; pumpback to tanker/ alternate storage unit, and soil clean-up as identified in spill contingency plans • Complete reporting and disposal procedures	• Implement water quality and soil monitoring procedures to assess any short and long term effects on water quality and habitat, and mitigation requirements • Monitoring will include benthic invertebrate community surveys, collecting mortalities, and comparing with data from control sites upstream • A specific monitoring program for amphibians and their habitat would be considered in some circumstances • No residual effects
2. Failure or major leakage from tailings or reclaim pipeline	Release of tailings and/or reclaim (process) water to the environment affecting downstream aquatic habitat and water quality	• Situate pipelines in locations that ensure any accidental releases of tailings or mine water flow into the pit, TSF, or seepage collection channels • Ensure proper construction and maintenance of tailings delivery and reclaim water systems to maintain closed system • Install ditches, berms and emergency tailings containment ponds to capture and contain tailings in the event of a pipeline break to ensure that in the event of an equipment failure all material would be contained and there would not be a release to the receiving environment • Conduct routine inspections of tailings delivery and reclaim water systems • Maintain and implement appropriate emergency response and spill contingency training, equipment, materials and procedures at the site to limit the consequences of such releases by prompt containment and clean up actions • Ensure proper tailings line training and supervision	• Conduct initial response and notification (mine supervisor, on-scene coordinator) as per emergency response plan • Shut-down source of spill (tailings reclaim water) by implementing emergency shut-down procedures • Activate emergency response groups • Assess if spill of tailings/reclaim water is internal (likely) or will have external effects • Notify PEP and/or MOE and/or DFO in accordance with Emergency Response Plan	• If internal, activate containment, clean-up, and reporting and disposal procedures as appropriate	• If release is outside containment of the TSF, implement water quality and soil monitoring procedures as appropriate to assess effects and mitigation required for longer term effects on water quality and habitat • No residual effect if release contained internally • If release outside TSF containment occurs, short term effects would be addressed by cleanup activities • Residual effects anticipated to be minimal

Table 2-1 Description of Possible Accident and Malfunction Scenarios (cont'd)

Risk Events – Description of Possible Scenario	Potential Effect	Mitigation			Monitoring/ Residual Effects
		Preventative Measures	Emergency Response	Clean-up	
3. a Concentrate haul spill – Land: Loaded truck overturns on dry land along main access road.	Release of concentrate to dry landscape.	• Ensure proper construction and maintenance of site access roads by MOT, including regularly inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent over-turning and/or capture load loss • Enforce speed limits by all mine traffic on roads • Ensure trucking/hauling contractors have driver training, radio contact capabilities, vehicle maintenance plan, clean-up kits, and an emergency response plan	• Conduct initial response and notification (mine supervisor, PEP, RCMP, MOE, and adjacent land owners) as per emergency response plan • Activate emergency response groups	• Assess integrity (leakage) of container • Assess feasibility of diverting any surface water away from truck/load • Activate containment/clean-up procedures, reporting and disposal as identified in spill contingency plans. • Complete reporting and disposal procedures.	• Implement soil and groundwater monitoring procedures to assess requirement for additional soil clean-up and disposal • <u>No residual effect.</u>
3. b Concentrate haul spill – Water: Loaded truck over-turns and releases load into water body via bridge, ditch or culvert crossing to either a) low flowing tributary to Taseko River or b) high flowing Chilcotin River	Release of concentrate to water body affecting water quality, aquatic habitat degradation.	• Provide haul monitoring and supervision, and a driver feedback plan • Concentrate containers will be designed such that there is no wind loss • Maintain and implement appropriate emergency response and spill contingency training, equipment, materials and procedures at the site to limit the consequences of such spills by prompt containment and clean up actions	• As above, and include DFO in emergency contacts • Initiate immediate monitoring and assessment procedures as appropriate • Provide containment of spill in transport container, stop source if safe and possible, cover spilled material to protect from rainfall, prevent egress of spilled material from vicinity	• Assess integrity (leakage) of container. Assess feasibility of containment and clean-up based on water body and flow rates. Assess feasibility of diverting water away from truck/load • In low flow water body, activate containment/clean-up procedures, reporting and disposal as identified in spill contingency plans • Complete reporting and disposal procedures	• If release is into a fast-moving body of water and loss of concentrate is suspected, implement water quality, habitat and fish monitoring procedures as appropriate to assess short and long term effects and mitigation required • Riparian habitat cleared to facilitate the cleanup will be restored as required. • <u>Some level of residual effect would be expected</u>
4. Road culvert failure: Blocked culvert across Taseko Lake Road causes ponding above the road, bank erosion, and increased sedimentation release into Fish Creek or Taseko Rivers.	In the event of a road failure, there is the potential for sediment from the road erosion to be released into the receiving environment affecting downstream water quality and aquatic habitat degradation.	• Ensure regular road maintenance • Design and install culverts to accommodate frequent extreme storm events, and include engineered debris gates in front of culverts • Conduct appropriate monitoring of the condition of culvert and debris traps (if present) • Assess culvert condition during and after storm events	• Conduct initial response and notification (mine supervisor, PEP, MOE, MOT, RCMP) as per emergency response plan • If sufficient water is ponded above the road as a result of blockage, notification of immediate downstream or adjacent residents may be required. • Activate emergency response groups, including mine site contractors for remediation • Unblock culvert or provide bypass to relieve stored water • Develop action plan to reinstate culvert, flow and normal access	• Activate sediment and erosion control contingency plans. • Re-establish culvert using best management practices for erosion control	• Implement water quality monitoring procedures as appropriate to assess effects and mitigation required for longer term effects on water quality, terrain stability, soil, and habitat • <u>No residual impacts would be expected</u>

Table 2-1 Description of Possible Accident and Malfunction Scenarios (cont'd)

Risk Events – Description of Possible Scenario	Potential Effect	Mitigation			Monitoring/ Residual Effects
		Preventative Measures	Emergency Response	Clean-up	
5. Excessive water in TSF due to storm events have the potential to affect downstream aquatic habitat and water quality if excess water results in off-spec volumes being discharged to environment	Minimal environmental effect if containment is maintained. If release is necessary, potential for Increased sedimentation and flow rates to downstream watercourses	• Conduct annual reviews by an engineer of tailings hydrological model, operation/ construction of the tailings complex, and water balances based on site collected meteorological data • Ensure all dams are built to maintain annual volumes of tailings release as well as the maximum potential storm events while maintaining a design freeboard criterion • Ensure upstream diversion structures for fresh water accommodate maximum storm events with safeguards in place to minimize blockage • Maintain a water treatment contingency plan • Ongoing monitoring of TSF water levels, freeboard and TSF integrity to reduce risks	• Conduct an initial response and notification (mine supervisor). • If water quality is suitable for release to the environment, and release is necessary, notify MOE for authorization • If water quality is not suitable, the tailings water may be bypassed to the open pit for temporary containment • *It is unlikely that water of unsuitable quality will be released to downstream environments; however, if it is, conduct initial response and notification (mine supervisor, PEP, MOE, DFO) as per emergency response plan, including downstream users; activate emergency response groups; and, initiate immediate monitoring and assessment procedures*	• Implement the water treatment contingency plan	• No residual effect if loss is into the pit, pump back system will return water to tailings under normal operating conditions • If release is in to the downstream environment, Implement water quality, bioassay, habitat and fish monitoring procedures as appropriate to assess effects and mitigation required for longer term effects. Short term impacts may be possible
6. Loss of power to TSF seepage recovery: Due to storm event, tailings seepage overflows into the emergency settling pond and towards the open pit	Human safety issues may arise as water is diverted to the pit; downstream water quality and aquatic habitat alteration could arise if water is discharged to the environment	• Conduct annual reviews by an accredited consultant of tailings hydrological model, operation/ construction of tailings complex, and water balances based on site collected meteorological data • Ensure sufficient reserve capacity in the pond to hold excessive run-off and seepage to withstand storm events for the number of days recommended by hydrological model • Provide access to backup (diesel) power generation and pumping capacity • Direct excess water to seepage ponds in a controlled manner to prevent wall erosion/stability issues potentially affecting human health/safety	• Conduct initial response and notification (mine supervisor) • Initiate immediate assessment of potential health and safety effects • *It is unlikely that water of unsuitable quality will be released to downstream environments; however, if it is, conduct initial response and notification (mine supervisor, PEP, MOE, DFO) as per emergency response plan, including downstream users; activate emergency response groups; and, initiate immediate monitoring and assessment procedures*	• Implement spill contingency plans	• No residual effect if loss is into the pit, pump back system will return water to tailings under normal operating conditions. Monitor pit walls for erosion issues, rocks and debris potentially affecting health and safety • If release is in to the downstream environment, implement water quality, bioassay, habitat and fish monitoring procedures as appropriate to assess effects and mitigation required for longer term effects. Some residual effect would be expected

2.2.2 Identification of Specific Events for Assessment

Six types of accidents, malfunctions or unplanned events that potentially could occur during the life of the Prosperity Project were considered in this environmental assessment. Additional details on these accidental events are provided in Table 2-1.

1. ***Fuel Spill***. Two possible fuel spill events were considered:
   - 1a. Land—Loaded fuel (gas or diesel) truck over-turns on dry land along main access road.
   - 1b. Water—Loaded fuel (gas or diesel) truck over-turns and releases load into water body, such as (a) low flowing tributary to Taseko River or (b) high flowing Chilcotin River.
2. ***Failure or major leakage from tailings or reclaim pipeline.***
3. ***Concentrate haul spill***. Two possible concentrate spill events were considered:
   - 3a. Land—Loaded truck overturns on dry land along main access road.
   - 3b. Water—Loaded truck over-turns and releases load into water body from bridge across or along road adjacent to either (a) low flowing tributary to Taseko River or (b) high flowing Chilcotin River.
4. ***Road culvert failure***: Blocked culvert across Taseko Lake Road causes ponding above the road, bank erosion, and increased sedimentation release into Fish Creek or Taseko Rivers.
5. ***Excessive water in TSF***: Situation arises from not keeping up with dam construction due to work delays, combined with storm events.
6. ***Loss of power to TSF seepage recovery***: Situation arises due to a storm event that causes tailings seepage to overflow into the emergency settling pond and towards the open pit.

2.2.3 Identification of Potential Interactions with Valued Environmental Components

For each scenario, each discipline conducted a preliminary screening to determine if the scenario was likely to affect the Valued Environmental Component (VEC) and/or Key Indicators (KIs) for that discipline. Potential interactions between the VECs for the Project and the six potential accidents, malfunctions and unplanned events were assessed using the same ranking system as used for Project environmental effects for the VEC. Interactions between the VECs and the six potential accident and malfunction events are summarized in Table 2-2. Based on the screening of potential interactions with the various VECs it was determined that neither Noise nor Socio Economic Issues had the potential to be affected by accidents and malfunctions. Noise will be generated during any clean-up events but they will be localized and short-term and therefore are considered not significant.

Table 2-2 Interaction of Project Related Accidents Malfunctions and Unplanned Events with the Environment

Project Activities/ Physical Works	Project Description Reference for Activity	Atmospheric	Hydrology and Hydrogeology	Water Quality and Aquatic Ecology	Fish and Fish Habitat	Terrain Stability	Soil	Vegetation	Wildlife	Archaeology	Human Health and Ecological Risk	Traditional Land Use	Non-Traditional Land Use
1a. Fuel Spill—Land	Loaded (50,000 Ls) fuel (gas or diesel) truck over-turns on dry land along main access road	1	2	1	1	0	2	1	1	1	1	2	1
1a. Fuel Spill—Water	Loaded (50,000 Ls) fuel (gas or diesel) truck over-turns and releases load into water body, such as a) low flowing tributary to Taseko River or b) high flowing Chilcotin River	1	1	2	2	0	1	1	2	1	2	2	1
2. Pipeline Failure	Release of tailings and/or reclaim (process) water to the environment affecting downstream aquatic habitat and water quality	1	1	0	0	1	0	1	1	0	1	1	1
3a. Concentrate Spill—Land	Loaded truck (40 tonnes) of concentrate overturns on dry land along main access road	1	1	0	0	0	1	1	2	1	1	1	1
3b. Concentrate Spill—Water	Loaded (40 tonnes) truck over-turns and releases concentrate load into water body from bridge across or along road adjacent to either a) low flowing tributary to Taseko River or b) high flowing Chilcotin River	1	1	2	2	0	1	1	1	1	2	2	1
4. Road culvert failure	Blocked culvert across Taseko Lake Road causes ponding above the road, bank erosion, and increased sedimentation release into Fish Creek or Taseko Rivers	1	1	1	1	2	2	1	1	1	0	1	1

Table 2-2 Interaction of Project Related Accidents Malfunctions and Unplanned Events with the Environment (cont'd)

Project Activities/ Physical Works	Project Description Reference for Activity	Atmospheric	Hydrology and Hydrogeology	Water Quality and Aquatic Ecology	Fish and Fish Habitat	Terrain Stability	Soil	Vegetation	Wildlife	Archaeology	Human Health and Ecological Risk	Traditional Land Use	Non-Traditional Land Use
5. Excessive water in TSF	Situation arises from not keeping up with dam construction due to work delays, combined with storm events	0	0	1	1	0	0	0	0	0	0	0	0
6. Loss of Power to TSF Seepage Recovery	Due to storm event, tailings seepage overflows into the emergency settling pond and towards the open pit	0	0	1	0	0	0	0	0	0	0	0	0

NOTES:
Project-Environment Interactions
0 = No interaction
1 = Interaction occurs; however, based on past experience and professional judgment the interaction would not result in a significant environmental effect, even without mitigation; or interaction would not be significant due to application of codified environmental protection practices that are known to effectively mitigate the predicted environmental effects
2 = Interaction could result in an environmental effect of concern even with mitigation; the potential environmental effects are considered further in environmental assessment

2.2.4 Assessment of Potential Environmental Effects

For interactions that were ranked as "2", potential environmental effects of the accident, malfunction or unplanned event on the VEC or KI were assessed in a similar fashion to Project environmental effects (Volume 2, Section 7: Methods). Specifically, for each environmental effect resulting from the accident or malfunction, the potential environmental effects were assessed as follows:

- to ensure that the assessment was conservative, each discipline framed the potential scenario so as to maximize the potential environmental effect of the VEC or KI. This could include selection of a product that is most harmful to the VEC or KI, as well as the specific time of year and location of the event
- the mechanisms through which the accident, malfunction or unplanned event could result in an environmental effect on the VEC or KI were described
- the project design measures that would minimize the risk of the accident or malfunction, as well as emergency response measures and other mitigation measures that would help minimize the environmental effect were described
- the potential residual environmental effect, taking into account the emergency response by Taseko, was described or quantified using the measurable parameter(s) and other effect characterization terms, as necessary
- the significance of the predicted effect or change was evaluated using the same significance criteria for the VEC or KI as for Project environmental effects
- if required, any follow-up and/or monitoring program that might be required if this event occurred was described

2.3 Fuel Spill on Land

2.3.1 Description of the Possible Event

It is possible that during the life of the Project that a fuel truck could overturn along the main access road during transport of fuel (gasoline or diesel) to the mine site, thereby releasing fuel onto land. For the purpose of this assessment, it was assumed that up to 50,000 Ls (~10,000 IGals) of gasoline or diesel fuel was spilled on dry land along the main access road during daylight hours.

2.3.2 Project Design Measures to Minimize Risk of a Fuel Spill on Land

To minimize the potential for fuel spills onto land, Taseko will implement the following suite of measures in cooperation with the Ministry of Transportation (MOT), contractors and sub contractors and other road users:

- ensure proper construction and maintenance of access roads by MOT and Taseko, including installation and regular inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent overturning and/or capture load loss
- enforce speed limits for all mine traffic on roads

- ensure trucking/hauling contractors have appropriate driver training and radio contact capabilities, engage in appropriate vehicle maintenance and carry appropriately sized emergency clean-up kits
- provide haul monitoring and supervision and a driver feedback plan
- ensure appropriate emergency response and spill contingency training and knowledge, maintenance of equipment, materials and procedures to limit the consequences of such spills by prompt containment and clean up actions

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.3.3.

2.3.3 Taseko Emergency Response Approach for Fuel Spills on Land

If all precautionary and preventative measures do not prevent a land-based fuel spill, an emergency response protocol will be initiated that involves:

- notification of all agencies and responders (mine supervisor, Provincial Emergency Program [PEP], RCMP) as per the emergency response plan
- activation of spill handling procedures including assessing feasibility of containment and clean-up
- implementation of spill handling procedures including: diverting fuel away from water; deployment of absorbent booming; pumpback fuel to a tanker/alternate storage unit as quickly as possible, and soil/environmental clean-up as identified in spill contingency plans
- completion of reporting and disposal procedures

2.3.4 Potential Environmental Effects

Based on the screening of potential interactions between a land-based fuel spill and VECs (Table 2-2), the VECs that are most likely to be detrimentally affected are:

- Hydrology and Hydrogeology (groundwater flow rate and groundwater quality)
- Soils
- Wildlife
- Human and Ecological Health
- Traditional Land Use

Interactions with all remaining VECs, apart from terrain stability that was ranked as a "0", were ranked as "1" for reasons described below.

Atmospheric: Under calm conditions the area within which CACs would disperse in the event of a spill would be limited (less than 1 km^3) and short-term (4–8 hours). Under windy conditions the time to for dissipation would be significantly reduced. As a result, atmospheric concerns associated with a fuel spill are low.

Water quality and fish and fish habitat: The extent of the spill on land would not likely result in direct spillage into a watercourse or water body. In addition, initial spill containment methods and subsequent spill clean-up measures would help minimize the potential for seepage of fuel into watercourses or water bodies (as these would be key areas to protect).

Vegetation: The spill would largely occur on a disturbed area within the road right-of-way where sensitive vegetation KIs are not likely to occur.

Archaeology: Potential land disturbances that are part of the spill response program would likely be restricted to a small area in the direct vicinity of the road right-of-way (i.e., an already disturbed area); as a result, the potential to affect archaeological sites would be low. In addition, if fuel did spread beyond the road right-of-way (ROW), land disturbances associated with the spill response program would be minimized until an archaeologist has determined that artifacts and sites would not be disturbed by clean-up activities.

Human Health Risk Assessment: The potential human and ecological health effects from a fuel spill on land would be dependent on effects to soil and groundwater and, in turn, their effects on terrestrial biota that occur in the immediate area (e.g., plants, soil invertebrates, burrowing animals). Effects on groundwater, soil and wildlife are assessed in Sections 2.3.4.2, 2.3.4.3 and 2.3.4.4 respectively. Based on these assessments, it is expected that proposed mitigation and emergency response measures, including active spill handling procedures, will be sufficient to avoid any long term effects. As a result, it is also unlikely that there will be long term human and ecological health effects.

Non-traditional land use (including forestry, mining, range, trapping and tourism): In the event of a spill licensees would continue to abide by their license agreements with the province or, in the event that a spill interacted with their activities, negotiate work-arounds at the operational level. Non-licensee activities, including public recreation, hunting and fishing, would be expected to respond in a similar fashion. Users would avoid the spill area and avail themselves of substitute routes or use areas. Commercial and public users of Crown land already adapt, both spatially and temporally, to changes brought about by forest harvesting, fires, pestilence, community development and industrial development. In this context, a land fuel spill is unlikely to induce changes in measurable parameters that are distinguishable from the base case.

2.3.4.1 Hydrology and Hydrogeology

The effects of a 50,000 L fuel spill on groundwater underlying the spill area could be locally significant depending on the rate and quantity of fuel that infiltrates into the subsurface, as well as the type of fuel spilled. Certain components of diesel and gasoline fuels (e.g. benzene) are comparatively soluble and can migrate as dissolved contaminants in groundwater for several tens to hundreds of metres, and sometimes further if conditions are appropriate. The rate of contaminant migration, total distance and concentrations of the various fuel-derived contaminants in the groundwater will depend to a large degree on the spill site hydrogeology (soil type, topography, depth to groundwater, depth to bedrock, soil/rock permeability, geochemical environment, etc.).

The initial spill response typically begins in the first several hours following the spill, or sometimes days depending on the time and location of the spill, and would typically recover a substantial portion of the spilled fuel. Recovery is done by, for instance, deploying spill containment or absorbent materials and mobilizing hydro-vacuuming units to the spill site to recover free phase fuels. Subsequent source removal excavations would likely occur over the next several weeks to remove soils with free phase fuel in the pore space. It is possible that, even after remediation, soil and groundwater containing residual gasoline or diesel contamination will remain in an area (e.g., worst case free-phase fuel penetrates into a locally important fractured bedrock aquifer). This residual fuel can persist in the subsurface for years to decades, or longer if conditions permit. As a result, environmental monitoring and possibly ongoing remediation and treatment may be required.

Post-emergency response techniques commonly used for spills of this nature will quickly provide containment of groundwater via excavation, dewatering sumps and on-site treatment, thereby limiting the distance and magnitude of impacts in the vicinity of the spill.

Given mitigation and emergency response measures, residual effects of a spill on hydrology and hydrogeology will be short term, reversible, sporadic in frequency, and site specific. The overall rating of the residual effect is not significant as groundwater quality can be re-established within a short time line.

2.3.4.2 Soil

A fuel spill has the potential to affect soil quality due to contamination. The amount of contamination and the mitigation required will depend on the physical state of the soil and clean-up response time. The physical state of the soil, including soil texture, bulk density, cation exchange capacity, organic matter content and depth to restricting layers, influences the amount and depth of fuel that is absorbed into the environment. For instance, the depth of fuel absorption will be greater in sandy soils versus soils that have a higher clay or organic matter content. The response time is critical because the longer the response time, the more fuel will be released and dispersed into the environment.

For any type of spill event, the first priority is to control the fuel leakage at the source and recover as much of the spill as possible. The contaminated soil will be dug out as soon as possible and taken to an approved facility for remediation.

For agricultural lands, the soil that is used to replace the contaminated soil must be of equivalent agricultural capability as the site prior to the contamination. Stakeholder input will be required. The soil must be from the same region to prevent introduction of new pests or invasive plants to the agricultural area. The method of soil placement is also critical to prevent further degradation of the soil. If subsoil and topsoil need to be replaced, minimizing admixing of the two soil types is essential as is reducing compaction and erosion.

Given mitigation and emergency response measures, residual effects of a spill on soil quality will be short term, reversible, sporadic in frequency and site-specific for the land event. The magnitude is considered low if the aerial extent of soil contamination is remediated and equivalent land capability is returned. The overall rating of the residual effect is not significant as prior land uses can be re-established within a one year timeline.

A land based spill would be confined to the vicinity in which the spill occurred; as a result, the mitigation will likely be able to be applied readily. The probability of a spill occurring in agricultural areas is low as those lands intersect less than 10% of the access road.

In the event of an accidental spill of fuel oil or diesel, the following monitoring progress will be undertaken:

1. ensure successful revegetation of remediated sites occurs within a growing season

2. where fill or topsoil has been used, ensure that weed control is implemented. Seeds of invasive plants may have been harbored in the replaced soil or invasive plants may have revegetated the site due to bare soil conditions at time of fill replacement
3. further soil amendments such as organic matter incorporation may be required to aid in re-establishing agricultural land capability in agricultural areas. Stakeholder input will be required
4. for soil that is remediated *in situ* due to low concentrations of fuel contamination, ongoing monitoring will be required to ensure complete remediation. (i.e., minimum two years of monitoring)

2.3.4.3 Wildlife

The interaction between wildlife and a land-based fuel spill is ranked as a “1” for most wildlife because the spill would largely occur on an already disturbed area within the road ROW and the areal extent of the spill would be small relative to the habitat requirements of most wildlife. Further, larger, more mobile wildlife could readily avoid the spill area. For soil invertebrates and other smaller, less mobile wildlife (e.g., burrowing animals); however, the interaction is ranked as a “2”. The assessment of this wildlife interaction is addressed under the human health and ecological risk assessment. Impacts are expected to be short duration and very localized. Post emergency response will mitigate the risks beyond the directly impacted spill area.

2.3.4.4 Traditional Land Use

It is unlikely there will be any effects to traditional land use under this spill scenario. The impacts to soil will be localized. Short-term minor impacts to traditional land use are possible in the immediate vicinity while access restrictions are in place. Emergency response and post-emergency response will address the risk to human health and the environment. No impacts to VECs associated with traditional land use are anticipated. Standard site restoration techniques used in these circumstances will be sufficient. No ongoing monitoring post-clean up should be required.

2.4 Fuel Spill in Water

2.4.1 Description of the Possible Event

It is possible that during the life of the Project that a fuel truck could overturn along the main access road during transport of fuel (gasoline or diesel) to the mine site and release all or part of its load into a watercourse or water body. For the purpose of this assessment, it was assumed that up to 50,000 Ls of fuel (gas or diesel) was released from a truck into a watercourse such as a low flowing tributary to Taseko River or a high flowing watercourse such as the Chilcotin River. The spill is assumed to occur during daylight hours.

2.4.2 Project Design Measures to Minimize Risk of a Fuel Spill in Water

To minimize the potential for fuel spills into a watercourse or water body, Taseko will implement the following suite of measures in cooperation with the MOT, contractors and sub contractors and other road users:

- ensure proper construction and maintenance of access roads by MOT and Taseko, including installation and regular inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent overturning and/or capture load loss
- enforce speed limits for all mine traffic on roads
- ensure trucking/hauling contractors have appropriate driver training, radio contact capabilities, engage in appropriate vehicle maintenance and carry appropriately sized emergency clean-up kits
- provide haul monitoring and supervision and a driver feedback plan
- ensure appropriate emergency response and spill contingency training and knowledge, maintenance of equipment, materials and procedures to limit the consequences of such spills by prompt containment and clean up actions

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.4.3.

2.4.3 Taseko Emergency Response Approach for Fuel Spills in Water

In the event of a spill, an emergency response protocol will be initiated that involves:

- notification of all agencies and responders (mine supervisor, PEP, RCMP) as per the emergency response plan
- activation of spill handling procedures including assessing feasibility of containment and clean-up based on water body and flow rates
- implementation of spill handling procedures including: diverting fuel away from water; deployment of absorbent booming; pumpback fuel to a tanker/alternate storage unit as quickly as possible, and soil/environmental clean-up as identified in spill contingency plans
- completion of reporting and disposal procedures

If the release is into a fast-moving body of water, water quality, habitat and fish monitoring procedures will be implemented to assess short- and long-term effects and the required mitigation.

2.4.4 Potential Environmental Effects

Based on the screening of potential interactions between a water-based fuel spill and VECs (Table 2-2), the VECs that are most likely to be detrimentally affected are:

- Water Quality and Aquatic Ecology
- Fish and Fish Habitat
- Wildlife

- Human and Ecological Health
- Traditional Land Use

Interactions with all remaining VECs, apart from terrain stability that was ranked as a "0", were ranked as "1" for reasons described below.

Atmospheric: It is expected that a spill would result in a very localized release of CACs and therefore potential atmospheric effects are expected to be low.

Hydrology and Hydrogeology: The volume of spilled material is not likely to affect surface water or ground water flow. As most streams and ponds are groundwater discharge zones, the spill would not affect ground water quality either.

Archaeology: Potential land disturbances as part of the spill response program would likely be restricted to a small area in the direct vicinity of the road right-of-way (i.e., an already disturbed area); as a result, the potential to affect archaeological sites would be low.

Soil: The risk of soil contamination along the riverbanks and soil disturbance during clean-up operations is low. For the water spill event, soil contamination may occur along the riverbanks and the dilution and dispersion resulting from the spill being in water makes it difficult to assess the amount of soil contamination that may occur. Soil will likely be disturbed during spill response and clean-up operations. However, the areal extent of the disturbed soil is expected to be localized. Remediation efforts outlined in the land spill scenario could also be applied, if necessary, to the water spill scenario to help restore pre-spill conditions. Interactions with hydrology and hydrogeology were ranked as 1 as the booms used to collect the fuel are hydrophobic and therefore do not remove much water from the stream. Furthermore, as surface water bodies are typically groundwater discharge areas, little interaction with groundwater will occur.

Vegetation: Petroleum fuel products such as gasoline and diesel have the capacity to chemically burn vegetation and to disrupt nutrient cycling processes. Effects vary depending on length of exposure, time of year (dormancy) and the characteristics of the plant species affected.

In the event that a fuel spill from a fully loaded fuel truck into water does occur, the release of as much as 50,000 Ls of gasoline or diesel fuel has the potential to cause adverse environmental effects to vegetation in wetland or riparian ecosystems. The magnitude and extent of these effects will vary depending on whether or not the receiving water body is slow moving or stagnant (e.g., wetland or back channel of a river or creek), or fast moving (e.g., Taseko or Chilcotin rivers).

In fast moving river currents, gas and diesel fuels would be diluted, emulsified by the action of the moving water and rapidly transported downstream. The turbulent action of a flowing river or stream would be expected to separate diesel into fine droplets that are then suspended in the water column and eventually adhere to particulates in the water and settle out, which rarely leads to appreciable contamination as most natural environments have microbes that break down diesel in one to two months. More acute effects may occur in slower moving backwater areas where riparian vegetation could come into sustained contact with fuels. Generally speaking, because of the dispersion of fuel in a fast moving system combined with dilution and evaporation, it is not anticipated that substantial amounts of fuel would enter soil substrates on the banks of the river or stream and effects to riparian vegetation are expected to be localized.

The effects of a spill into a fast flowing river are not easily contained, but it is expected that fuels will be dissipated by the action of the moving water. A fuel spill into a slower moving system provides better opportunities for containment and clean-up, and assuming mitigation measures are implemented promptly and effectively, the effects of this scenario can be minimized. In either situation, some residual adverse environmental effects to vegetation are predicted to occur but, assuming implementation of prescribed mitigation measures, the effects are expected to be adverse, localized, short term and reversible over time and are not considered significant.

Non-traditional land: A fuel spill in water is unlikely to affect measurable parameters for commercial activity (e.g. forestry, range, trapping, guide outfitting) even without mitigation while tourism and public recreation (including hunting and fishing) are primarily lake and land-based activities where the spill would not interfere or where the spill area could be avoided until conditions are normalized.

2.4.4.1 Water Quality and Aquatic Ecosystems

The risk of fuel spills into water bodies along the access roads will be minimized through Project design, mitigations (Section 2.4.2) and emergency responses (Section 2.4.3). With these precautions in place, and given that the proportion of road near or over water is very low, the probability of such an event occurring is considered to be very low. However, should such an event occur, it may have significant short-term effect on water quality and could lead to sublethal or lethal effects on sensitive species of aquatic organisms.

Literature on the effects of fuel spills in streams and rivers indicates both short and long-term effects on benthic invertebrate communities (Lytle and Peckarsky 2001; Crunkilton and Duchrow 1990; Pontasch and Brusven 1988; Miller and Stout 1986). For example, Lytle and Peckarsky (2001) documented benthic invertebrate community responses to a 26,500 L diesel fuel spill into a small stream in New York, including immediate impacts on benthic invertebrate communities throughout the 12 km study area. Substantially lower abundance (90% lower) and taxon richness (50% lower) were measured immediately and three months after the spill in impact areas 5 km downstream of the spill compared to reference areas. After one year, abundance levels had recovered, in part by recolonization by upstream invertebrates, but taxon richness and other differences in community structure were still apparent.

It is likely that a spill within the Project area would result in similar effects. The worst case scenario is of a fully loaded fuel truck overturning and releasing its entire 50,000 L load into a slow flowing tributary of the Taseko River or a faster flowing river such as the Chilcotin River during the late summer low flow period. General considerations for this scenario include:

- a slow rather than immediate release of the entire 50,000 L
- retention of some fuel constituents in periphyton and shoreline substrates
- physical processes, such as volatilization and dilution of fuel, in addition to spill cleanup, that would reduce the volume of fuel actually released to the water
- differences in behaviour of gasoline (quick volatilization) and the denser diesel fuel (slower volatilization and weathering), resulting in longer persistence of diesel in the aquatic environment

- quick volatilization of toxic constituents such as BTEX (benzene, toluene, ethylbenzene and toluenes)
- slower weathering (up to several years) of toxic compounds such as polycyclic aromatic hydrocarbons (PAHs)

Most of the fuel product would remain on the water surface, where it would be exposed to rapid volatilization and dilution downstream. Toxic components such as BTEX would volatilize quickly but while present in water could have acute effects. Surface-dwelling organisms would be the most exposed to the fuel. Longer term effects and chronic contamination would be associated with the PAHs, which would accumulate in depositional areas downstream, take up to several years to degrade and involve exposure of benthic organisms to the compounds.

Among the tributaries of the Taseko River crossed by the access road, Tête Angela Creek would be considered the most likely candidate for such an accident, given the relatively short distance of approximately 4 km between the road crossing and the Taseko River. Assuming that summer low flows in Tête Angela Creek are similar to flows in Fish Creek (0.03 m^3/s), the volume of fuel released (50 m^3) would be large in relation to stream flow, although instantaneous release of the entire volume would not be expected. As a result, effects on water quality and acute effects on aquatic life could extend through the 4 km of stream down to the Taseko River, and perhaps beyond. In addition, PAHs would likely settle in slow flowing depositional areas of Tête Angela Creek and possibly in the Taseko River. With freshet and other high flow events in the stream, PAHs in the sediment would be redistributed downstream over time. Benthic invertebrates from upstream would likely recolonize the area within one year. Thus a short-term, high magnitude and local to regional effect could result from such a fuel spill.

For the fast-flowing Chilcotin River, a fuel spill at the crossing near Hanceville during the late summer low flow period would result in rapid transport of fuel downstream, also with rapid dilution and volatilization. Although the higher volume of water in a larger watercourse would provide dilution, and reduce the magnitude of any acute effects on aquatic life, this volume and velocity would move the fuel downstream further and faster than in a small stream. Low concentrations of contaminants would be transported longer distances (e.g., several kilometres). Benthic invertebrates from upstream would likely recolonize the area within one year. Thus, a short-term, medium to high magnitude and regional effect could result from such a fuel spill.

The geographic extent and magnitude of the environmental effects of a fuel spill to water could be significant. However, the temporal effects can be reduced and managed with the application of a well defined emergency response plan, complemented by additional mitigation and compensation measures as identified in follow-up and monitoring plans.

For either scenario, residual effects would be anticipated, although they would be considered not significant, given that the benthic community would recover much of its productivity within one year.

Follow-up water quality, sediment, and biota monitoring would be conducted to assess short- and long-term effects and to identify any additional mitigations required. Analysis of PAH in sediment from downstream depositional habitat would be useful in determining geographic extent of the effect and in monitoring improvement over time. This would be conducted in conjunction with a benthic invertebrate community survey to assess biological responses.

2.4.4.2 Fish and Fish Habitat

A fuel spill of 50,000 L could have different effects on fish and fish habitat, depending on the size and flow rate of the receiving water body, the weather conditions during and immediately after the spill and any fire suppression chemicals used to prevent the spilled fuel from igniting.

For example, in a larger, faster moving water body, spilled fuels could be substantially diluted and moved several kilometers downstream. Some acute effects would be expected in the spill area, such as localized areas of sediment contamination, and in downstream, slower moving reaches.

In a smaller, slow moving stream, direct fish and invertebrate mortality would be expected along with more widespread and likely higher levels of sediment contamination than spills to a larger system. Heavy rainfall immediately following a fuel spill would help dilute concentrations and ideally reduce subsequent sediment contamination, but would carry the spilled product farther downstream than on a dry day. Fire suppressants, like CHEMGUARD, which contain ethylene glycol, could have their own effects on fish in spill-affected areas depending on the size and flows of the receiving water body.

Characterizing the potential effects on water and sediment quality would begin during the clean up phase and would include the following:

- identifying the downstream limit of fuel migration
- collecting mortalities (e.g., fish and amphibians)
- characterizing habitats in spill-affected areas
- analysis of water and sediment samples for benzene, ethylbenzene, toluene and xylenes (BTEX), polycylic aromatic hydrocarbons (PAH), volatile hydrocarbons (VH), volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH)

Mitigation and clean up measures to protect fish and fish habitat would begin with containing the spill, both at the source and at accessible downstream locations. Sediment removal will likely be required at the spill site and may also be required at accessible downstream areas.

Water quality monitoring would continue until the concentrations of BTEX and PAH dropped to BC approved and working water quality guideline levels. Sediment quality monitoring would be conducted on an ongoing basis in clean up areas, until the combination of field observations and sampling data demonstrated the contaminated sediments were successfully removed, or remaining sediments were consistent with the BC working sediment quality guidelines. Sediment monitoring would continue in other areas affected by the spill, like machine inaccessible locations, to confirm the natural attenuation of PAH and BTEX.

Fish and fish habitat monitoring programs would help determine how long it takes for fish to return to a spill-affected area, as well as the changes in species diversity and abundance in spill-affected areas over time. The data from spill-affected reaches would be compared with data collected from one or more control sites upstream of the spill site. If upstream reaches were inaccessible, control sites in nearby drainages of similar size, and providing similar habitats, would be chosen for comparison with spill-affected reaches.

The residual effects of a fuel spill could include the temporary loss of fish and benthic invertebrates and localized areas of sediment contamination in spill affected reaches. Depending on sediment concentrations of parameters of concern like PAH, this could adversely affect invertebrates, which are in direct contact with the sediment and pore water. Fish feeding on invertebrates in these areas could also be adversely affected, again depending on the contaminant levels in the sediments and invertebrates. The potential for adverse effects would be determined as part of the sediment monitoring program. Adverse effects could persist until the sediments are covered or re-distributed through channel processes, or until natural attenuation results in lower concentration of the parameters of concern.

The geographic extent and magnitude of the environmental effects of a fuel spill to water could be significant. However, the temporal effects can be reduced and managed with the application of a well defined emergency response plan, complemented by additional mitigation and compensation measures as identified in a follow-up and monitoring plan. It is anticipated the effects would be temporary (zero to four years) and reversible.

2.4.4.3 Wildlife

The assessment of an in-water fuel spill in water event on wildlife is directly related to the effects of such a spill on water quality and aquatic ecosystems (Section 2.4.4.1), fish and fish habitat (Section 2.4.4.2), and human health and ecological risk assessment (Section 2.4.4.4).

Wildlife as a whole is addressed in the human health and ecological risk assessment section, while strictly aquatic organisms (fish, benthic invertebrates) are addressed in the other two sections.

The mechanisms for environmental effects associated with a fuel spill include chemical changes to the water and sediment quality resulting in biological damage to stream biota and aquatic and semi-aquatic wildlife habitat, sensory disturbance (odour), and possible health effects as the result of ingestion or direct contact with the fuel.

The mitigation measures described in general for this event (Table 2-1) and specifically for fish and fish habitat, water quality and aquatic ecosystems, and human health and ecological risk assessment (e.g., containment, sediment removal) minimize the effects of a spill on wildlife.

The geographic extent and magnitude of the environmental effect on aquatic and semi-aquatic wildlife and wildlife habitat depends on a variety of factors (e.g., fuel type, size and flow rate of receiving environment, weather conditions, success and type of response). The residual effects of a fuel spill could include the loss or displacement of fish, amphibians and benthic invertebrates, disruption of stream habitat, localized areas of sediment contamination and general avoidance of the affected area by wildlife. Depending on sediment concentrations of parameters of concern (e.g., PAH) there could be adverse effects on benthic invertebrates. In turn, fish and other animals (e.g., waterfowl) feeding on invertebrates in these areas may also be adversely affected.

It is anticipated that the residual environmental effect of a fuel spill into water would be temporary (zero to four years) and reversible. This residual effect could be significant; however, the magnitude and duration of the effect can be reduced and managed with the application of a well defined emergency response plan, complemented by additional mitigation and compensation measures.

Monitoring and follow-up programs for water quality, sediment, biota, and fish and fish habitat would be conducted to assess the short- and long-term effects of the spill, and to identify any additional mitigations required. A specific monitoring program for amphibians and amphibian habitat would be considered in some circumstances (e.g., spill into lentic environment). However, in general, the monitoring and follow-up programs proposed for fish and fish habitat and water quality and aquatic ecosystems are considered adequate to address wildlife concerns. No long term impact is anticipated.

2.4.4.4 Human Health and Ecological Risk

Potential effects of an in-water fuel release on ecological and human health would be dependent on the physical parameters of the water body (e.g., stream flow rate, depth, width). Acute effects to ecological health could occur if wildlife and avian species were to come into contact with the hydrocarbon free-product (Section 2.4.4.3). No acute health effects would be expected for humans given that the water bodies in the area are not used as potable water sources.

Downstream ecological effects are possible given that these water bodies are used as a source of drinking water by terrestrial and avian wildlife species. Potential effects would be dependent on the dilution of the hydrocarbons in the waterway as this affects the concentration of hydrocarbons that a species would be exposed to.

Free-product recovery from water bodies should be completed to the best of the ability of the emergency response team; its success will be highly dependent on stream velocity and weather conditions at the time. Water samples will be collected immediately from the source area of the spill. These measured detailed in Table 2-1 would ensure the protection of human and ecological health.

Overall, there is a potential for acute (short-term) effects to both terrestrial and avian species in the event of a fuel spill to water. Depending on the volume of the fuel spilled and the physical characteristics of the receiving water body, there is the potential that effects on aquatic resources and the concentration of hydrocarbons in the water may have residual effect on fish tissue (for consumption).

In the event of an accidental spill of fuel oil or diesel, the follow-up and monitoring steps detailed in Table 2-1 would be sufficient for the protection of human and ecological health. Depending on the magnitude of the spill this would include the implementation of water quality, and potentially sediment quality, monitoring in the affected water body. Assuming contaminant concentrations remain below conservative risk-based water quality objectives then there would not be a risk to either ecological or human health.

As a result, it is expected that effects of a water-based fuel spill on ecological health and human health would be not significant.

2.4.4.5 Traditional Land Use

There is a potential risk to traditional land use in the event of a spill to water. These risks and the response measures to address the release are the same as those described in the previous sections. It is anticipated that the impacts will be short duration and pose little long term risk to human health or the environment associated with traditional land use.

2.5 Failure or Major Leakage from Tailings or Reclamation Pipelines

2.5.1 Scenario Description

Over the life of the Project it is possible that the tailings or reclamation pipelines could develop a major leak or completely fail thereby releasing tailings or reclaim (process) water to the environment. The project has been designed in such a way that should such an event occur, any released tailing or process water would be restricted to the open pit or seepage collection ditches where water or tailings would be pumped into the TSF. As a result, no release of tailings or mine water to area watercourses would occur.

For the purpose of this assessment, it is assumed that there was a release of tailing and/or reclaim (process) water to the environment, and that this release has the potential to affect soil as well as downstream aquatic habitat and water quality.

2.5.2 Project Design Measures to Minimize Risk of a Failure or Major Leakage from Tailings or Reclamation Pipeline

Preventative measures to mitigate effects related to the tailings area or reclaim pipeline include the following:

- situate pipelines in locations that ensure any accidental releases of tailings or mine water flow into the pit, TSF or to seepage collection channels
- ensure proper construction and maintenance of tailings delivery and reclaim systems to maintain a closed system
- install ditches, berms and emergency tailings containment ponds to capture and contain tailings in the event of a pipeline break to ensure material containment
- ensure proper tailings line training and supervision
- conduct routine inspections of tailings delivery and reclaim systems
- maintain spill response procedures and implement appropriate emergency response

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.5.3.

2.5.3 Taseko Emergency Response Approach for a Failure or Major Leakage from Tailings or Reclamation Pipeline

If all precautions and preventative measures do not prevent a failure or major leakage from the TSF or reclamation pipeline, an emergency response protocol will be initiated that involves:

- conducting an initial response and notification (mine supervisor, on-scene coordinator) as per emergency response plan
- shutting down source of spill (tailings reclaim water) by implementing emergency shut-down procedures
- activating the emergency response groups

- assessing if the spill of tailings/reclaim water is internal (likely) or will have external effects
- notify the PEP office and the Ministry of Environment (MOE) as precautionary measure even if internal

In the unlikely event that there is an external discharge of tailings or reclaim water and the release enters Fish Creek, DFO would be notified (in addition to PEP and MOE), and monitoring and assessment procedures would be immediately initiated.

2.5.4 Potential Environmental Effects

Based on the screening of potential interactions between VECs and a failure or major leakage from tailings or reclamation pipeline (Table 2-2), no VECs that are likely to be detrimentally affected.

Interactions with all remaining VECs, apart from water quality and aquatic ecosystems, fish and fish habitat and soil and archaeology, which were ranked as a “0”, were ranked as “1” for reasons described below.

Atmospheric Environment: A release of tailings water may result in the generation of some particulates, however, it is not expected to result in a substantial release of evaporates.

Hydrology and Hydrogeology: the spill would only result in a localized and temporary affect to stream flow, and is not likely to affect groundwater flow or quality. The only location for tailings to possibly reach the environment as a result of a spill would be from the West Embankment. Should this occur, tailings would ultimately be intercepted by drainage ditches, directing it to collection ponds where it can be recovered and placed back in the TSF. The water component of the tailings will be primarily surface drainage to the collection ponds, leaving very little water to reach the groundwater system.

Terrain Stability, Vegetation and Wildlife: effects on these VECs would be minimal as a result of spill response measures and codified environmental protection practices. The Environmental Management Plan has measures that are known to effectively mitigate the predicted environmental effects from a pipeline failure. Measures specific to reducing soil contamination include ditches and berms to contain the leakage from the pipeline, and diversion of the spill towards the pit, Also, the mine site will have topsoil stockpiled away from contamination sources.

Human Health and Ecological Risk: A rupture or major leakage from the tailings or a reclaim pipeline, both of which contain elevated concentrations of metals, would result in the release of tailings and/or reclaim (process) water to the environment. Effects on water quality are not expected because the release will be restricted to the mine site itself.

If the leak occurred to soil, it is unlikely that the concentrations of metals would be high enough to pose an acute (short-term) risk to either human or ecological health. This is based on the qualitative understanding that acute toxicity requires exposure to very high concentrations of metals in soil. In addition, the soil in the affected area would be remediated in a short period of time.

Traditional Land Use: There is a low potential risk to traditional land use in the event of a tailings release as the release will most certainly occur within the mine footprint. These risks, and the response measures to address the release, are the same as those described in the previous sections. It is anticipated that the impacts will be short duration and pose little long term risk to human health or the environment associated with traditional land use.

Non-traditional Land Use: Commercial land users have access to large license areas for extended periods of time. Public users have access to a Crown land base that offers opportunities for multiple, substitute locations and experiences. A major leakage is unlikely to affect measurable parameters for commercial activity (e.g. forestry, range, trapping, guide outfitting) even without mitigation while tourism and public recreation (including hunting and fishing) are primarily lake and land-based activities where the leakage would not interfere or where the spill area could be avoided until conditions are normalized. While we are mindful of the potential adverse effects on downstream aquatic habitat and the sport fishery, we also recognize the preponderance of lake fishing, and alternative river sites, in the Regional Study Area (RSA) and the opportunities that will continue to exist should a leakage occur.

2.6 Concentrate Haul Spill on Land

2.6.1 Scenario Description

During the course of the Project it is possible that a concentrate truck could overturn on dry land thereby releasing concentrate to the dry landscape. For the purpose of this assessment it was assumed that a loaded truck (40 tonnes) overturns along the main access road.

2.6.2 Project Design Measures to Minimize Risk of a Concentrate Spill on Land

Preventative measures to mitigate effects related to land-based concentrate haul spill are similar to those outlined for mitigating fuel spills (Section 2.3.2). These include:

- ensuring proper construction and maintenance of access roads by MOT and Taseko, including installation and regular inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent overturning and/or capture load loss
- enforcing speed limits for all mine traffic on roads
- ensuring trucking/hauling contractors have appropriate driver training, radio contact capabilities, engage in appropriate vehicle maintenance and carry appropriately sized emergency clean-up kits
- providing haul monitoring and supervision and a driver feedback plan
- ensuring appropriate emergency response and spill contingency training and knowledge, maintenance of equipment, materials and procedures to limit the consequences of such spills by prompt containment and clean up actions

In addition, Project concentrate containers will be designed such that there is no wind loss (i.e., sealed hard covers). However, in the event of a truck upset, it is assumed that concentrate could be released from the container and be spilled onto the land surface.

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.6.3.

2.6.3 Taseko Emergency Response Approach for a Concentrate Spill on Land

As per above, the emergency response approach for a land-based concentrate haul spill are similar to those outline for fuel spills (Section 2.3.3). These include:

- notification of all agencies and responders (mine supervisor, PEP, RCMP) as per the emergency response plan
- notify MOE and (adjacent) land owners
- if the driver is not injured, the driver will notify Taseko and request assistance. The driver will then implement initial and immediate containment activities using on-board containment equipment
- activate emergency response groups
- completion of reporting and disposal procedures

2.6.4 Potential Environmental Effects

Based on the screening of potential interactions between a land based concentrate haul spill and VECs (Table 2-2), the VECs that are most likely to be detrimentally affected are:

- Wildlife

Interactions with all remaining VECs, apart from water and aquatic ecosystems, fish and fish habitat and terrain stability, which were ranked as a “0”, were ranked as “1” for reasons described below.

Atmospheric Environment: It is expected that the spill will result in a very localized release of particulates. Additional particulates will be generated during clean-up activities.

Hydrology and Hydrogeology: small quantities of concentrate could be washed into a watercourse or water body (e.g., during a rain storm), but effects would be highly localized.

Soil and Vegetation: the areal extent of the spill would be very small and clean-up activities are expected to remove the spilled concentrate within a short period (days). Rehabilitation of the site would help restore soil and vegetation and, eventually, wildlife use.

Archaeology: potential land disturbances as part of the spill response program would likely be restricted to a small area in the direct vicinity of the road right-of-way (i.e., an already disturbed area) as a result, potential to affect archaeological sites would be low. In addition, if concentrate did spread beyond the road ROW, land disturbances as part of the spill response program would be minimized until an archaeologist has determined that artefacts and sites would not be disturbed by clean-up activities.

Human Health Risk Assessment: The potential human and ecological health effects from a concentrate spill on land would be dependent on the aerial extent of effects on soil and groundwater. Although ore concentrate contains elevated concentrations of metals (e.g., copper), it would likely not result in acute (short-term exposure) chemical effects on ecological or human health. This is based on the qualitative understanding that acute toxicity requires exposure to very high concentrations of metals in soil. In addition, the soil in the affected area would be cleaned-up in a short period of time and thus humans and terrestrial ecological receptors would experience limited exposure to these elevated metal concentrations.

If through soil monitoring (Table 2-1), concentrations of metals in soils and vegetation were elevated over background concentrations, Taseko would undertake a risk assessment to ascertain if the levels were of a sufficient concentration to pose a potential risk.

Traditional Land Use: There is a low potential risk to traditional land use in the event of a tailings release as the release will most certainly occur within the mine footprint. These risks, and the response measures to address the release, are the same as those described in the previous sections. It is anticipated that the impacts will be short duration and pose little long term risk to human health or the environment associated with traditional land use.

Non-traditional Land Use (including forestry, mining, range, trapping and tourism): These activities are licensed for commercial use and managed by government over large land areas and for extended periods of time. Similarly, public recreation, including hunting and fishing, has access to a Crown land base that offers opportunities for multiple, substitute locations and experiences for enjoying those activities. A concentrate spill on land will be a site specific event with short-term effects once preventative and emergency response measures are considered. We would not expect measurable parameters to be adversely affected. Licensees would continue to abide by their license agreements with the province and at the very worst would negotiate work-arounds at the operational level where a spill happened to interact with those activities. Public recreation, hunting and fishing activity would also be expected to respond in a similar fashion. Users would avoid the spill area and avail themselves of substitute routes or use areas. Commercial and public users of Crown land already adapt, both spatially and temporally, to changes brought about by forest harvesting, fires, pestilence, community development and industrial development. In this context, a land concentrate spill is unlikely to induce changes in measurable parameters that are distinguishable from the base case.

2.6.4.1 Wildlife

The interaction with a land-based concentrate spill is ranked as a “1” for most wildlife, since the spill would largely occur on an already disturbed area within the road right-of-way, the areal extent of the spill would be small relative to the habitat requirements of most wildlife, and clean-up activities would be expected to remove the spilled concentrate within a short period (days). Further, larger, more mobile wildlife could readily avoid the spill area.

2.7 Concentrate Haul Spill in Water

2.7.1 Scenario Description

During the course of the Project it is possible that a concentrate truck could overturn and release its load into a water body. Such a release could affect water quality and result in aquatic habitat degradation. For the purpose of this assessment it was assumed that a loaded truck (40 tonnes) turned over and released concentrate from a bridge or along a road that is adjacent to either: a) a low flowing tributary to Taseko River; or b) high flowing Chilcotin River.

2.7.2 Project Design Measures to Minimize Risk of a Concentrate Spill in Water

Preventative measures to mitigate effects related to an in water concentrate haul spill are similar to those outlined for mitigating fuel spills (Section 2.3.2). These include:

- ensuring proper construction and maintenance of access roads by MOT and Taseko, including installation and regular inspection of guard rails on bridges and berms/concrete abutments on roads adjacent to water courses that prevent overturning and/or capture load loss. This could also include design features such as the use of berms or concrete abutments on roads to prevent trucks from over-turning, and to help contain load loss. Maintenance plans would include routine inspections of signage condition, bridges, ditches, culverts and running surfaces to identify potential driving hazards
- enforcing speed limits for all mine traffic on roads
- ensuring trucking/hauling contractors conduct and record regular vehicle maintenance, have Transportation of Dangerous Goods (TDG) training, radio contact capabilities, spill response training and response kits, personal protective equipment and copies of the project emergency response communication protocols and plans
- ensuring trucking/hauling contractors have appropriate driver training, radio contact capabilities, engage in appropriate vehicle maintenance and carry appropriately sized emergency clean-up kits
- providing haul monitoring and supervision and a driver feedback plan
- ensuring appropriate emergency response and spill contingency training and knowledge, maintenance of equipment, materials and procedures to limit the consequences of such spills by prompt containment and clean up actions

In addition, Project concentrate containers will be designed such that there is no wind loss (i.e., tarpaulin covered trailers). However, in the event of a truck upset, is likely that concentrate would be released from the trailer and that concentrate could be spilled into a water body or watercourse.

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.7.3.

2.7.3 Taseko Emergency Response Approach for a Concentrate Spill in Water

As per above, the emergency response approach for an in water concentrate haul spill are similar to those outline for fuel spills (Section 2.3.3). These include:

- notification of all agencies and responders (mine supervisor, PEP, RCMP) as per the emergency response plan
- activation of spill handling procedures including assessing feasibility of containment, diverting of water away from truck/load and clean-up based on water body and flow rates
- initiate immediate monitoring and assessment procedures

In addition to the above, because the spill is in water DFO would be notified and water quality, habitat and fish monitoring procedures would be implemented to assess short- and long-term effects and mitigation required.

2.7.4 Potential Environmental Effects

Based on the screening of potential interactions between an in water based concentrate haul spill and VECs (Table 2-2), the VECs that are most likely to be detrimentally affected are:

- Water Quality and Aquatic Ecosystems
- Fish and Fish Habitat
- Wildlife
- Human Health and Ecological Risk
- Traditional Land Use

Interactions with all remaining VECs, apart from terrain stability that was ranked as a "0", were ranked as "1" for reasons described below.

Atmospheric Environment: Expected that the spill will result in a very localized release of particulates. Additional particulates will be generated during clean-up activities.

Hydrology and Hydrogeology: The volume of spilled material is not likely to affect surface water or ground water flow. As most streams and ponds are groundwater discharge zones, the spill would not affect ground water quality either.

Soil and Vegetation: The areal extent of the spill would be very small and clean-up activities are expected to remove the spilled concentrate within a short period (days). Rehabilitation of the site would help restore soils and vegetation and, eventually, wildlife use.

Archaeology: potential disturbances would likely be restricted to a small area in the direct vicinity of the road right-of-way (i.e., an already disturbed area); as a result, potential to affect archaeological sites would be low. In addition, if concentrate did spread beyond the road ROW, disturbances of land and riparian areas would be minimized until an archaeologist has determined that artefacts and sites would not be disturbed by clean-up activities.

Traditional Land Use: Impacts are expected to be temporary and in the immediate vicinity of the spill. Effects to water quality are possible which may result in restrictions on cattle watering from the impacted water body until the concentrate source is removed by emergency and post-emergency cleanup activities. Notification to the nearby ranchers will be sufficient during this period.

Non-traditional Land Use: Commercial land users have access to large license areas for extended periods of time. Public users have access to a Crown land base that offers opportunities for multiple, substitute locations and experiences. A concentrate spill in water is unlikely to affect measurable parameters for commercial activity (e.g. forestry, range, trapping, guide outfitting) even without mitigation while tourism and public recreation (including hunting and fishing) are primarily lake and land-based activities where the leakage would not be expected to interfere or where the spill area could be avoided until conditions are normalized. While we are mindful of the potential adverse effects on downstream aquatic habitat and the sport fishery, we also recognize the preponderance of lake fishing, and alternative river sites, in the RSA and the opportunities that will continue to exist should a spill occur.

2.7.4.1 Water Quality and Aquatic Ecosystems

In the event that a fully loaded fuel truck overturns and releases its load into either a slow-flowing tributary of the Taseko River or a faster flowing river such as the Taseko or Chilcotin, the released concentrate would affect water quality and, through that mechanism, could affect aquatic organisms, including mortality of sensitive species.

There are no mitigations specific to water quality, beyond those mentioned in Sections 2.7.2 and 2.7.3, although spill clean-up measures would be related to containment and removal of concentrate in addition to any vehicle fuels. The emergency response for a tributary would be to divert the watercourse around the spill area, and remove the concentrate using an excavator and vacuum truck where possible. Alternative or larger scale strategies would be needed for the Chilcotin River.

Similar to fuel spills, there is be a very low probability of such an event, given that the proportion of road near or over water is very low, However, such an event could have significant residual environmental effects.

Copper, the main constituent of the ore concentrate, is toxic at low concentrations to many aquatic organisms, including fish. The CCME WQG for protection of aquatic life of 0.002 mg/L in low hardness water (such as the Taseko River) and 0.004 mg/L in high hardness water (such as Tête Angela Creek and other small tributaries). The BC WQG is slightly higher, incorporating site-specific hardness levels. Other metals, in addition to copper, would likely be present and pose a hazard to aquatic organisms.

Since ore concentrate has the consistency of sand, the immediate effect of a spill will be localized smothering of benthic habitat. However, because of the high levels of copper and other metals, and its fine texture, metals will start leaching into the water quickly. In addition, in the fast-flowing Chilcotin River, the concentrate would be moved downstream in the current. As a result, there would be acute effects downstream of the spill, and probably longer term chronic effects downstream. Elevated copper levels in water and physical smothering of habitat would lead to lower abundance of benthic organisms and loss of sensitive species (lower biodiversity). Productivity in the affected area would be reinstated through recolonization from upstream, in as little as one year (depending on success of the clean-up).

Among the tributaries of the Taseko River crossed by the access road, Tête Angela Creek would be considered a good example for such an accident, given the relatively short distance of approximately 4 km between the road crossing and the Taseko River. During summer, the affected area could be isolated by redirecting stream flows around it, allowing machine access for the clean-up. With a quick response, it might be possible to limit the high magnitude effects to Tête Angela Creek, with some transport of dissolved copper into the Taseko River. However, clean-up efforts would be more challenging during high flow (spring freshet), and movement of copper downstream into the Taseko River would be expected. Thus a short-term, high magnitude and local to regional effect could result from such a concentrate spill.

For a spill at the crossing of the fast flow Chilcotin River, the same physical smothering effects would occur in the immediate vicinity of the spill. However dissolved copper and particulate concentrate would be transported further downstream before clean-up could be completed, and the clean-up would be exacerbated by the volume and velocity of water. As a result, several kilometres of river habitat would be affected by the released. The area would be colonized by benthic organisms from upstream areas, although, depending on success of the remediation, effects could last for several years. Thus, a short to medium duration, high magnitude and regional effect could result from such a fuel spill, which would eventually be reversible. Such an event would not be considered significant, given that the benthic community would recover much of its productivity within a few years.

Follow-up water quality, sediment, biota monitoring would be conducted to assess short- and long-term effects and to identify any additional mitigations required. Analysis of metals in water and sediment from downstream areas would be useful in determining geographic extent of the effect and in monitoring changes over time. This would be conducted in conjunction with a benthic invertebrate community survey to assess biological responses.

2.7.4.2 Fish and Fish Habitat

A spill of concentrate to a large, fast moving river would likely result in the quick and widespread distribution of concentrate in a downstream direction. Some elevation in turbidity and total suspended solids (TSS) would occur until containment and diversion measures were in place.

Spills to a smaller, slower moving watercourse would likely result in localized smothering of bed material, with the gradual movement of concentrate downstream until containment and diversion measures were in place. Given the 24.55% copper in the concentrate, localized areas of elevated copper levels in sediment may also result from a spill. Turbidity and TSS would be expected to increase in a smaller receiving water body until containment and diversion measures were implemented.

Elevated TSS can affect behaviour and cause physiological stress in fish. For example, (Noggle 1978) reported 45% reduced feeding rates for Coho at 100 mg/L and cessation of feeding at 300 mg/L (Berg and Northcote 1985). Physiological stress and behavioural changes have been observed at 53.5 mg/L (Berg 1993).

The BC working sediment quality guidelines for copper are 35.7 ppm (threshold effect level [TEL]) and 197 ppm (probable effect level [PEL]). The TEL is the concentration below which adverse effects are rarely expected to occur, whereas the PEL is the concentration above which adverse effects are frequently expected to occur. Sediment copper levels resulting from concentrate spills above the TEL may have some adverse effects on aquatic life. Roman et al. (2007) reported a predicted No Effect Concentration (PNEC) for sediment of 3.3 to 47.1 mg copper/dry wt for five invertebrate species (*Gammarus pulex*, *Lumbriculus variegates*, *Hyalella azteca*, *Chironomus Riparius* and *Tubifex tubifex*) Roman et al. (2007) also identified median LC_{50} copper concentrations of 151 to 327 mg/kg dry wt.

Characterizing the potential effects on water and sediment quality would begin during the clean up phase with in situ and analytical sample collection. In situ parameters would include pH, turbidity, total dissolved solids and conductivity. Analytical parameters would emphasize total and dissolved metals in water, and metals and pH in sediments.

TSS and turbidity monitoring would continue until these parameters reached background levels in the receiving water body (e.g., upstream from the spill site) or were consistent with the BC Approved water quality guidelines (2006) In situ and analytical sample collection would also continue until pH, metals and any other parameters of interest reached background levels, BC approved and working water and sediment quality guidelines (2006) or site-specific objectives agreed to by MOE.

Mitigation measures to limits impact on fish habitat would emphasize the physical removal of spilled concentrate from accessible riparian and instream habitats. Instream habitats covered in spilled concentrate, or containing contaminated sediments resulting from the spill, would have to be physically restored (e.g., new pools excavated, or new spawning substrate added. Riparian habitat cleared to facilitate cleanup efforts would have to be replanted, with follow up monitoring programs to ensure the success of riparian restoration programs.

Residual effects of a concentrate spill to water may occur in areas that could not be accessed for clean up, or where spilled concentrate has accumulated and resulted in elevated copper in sediments. This could result in localized areas causing sub-lethal effects on aquatic invertebrates, as they are in direct contact with sediment and would also be exposed to copper in pore water. These localized areas would remain a potential exposure route until the sediments were eroded and washed downstream, or were covered through natural sediment accumulation processes.

The residual effects would be significant on a temporal and spatial basis (0–4 years) and reversible with the appropriate mitigation plans to be implemented during the spill clean-up and from a follow-up and monitoring program.

2.7.4.3 Wildlife

The assessment of a concentrate spill in water event on wildlife is directly related to the effects of such a spill on water quality and aquatic ecosystems (Section 2.7.4.1), fish and fish habitat (Section 2.7.4.2), and human health and ecological risk assessment (Section 2.7.4.4). The results of these assessments are summarized in brief in this section. Wildlife as a whole is addressed in the human health and ecological risk assessment, while strictly aquatic organisms (fish, benthic invertebrates) are addressed in the other two sections.

The mechanisms for environmental effects associated with this event include physical smothering of stream biota and stream and riparian habitat, physiological changes in fish behaviour and stress levels due to elevated TSS and turbidity, and the potential adverse (lethal and sublethal) effect of elevated copper levels on aquatic organisms.

There are no wildlife-specific mitigation measures. The mitigation measures described in general for this event (Table 2-1) and for fish and fish habitat, water quality and aquatic ecosystems, and human health and ecological risk assessment specifically would be applicable (e.g., removal of spilled concentrate, stream habitat restoration, temporary stream diversion).

The geographic extent and magnitude of the environmental effect on aquatic and semi-aquatic wildlife and wildlife habitat depends on a variety of factors (e.g., size and flow rate of receiving environment, weather conditions, success and type of response). The residual effects of a concentrate spill could include the loss or displacement of fish, amphibians and benthic invertebrates, reduced diversity of stream biota (through loss of sensitive species), destruction of stream habitat, localized areas of sediment contamination and general avoidance of the affected area by wildlife. Elevated copper levels in surface water are unlikely to be high enough to pose a potential acute risk to terrestrial wildlife consuming the water, or alter fish tissue copper levels over time.

It is anticipated the residual environmental effect of a concentrate spill into water would be temporary (zero to four years) and reversible. This residual effect could be significant. However, the magnitude and duration of the effect can be reduced and managed with the application of a well defined emergency response plan, complemented by additional mitigation and compensation measures.

Water quality, TSS, turbidity, sediment, habitat restoration, and biota monitoring and follow-up programs would be conducted to assess the short- and long-term effects of this type of spill, and to identify any additional mitigations required. However, in general, the monitoring and follow-up programs proposed for fish and fish habitat and water quality and aquatic ecosystems are considered adequate to address wildlife concerns.

2.7.4.4 Human Health and Ecological Risk

If the concentrate was spilled into a water body, there would be a potential increase in surface water metal concentrations. It is unlikely that the resulting concentrations would be high enough to pose a potential acute risk to terrestrial wildlife consuming the water, or even if humans were in the area hunting and were to drink water from the affected water body. This is based on the qualitative understanding that acute toxicity requires exposure to very high concentrations of metals in water.

Given that such a spill would result in 40 tonnes of concentrate being deposited into the water body, it is not known how this would alter fish body burden concentrations over the long-term. Therefore, chronic effects to human and ecological health could not be quantitatively predicted.

Clean-up procedures would be similar to those described above for leak of tailings or reclaim pipeline to water and are detailed in Table 2-1. If possible, containment and clean-up of concentrate in the water body would be conducted and potentially consideration of diverting water away from truck / load would occur.

Overall, it is unlikely that there would be an acute effect to either terrestrial or avian species in the event of a concentrate spill to water. Depending on the volume of the fuel spilled and the physical characteristics of the receiving water body, there is a potential that effects on aquatic resources and the concentration of metals in the water may have a long-term residual effect on fish tissue (for consumption) and drinking water in the area.

In the event of an accidental spill of concentrate to water, the follow-up and monitoring steps detailed in Table 2-1 would be sufficient for the protection of human and ecological health. Depending on the magnitude of the spill this would include the implementation of water quality, and potentially sediment quality, monitoring in the affected water body. If metal concentrations remain below conservative risk-based water and/or sediment quality objectives then there would be no significant risk to ecosystems or human health.

If through monitoring, concentrations of metals in water and/or fish were elevated over background concentrations, Taseko would undertake a risk assessment to ascertain if the levels were of a sufficient concentration to pose a potential risk.

2.8 Road Culvert Failure

2.8.1 Scenario Description

It is possible that during the life of the Project that a road culvert could fail resulting in bank erosion and increased sedimentation that could affect downstream water quality and aquatic habitat. For the purpose of this assessment, it was assumed a culvert across Taseko Lake Road was blocked and caused ponding above the road, bank erosion, and increased sedimentation release into Upper Fish Creek and Taseko Rivers.

2.8.2 Project Design Measures to Minimize Risk of a Road Culvert Failure

To minimize the potential for a road culvert failure that may result in bank erosion and increased sedimentation, Taseko will implement the following suite of measures:

- ensure regular road maintenance
- design and install culverts to accommodate frequent extreme storm events, and include engineered debris gates in front of culverts
- conduct weekly monitoring of the condition of culvert and debris traps (if present)
- assess culvert condition during and after storm events

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.8.3.

2.8.3 Taseko Emergency Response Approach for a Road Culvert Failure

If all precautionary and preventative measures do not prevent a road culvert failure, an emergency response protocol will be initiated that involves:

- conduct initial response and notification (mine supervisor, PEP, MOE, MOT, RCMP) as per emergency response plan
- activate emergency response groups, including mine site contractors for remediation
- if sufficient water is ponded above the road as a result of the blockage, notification of immediate downstream or adjacent residents may be required

2.8.4 Potential Environmental Effects

Based on the screening of potential interactions between a road culvert and VECs (Table 2-2), the VECs that are most likely to be detrimentally affected are:

- Terrain Stability and Soil

Interactions with all remaining VECs, apart from human health and ecological risk that was ranked as a “0”, were ranked as “1” for reasons described below.

Atmospheric Environment: it is expected that some particulates could be generated during clean-up activities.

Hydrology and hydrogeology: The flooding associated with a blocked culvert would not result in substantial changes to surface hydrology or hydrogeology outside of the immediate area of the blockage.

Water Quality, Aquatic Ecology and Fish and Fish Habitat: effects are expected to be low given that the area of the effect would be highly localized. In addition, effects on these VECs would be minimized through spill response measures and codified environmental protection practices (Volume 3, Section 9.2: Environmental Management Plan) that are known to effectively mitigate the predicted environmental effects.

Vegetation, Wildlife, Traditional Use and Non-traditional Land Use: while localized effects could occur, these effects would only affect a small area and would only persist for days after the culvert blockage is remedied.

Archaeology: potential disturbances would likely be restricted to a small area in the direct vicinity of the road right-of-way (i.e., an already disturbed area); as a result, potential to affect archaeological sites would be low. In addition, land disturbance during restoration of the culvert would be minimized until an archaeologist has determined that artefacts and sites would not be disturbed by clean-up activities

2.8.4.1 Terrain Stability and Soil

The potential for road culvert failure can happen due to unpredicted events such as heavy rainfall or rapid snowmelt. The likelihood of such a failure occurring is low due the relatively subdued nature of the topography coupled with preventative measures including:

- regular road maintenance
- appropriate sizing of culverts (design stage)
- monitoring of debris traps and culvert condition
- assessing culvert condition during and after storm events
- regular maintenance

However, terrain stability may become compromised when preventative measures are unable to prevent ponded water above the road as a result of a culvert blockage or damage. The ponded water can cause increased pore pressure in the sediment resulting in a change in natural terrain stability upslope from the road.

Areas where culverts are required often are associated with incised landscape features including gullies, seepage areas and natural drainages including creeks and rivers. In this scenario the area is near Fish Creek and Taseko River. These areas inherently have slope conditions and geomorphic processes that may make them predisposed or at risk of mass wasting.

The most effective way to mitigate the effects of mass wasting is in proper road design. Detailed terrain assessments prior to road construction allow for the identification of material type, stratigraphy, depth to bedrock, slopes, topography and locations of hazardous terrain. This information allows for the proper design of roads including appropriate culvert size, and if possible, the avoidance of hazardous terrain. Once the road is constructed preventative measures as outlined above further reduce the probability and scale of a mass wasting event.

In the event of a road culvert failure, re-establishing terrain stability is one of the first requirements to protect human safety, water supplies, water quality, fish habitat, and re-establish landscape aesthetics, vegetation and recreational use of the area. For this reason, the timely response in the event of a road culvert failure is to act on stabilizing the terrain.

The *Mines Act* is very explicit in the mitigation measures to be followed in the event of a mass wasting event. These mitigation measures also are effective in the event of road culvert failures. The measures include:

1. restorative activities will be designed and implemented by a qualified person to minimize further mass wasting events such as landslides, channelized debris or mud flow, and gully bank destabilization
2. mitigation measures that will be implemented after a road culvert failure has occurred to address terrain stability include:
    - stabilize any disturbed areas
    - ensure a geotechnical engineer prepares a terrain remediation plan in a timely manner (e.g., within 30 days)

If a mass wasting event does occur due to compromised terrain stability, which in this scenario may result from failure of a road culvert resulting in bank erosion, a residual effect is anticipated. With preventative mitigation, the likelihood of a mass wasting event is minimal. However, with unforeseen storm events, a change in terrain stability can occur within hours to days. If mass wasting does occur, there will be changes from baseline conditions. The change is non reversible, sporadic in frequency and is site specific. The magnitude is considered low if the area of terrain stability is not increased and stabilization efforts are effective.

The changes to terrain stability are permanent, but a new equilibrium for terrain stability can be established and allow for the previous land use to occur. Modifications to road design may be required, but overall rating of the effect is not significant as prior land uses can be re-established quickly.

In the event that an event such as a road culvert failure occurs follow-up and monitoring would be appropriate to:

1. determine whether the preventative and mitigation measures employed have achieved terrain stability
2. check for renewed erosion or instability (frequency of monitoring program will depend on effectiveness of mitigation)
3. inspect revegetation progress (effectiveness will be visible within one growing season, if not deemed successful, additional inspections may be required)

2.9 Excessive Water in Tailings Storage Facility

2.9.1 Scenario Description

During the life of the mine it is possible that storm events could result in excessive water in the TSF. If this situation result in off-spec volumes of water being discharged into the environment there may be an effect on downstream aquatic habitat and water quality.

2.9.2 Project Design Measures to Minimize Risk of Excessive Water in TSF

To minimize the potential for excessive water in the TSF resulting in off-spec volumes of water being discharged to the environment, Taseko will implement the following suite of measures:

- conduct annual reviews by an accredited consultant of tailings hydrological model, operation/construction of the tailings complex, and water balances based on site collected meteorological data
- ensure all dams are built to maintain annual volumes of tailings release as well as the maximum potential storm events while maintaining a design freeboard criterion
- ensure upstream diversion structures for fresh water accommodate maximum storm events with safeguards in place to minimize blockage
- maintain a water treatment contingency plan

If the preventive measures do not prevent ongoing accumulation of water in the TSF, an emergency response protocol will immediately be initiated as described in Section 2.9.3.

2.9.3 Taseko Emergency Response Approach for Excessive Water in Tailings Storage Facility

If all precautionary and preventative measures do not prevent excessive water in the TSF, an emergency response protocol will be initiated that involves:

- conduct an initial response and notification (mine supervisor, MOE)
- conduct monitoring of TSF to ensure containment is maintained
- if discharge is necessary to maintain integrity of TSF, initiate MOE notification process and implement next phase of emergency response plan
- if water quality is suitable to release to the environment, then by-pass to downstream environment into Fish Creek. If water quality is not suitable, the tailings water should be bypassed to the open pit, which may require some short-term rescheduling of mining sequences

2.9.4 Potential Environmental Effects

Based on the screening of potential interactions between excessive water in the TSF and VECs (Table 2-2), none of the VECs are likely to be detrimentally affected. For ten VECs the effect of this event was ranked as a “0” and, therefore, was scoped out of this assessment. Interactions with the two remaining VECs were ranked as “1” for reasons described below.

Water Quality and Aquatic Ecology: Under the most likely scenario, excess water will remain contained within the TSF and no impacts will occur to human health or the environment. However, considering the case where an emergency discharge from the TSF containing excess water is necessary to maintain structural integrity of the TSF, short duration water quality impacts are possible. Dilution of tailings water by the large inflow necessary to cause this issue to arise is expected to reduce concentrations of contaminants of concern in the discharge. With notification to applicable agencies, regulating the discharge rate and limiting the duration of the discharge is expected to result in no detrimental impact to the receiving waters and their biota.

Fish and Fish Habitat: The impact to fish and fish habitat is expected to be minimal, as described above.

2.10 Loss of Power to Tailings Storage Facility Seepage Recovery

2.10.1 Scenario Description

During the life of the mine it is possible that a storm event could result in loss of power resulting in a temporary loss of the ability to reclaim seepage from the TSF and the potential overflow into the emergency settling ponds.

2.10.2 Project Design Measures to Minimize Risk of Loss of Power to Tailings Storage Facility Seepage Recovery

To minimize the potential for a loss of power to TSF seepage recovery Taseko will implement the following suite of measures:

- conduct annual reviews by an accredited consultant of tailings hydrological model, operation/construction of tailings complex, and water balances based on site collected meteorological data
- ensure sufficient reserve capacity in the pond to hold excessive run-off and seepage to withstand storm events for the number of days recommended by hydrological model
- access to backup (diesel) power generation and pumps
- direct excess water to seepage ponds in a controlled manner to prevent wall erosion/stability issues potentially affecting human health/safety

If the preventive measures do not prevent an accident, an emergency response protocol will immediately be initiated as described in Section 2.10.3.

2.10.3 Taseko Emergency Response Approach for Loss of Power to Tailings Storage Facility Seepage Recovery

If all precautionary and preventative measures do not prevent a loss of power to TSF seepage recovery, an emergency response protocol will be initiated that involves:

- conduct initial response and notification (mine supervisor, MOE)
- initiate immediate assessment of potential health and safety effects

In the unlikely event that unsuitable water is released to downstream environments an initial response and notification (mine supervisor, PEP, MOE, DFO) will be initiated as per emergency response plan, including notification of downstream users; activation of emergency response groups; and initiation of monitoring and assessment procedures.

2.10.4 Potential Environmental Effects

Based on the screening of potential interactions between a loss of power to TSF seepage recovery and VECs (Table 2-2), none of the VECs are likely to be detrimentally affected.

Details of preventative measures that deal with stability and potential erosion are addressed in the mine design plan.

Any excessive water should be contained in spillways, retention ponds and the pit, therefore 11 interactions have all been ranked as “0”. Interactions with the two remaining VECs were ranked as “1” for reasons described below:

Water Quality and Aquatic Ecology: Under most conditions, the loss of power would be temporary and existing containment in the TSF and seepage collection ponds will be sufficient to maintain a closed system. In the unlikely event that power is not restored and emergency power and pumping cannot maintain containment, there is the potential for a release to the environment to occur. While the quality of this water is expected to be satisfactory, as a result of the significant dilution provided by a large rainfall event or snow melt, it will be necessary to monitor the quality of the water and evaluate the conditions further. If impacts are determined to be possible, a high priority will be placed on reinstatement of the containment.

3 Effects of the Environment on the Project

The definition of an "environmental effect" under CEAA includes any change to the Project that may be caused by the environment.

A significant effect on the Project is considered to be one that results in:

- damage to site infrastructure (e.g. tailings storage facility, transmission line, waste storage sites) that may result in risk to public health and safety
- a long-term interruption in service

Minor effects are considered to be ones that result in:

- significant alterations to the construction schedule
- increased operating or maintenance costs
- a short-term interruption in service

The Application considers the following types of natural environmental issues or events that could have an effect on the Project:

- extreme weather (severe rainstorms, snow storms, wind, drought), and the potential of climate change to increase rainfall
- forest fires and the potential amplifying effect of Mountain Pine Beetle (MPB)
- seismic activity

Details of a number of planning, design, construction, and management strategies intended to minimize the potential environmental effects of the environment on the Project are described in Volume 3: Project Description and Scope of the Project. A summary of these considerations is provided below. If an accident, malfunction, or unplanned event occurs as a result of effects of the environment on the Project, clean-up procedures and measures to protect workers and the public in the vicinity of the Project will be put into place.

3.1 Extreme Weather Events

3.1.1 Severe Rainstorms

The extreme daily rainfall for the area is 34.3 mm (July 1964). 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.

Mitigations for such an event include:

- The TSF will be designed to contain the Inflow Design Flood (IDF) volume from a 72-hour storm event, defined as 2/3 between the 1/1000 flood and the Probable Maximum Flood (meeting the Dam Classification design criteria, as defined by the Canadian Dam Association "Dam Safety Guidelines 2007). In addition, this IDF event is considered sufficient to manage any net increases in precipitation due to climate change.

- Newly constructed water management structures (ditches, ponds, etc.) will be designed to manage a return-period event longer than the duration of the mine operation (>20 years). The effect of climate change on the duration curves will be evaluated and the new values applied to the design of the water management structures.
- The proponent will work with the lease holder and Ministry of Highways as necessary to address the impact of severe rainstorms on existing small bridges and culverts.

3.1.2 Snow Storms

Extreme daily snowfall for the area is 42.7 mm (December 1968). High levels of snowfall could impede the movement of mobile equipment on the access road and at the mine site. Related problems could include reduced traction by vehicles and reduced visibility during snowstorms. Fog could also reduce visibility at the mine site. Buildings exposed to large accumulations of snow could experience structural damage, or collapse.

Mitigations for snowstorms include:

- As appropriate designs will follow Part 4 of the Building Code.
- The proponent will work with the lease holder and Ministry of Highways to remove excess snow from existing roadways and will remove excess snow from active mining areas as necessary. The mine production fleet will include equipment, such as snow plows, sand-trucks, graders, loaders, trucks and scrapers, to clear snow.
- Crushed aggregate will be produced to spread on the roads for improved traction.
- Storm-related visibility issues at the mine site will be addressed with the development of operating protocols to ensure safe and efficient traffic flow during periods of reduced visibility.
- Cable stands will be utilized, where necessary, to elevate pit equipment electrical cable from snow and ice.
- Buildings will be designed to meet building code requirements to withstand roof loading from snow and associated rain (based on the 1 in 50 year ground snow load).

3.1.3 Wind

High-velocity winds could create large waves in the tailings pond and damage buildings and power lines.

Mitigations include:

- Buildings will be designed per Part 4 of the Building Code.
- The TSF will be developed with significant tailings beaches (about 1000 m wide from the dam crest to pond), thereby keeping any waves a long distance from the embankments. Furthermore, under full flood storage conditions for the IDF event, the TSF filling schedule has been developed to maintain a minimum 1-m wave-run-up protection above the supernatant pond.

3.1.4 Drought

A significant reduction in the accumulated annual rain and snowfall would: reduce the runoff entering the tailings management structures and the open pits, thereby decreasing the dilution of mine discharge waters into the receiving environment. During droughts, there is also the potential for low-level effects to aquatic receptors due to changes in water quality from filter plant effluent discharge (for increased risk of forest fires, see the section below).

Mitigations include:

- The TSF operating pond is designed to have a minimum pond volume with an operating buffer under average conditions. Consecutive dry years may require diversion of excess water from the eastern part of the Fish Creek catchment to augment the TSF Pond volume.
- Water will not be released into the receiving environment from the mine site until the post closure period, currently estimated to begin at Year 44 of the mine life. Water quality monitoring anticipated to be conducted throughout the life of the mine will provide opportunities to develop and implement appropriate treatment strategies prior to there being any release of water to the receiving environment.

3.2 Forest Fires

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. Depending on the size of the crossing and the severity of the fire, damage or loss of bridges along the access corridor caused by a fire could restrict road access to the mine site from half a day up to two weeks. Extensive dead timber due to the MPB could increase the risk and intensity of fire.

- Fire-fighting equipment will exist as part of the Health and Safety system for the mine. This equipment, as well as employee awareness training to assist the prevention of forest fires, will minimize the potential for forest fires to affect the project.
- A safety plan will be developed that describes 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.
- Personnel not involved in containing a fire from work areas or camps will be gathered at muster stations and evacuated.
- Water pumps and fire-fighting equipment will be strategically located around the mine site.
- Vegetation that could be fuel for fire will be removed from around mine infrastructure.
- Steel sub-structures will be incorporated into bridge designs, leaving only the wooden decks vulnerable to fire.

- Backup generators at the mine site will have enough power capacity to operate essential equipment around the sites in case of transmission line loss.
- A spare transmission line conductor will be stored on site to expedite repairs.

3.3 Seismic Activity (Earthquakes)

The Project is located in a seismically stable region of Canada. Nonetheless all Project components could potentially be affected by a seismic event, and the appropriate codes such as Part 4 of the Building Code will be implemented.

Of all the structures the tailings embankment has the potential for being most affected and for having the greatest impact if it failed. The design and construction of TSF embankments will be done per Canadian Dam Association's "*Dam Safety Guidelines*" 2007. Embankment dams will be designed to safely withstand seismic ground motions from the maximum design earthquake, defined according to the Dam Classification and based on the criteria specified by the Canadian Dam Association's Dam Safety Guidelines. For the Main Embankment, the maximum design earthquake is defined as the 1 in 5000 year earthquake with a maximum ground acceleration of 0.42 g and design earthquake magnitude of 7.5.

4 Capacity of Renewable Resources

The issue of the Project's impacts on renewable resources was assessed in detail in Volume 4: Physical Environment and Volume 5: Biotic Environment. The physical renewable resources assessed were the atmospheric environment (Volume 4, Section 2), and surface and ground water (Volume 4, Section 4). For the biotic environment the assessed were water quality and aquatic ecology (Volume 5, Section 2), fish and fish habitat (Volume 5, Section 3), soils (Volume 5, Section 4.5), vegetation (Volume 5, Section 5), and wildlife (Volume 5, Section 6). After consideration of the Project's design, the best management practices that would be employed, and the project-specific mitigations developed where needed, the determination for all renewable resources is that the project will not have significant effects. While the measure for significance is specific to each resource, generically significance is determined by a regulatory standard or a threshold based on community values or management objectives. None of the Project's residual effects exceeded these standards or thresholds and were therefore determined to be not significant. Volumes 4 and 5 contain assessment details supporting the conclusions of the project not having significant effects on the capacity of renewable resources.

Effects of the Project on Fish and Fish Habitat required the development of substantial project specific mitigations and deserve particular mention. Lake dewatering, starter dam construction and water diversion around the Project site will affect fish habitat through loss of Fish Lake, eventual inundation of Little Fish Lake, reduction of downstream flows to Fish Creek rainbow trout populations, and loss of mainstem, tributary and riparian habitats. The downstream effects could also have an effect on salmon. The compensation and mitigation measures including the creation of Prosperity Lake, spawning channels, and water flow controls to be put in place will combine to meet the overall No Net Loss principle of the HMP. The Compensation Plan reflects the need to avoid loss of fish and fish habitat where possible, then mitigate to the extent possible, and finally compensate for losses according to the hierarchy of preferences (e.g., like for like first). The Compensation Plan has been designed to go beyond the replacement of the surface area of lost habitat, and addresses some of the regional DFO and MOE priorities, and provides opportunities to build relationships with public stakeholders and local First Nations.

In addition to the assessment of Volumes 4 and 5, Volume 6, Section 5 assesses Project specific and cumulative effects on Resource Uses for the following: land use objectives; forestry; agriculture and ranching; fishing; hunting; public recreation; tourism; and trapping. No significant negative effects by the Project were determined. For some the effect was positive.

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6 Appendices

Appendix 9-2-A Accidents and Malfunctions Report September 2007