Screening Report and Recommendation

Project Assessment 2010-0267

Eagle Gold Project

Yukon Environmental and Socio-economic Assessment Board

February 19, 2013

Prepared by
Executive Committee
Yukon Environmental and Socio-economic Assessment Board

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PREFACE

Victoria Gold Corp. (VIT) is proposing the construction, operation, closure and reclamation of an open pit gold mine in central Yukon, approximately 350 km north of Whitehorse and 45 km northeast of the Village of Mayo in the Dublin Gulch watershed. The Eagle Gold Mine would produce approximately 132 million tonnes of waste rock and 92 million tonnes of ore to be processed for gold using a cyanide heap leaching process. The Project would include a camp for approximately 400 personnel.

The Project includes a construction stage of 25 months, an operational stage (i.e. mining and production) of 9.2 years, an additional one to two years of gold extraction, a reclamation and closure stage of ten years, and post-closure of more than five years.

The Executive Committee of the Yukon Environmental and Socio-economic Assessment Board (YESAB) has assessed the environmental and socio-economic effects of the proposed Project pursuant to the *Yukon Environmental and Socio-economic Assessment Act* (YESAA).

The Screening Report is available on the YESAB Online Registry (www.yesab.ca/registry, YESAB Project No. 2010-0267) or copies can be obtained from:

- YESAB Head Office at Suite 200 – 309 Strickland Street
- YESAB Mayo Designated Office

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EXECUTIVE SUMMARY

This Screening Report is the outcome of the Yukon Environmental and Socio-economic Assessment Board (YESAB) Executive Committee's assessment of the Eagle Gold Project proposed by the Victoria Gold Corp. The purpose of the Project is the construction, operation, closure and reclamation of an open pit gold mine in central Yukon. The Eagle Gold Mine would produce 92 million tonnes of ore that would be processed for gold using a cyanide heap leach, and 132 million tonnes of waste rock over 9.2 years of active mining. The project is located in central Yukon, approximately 350 km north of Whitehorse and 45 km northeast of Mayo in the Dublin Gulch watershed.

The *Yukon Environmental and Socio-economic Assessment Act* (YESAA) directs the Executive Committee to examine the potential environmental and socio-economic effects of a project and provide a recommendation to Decision Bodies on whether or not a project should be allowed to proceed or, in certain circumstances, refer the project for review by a panel. YESAA requires that Decision Bodies consider the recommendation, and issue a decision document, prior to taking any action that would enable a project to be undertaken. The purpose of the Screening Report is to provide the Decision Bodies with our recommendation arising from the screening, and the reasons for that recommendation.

This Screening Report:

- describes the Project and the screening approach;
- summarizes the matters considered during the screening;
- identifies potential effects of the Project and outlines terms and conditions that mitigate potentially significant adverse environmental and/or socio-economic effects of the Project; and
- considers the public comments received on the proposal and the Draft Screening Report.

The Executive Committee has employed a valued component based assessment methodology to assess the environmental and socio-economic effects of the Eagle Gold Project. The Executive Committee has identified the Valued Environmental and Socio-economic Components (VESECs) for the Project to be hydrology, aquatic ecosystems, environmental quality, vegetation, wildlife, heritage resources, land and resource use, local services and infrastructure, health and safety, cultural and community well-being, and securities and bonding. This report is structured to present the potential effects related to cyanide and other hazardous materials before these other VESECs, as cyanide could result in adverse effects to several other components.

This report addresses Project and cumulative effects on these VESECs. These VESECs are introduced and relevant issues are highlighted. Potential effects are subsequently characterized and their significance is discussed. For each VESEC, mitigative measures that address the significant adverse effects are presented and a final determination is made. The Executive Committee has identified mitigation for all significant adverse effects identified in this report.

Many of the significant adverse effects of the Project are associated with the management of cyanide. Cyanide is acutely toxic to humans and other life in relatively small quantities. Controlling the adverse effects related to cyanide involves minimizing the release of cyanide and, if a release occurs, minimizing the exposure of VESECs to toxic levels of cyanide. The Executive Committee has recommended over 35 mitigations that will eliminate, reduce or control significant adverse effects related to cyanide.

Pursuant to s. 50(3) of YESAA, before submitting a proposal to the Executive Committee, a proponent is required to consult any First Nation in whose traditional territory the project will be located or might have significant environmental or socio-economic effects, as well as the residents of an community in which the project will be located or might have significant environmental or socio-economic effects. Based on the information provided in the proposal, the Executive Committee determined that for the purposes of s.50(3), the Proponent was required to consult:

- the First Nation of Na-Cho Nyak Dun (NND), being the First Nation in whose territory the Project "will be located or might have significant environmental or socio-economic effects"; and
- the residents of Mayo, being the community in which the project "will be located or might have significant environmental or socio-economic effects".

In a letter dated January 21, 2011, the Executive Committee determined that, in its opinion, with respect to the Eagle Gold Project, the Proponent consulted with NND and residents of Mayo in accordance with s. 50(3) of YESAA. The Executive Committee acknowledges and commends the Proponent’s efforts to engage both the NND and the people of Mayo.

As a result of this assessment, the Executive Committee recommends to the Decision Bodies that the Eagle Gold Project be allowed to proceed without a review, subject to terms and conditions identified in this report. The Executive Committee has determined that this Project will have significant adverse environmental and/or socio-economic effects in Yukon that can be mitigated by these terms and conditions. Recommended terms and conditions are summarized in Part III Assessment Recommendation.

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ACRONYMS AND ABBREVIATIONS

~	approximately
>	greater than
<	less than
µg/m³	micrograms per cubic metre
µg/L	micrograms per litre
ABA	acid base accounting
ADR	adsorption, desorption and recovery
ANFO	ammonium nitrate/fuel oil explosive
AP	acid potential (in kg $CaCO_3$/t equivalent)
ARD	acid rock drainage
As	arsenic
asl	above sea level
BADCT	Best Available Demonstrated Control Technology
BC	British Columbia
$CaCO_3$	calcium carbonate
CACs	criteria air contaminants
COCs	contaminants of concern
CCME	Canadian Council of Ministers of the Environment
Cd	Cadmium
COPC	constituents of potential concern
CDP	cyanide detoxification plant
CH_4	methane

cm	centimetre
CN	cyanide
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
Cu	copper
d	day
dB	Decibel
DFO	Fisheries and Ocean Canada
DG	Dublin Gulch
DGDC	Dublin Gulch Diversion Channel
DO	dissolved oxygen
DOC	dissolved organic carbon
DSR	Draft Screening Report
EC	Environment Canada
ECP	Eagle Creek Pond
EP	Eagle Pup
Executive Committee	Executive Committee of the Board
ft	feet
GCL	geosynthetic clay liner
GWh	gigawatt hours
h	hour
ha	hectares

HADD	harmful alteration, disruption or destruction
HCN	hydrogen cyanide (a gas at room temperature/pressure)
HCR	Haggart Creek Road
HDPE	high density polyethylene
HLF	Heap Leach Facility
HPGR	high pressure grinding rolls
Hg	mercury
hp	horsepower
IDF	inflow design flood
in	inches
km	kilometre
km^2	square kilometres
kWh	kilowatt hours
L	litre
LCRS	leak collection and recovery system
LDRS	leak detection and recovery system
LLDPE	linear low-density polyethylene
LNG	liquefied natural gas
LSA	local study area
m	metre
m^2	square metres
m^3	cubic metres
MCE	maximum credible earthquake
mg	milligrams

ML	metal leaching
mm	millimetres
MMER	Metal Mining Effluent Regulations
Mo	molybdenum
MWh	megawatt hours
MWTP	mine water treatment plant
N/A	not applicable
N	nitrogen
NH_3	ammonia
NO_2	nitrogen dioxide
NAC	Nevada Administrative Code
NAG	non acid generating
NBCC	National Building Code of Canada
Ni	nickel
NND	First Nation of Na-Cho Nyak Dun
NP	neutralization potential (in kg $CaCO_3$/t equivalent)
NP/AP	neutralization potential to acid potential ratio
ORV	off-road vehicle
PAG	potential acid generating
Pb	lead
PG	Platinum Gulch
pH	potential of hydrogen (measure of acidity)
PLS	pregnant leach solution
PM	particulate matter

ppbv	parts per billion by volume
Project	Eagle Gold Project
Proponent	Victoria Gold Corp.
PSL	permissible sound level
PTS	passive treatment system
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
s	seconds (of time)
SARA	*Species at Risk Act*
SCP	sediment control pond
Se	selenium
SIR	Supplementary Information Report
SMR	South McQuesten Road
SO_2	sulphur dioxide
SSWQO	site specific water quality objective
SWBM	surface water balance model
t	tonnes (metric)
TC	Transport Canada
TDS	total dissolved solids
TK	traditional knowledge
TOC	total organic carbon
TSP	total suspended particulates
TSS	total suspended solids
UFA	Umbrella Final Agreement

VRP	velocity reduction pond
VESEC	Valued Environmental Socio-economic Component
VIT	Victoria Gold Corp. (Proponent)
WKA	wildlife key areas
WMP	water management plan
WQG	water quality guideline
WQM	water quality model
WRSA	waste rock storage area
WWTP	waste water treatment plant
Y	year
YAAQS	Yukon Ambient Air Quality Standards
YESAA	*Yukon Environmental and Socio-economic Assessment Act*
YESAB	Yukon Environmental and Socio-economic Assessment Board
YG	Government of Yukon
YOR	YESAB Online Registry

PART I BACKGROUND

1.0 INTRODUCTION

The *Yukon Environmental and Socio-economic Assessment Act* (YESAA) requires that Decision Bodies consider the recommendation arising from a screening conducted under YESAA, and issue a Decision Document, prior to taking any action that would enable a project to be undertaken.

The purposes of this report are to provide the Decision Bodies with a recommendation arising out of the screening and the reasons for that recommendation.

This report:

- describes the Project and the screening approach;
- summarizes the matters, including public comments, considered during the screening; and
- identifies potential effects of the Project and outlines terms and conditions that mitigate potentially significant adverse environmental and/or socio-economic effects of the Project.

1.1 LEGISLATIVE CONTEXT FOR THE ASSESSMENT

YESAA sets out a process to assess the environmental and socio-economic effects of projects and other activities in Yukon, or that might have effects in Yukon. The Executive Committee of the Yukon Environmental and Socio-economic Assessment Board (YESAB) is responsible for assessing large, complex projects identified under the *Assessable Activities, Exceptions and Executive Committee Projects Regulations* (Activity Regulations). A screening by the Executive Committee is required for the Eagle Gold Project because:

- Victoria Gold Corp. (VIT or Proponent) proposes to undertake activities listed in Schedule 3 of the Activity Regulations, specifically, s. 3 states:

  "Construction, decommissioning or abandonment of

  ...

  (b) a gold mine with an ore production capacity of 300 t/day or more."

- The activities are proposed to be undertaken in Yukon; and
- An authorization or the grant of an interest in land by a government agency, independent regulatory agency, municipal government or First Nation is required for the activity to be undertaken.

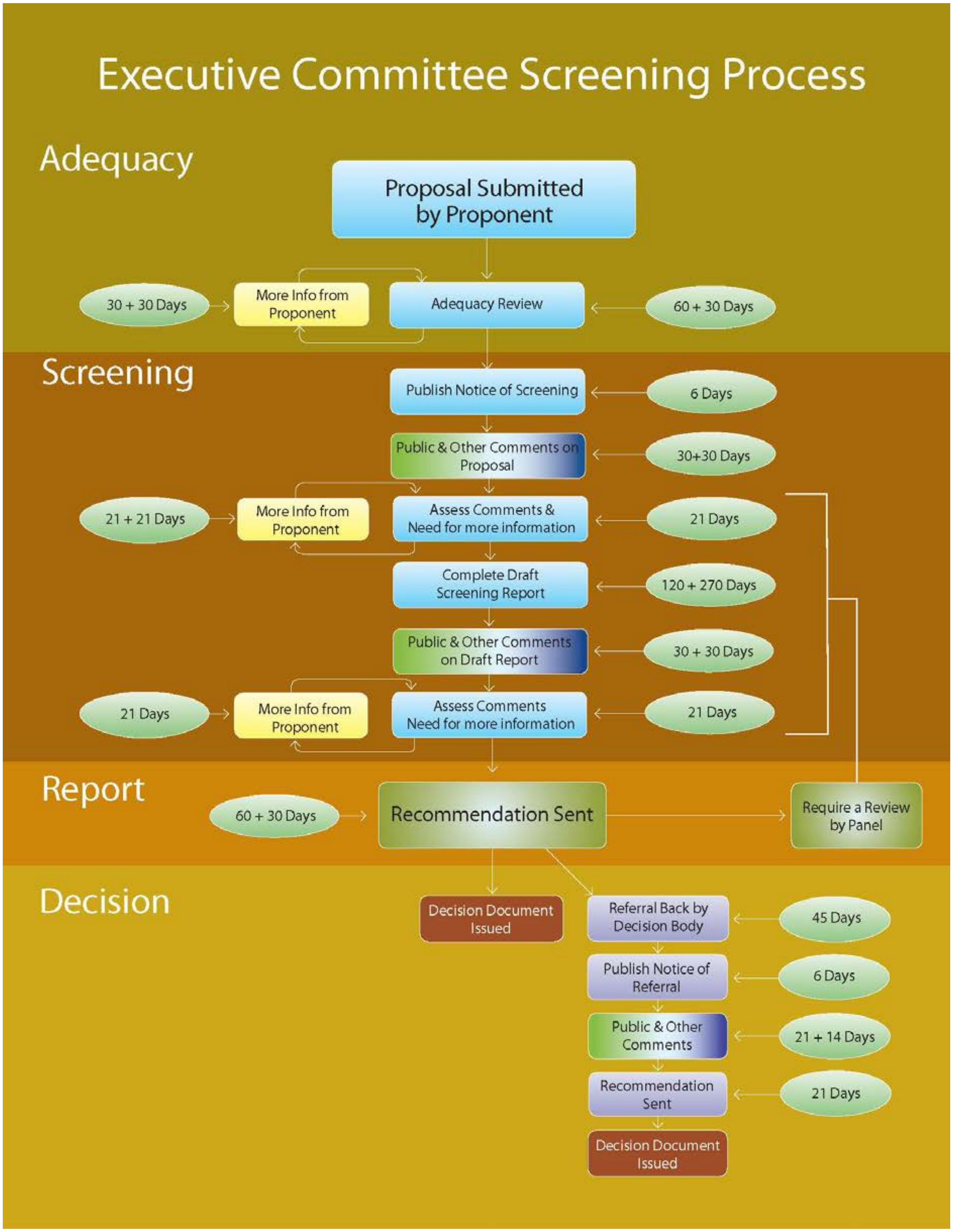

Figure 1 Executive Committee Screening Process Flowchart

Decision Bodies and required authorizations were identified based on information in the proposal and information submitted to the Executive Committee. Natural Resources Canada, Fisheries and Oceans Canada, Transport Canada and Government of Yukon are identified as potential Decision Bodies for this Project. The potential Decision Bodies and authorizations required for the Project are listed in Tables 1 and 2.

Table 1 Government of Canada Decision Bodies and Authorizations Required

Decision Body	Act or Regulation	Authorization(s) Required
Transport Canada	*Navigable Waters Protection Act (NWPA)*	NWPA, Section 5(2) Approval
	Transportation of Dangerous Goods Act *Transportation of Dangerous Goods Regulations*	Waste Manifest
Natural Resources Canada	*Explosives Act* *Explosives Regulations*	Explosives Factory Licence Explosives Magazine Licence(s)
Fisheries and Oceans Canada	*Fisheries Act*	Section 35(2) Authorization

Table 2 Government of Yukon and Authorizations Required

Responsible Agency	Act or Regulation	Authorization(s) Required
Department of Energy, Mines and Resources	*Quartz Mining Act*	Quartz Mining License
	Territorial Lands (Yukon) Act	
	Land Use Regulations	Land Use Permit
	Quarry Regulations	Quarry Permit
	Forest Resources Act	
	Forest Resources Regulations	Timber Permit
Yukon Water Board	*Waters Act*	Water Licence – Type A
Government of Yukon	*Public Utilities Act*	Energy Certificate and Operating Certificate
Department of Highways and Public Works	*Highways Act*	
	Highways Regulations	Work in Highway Right of Way Permit Access Permit
	Bulk Commodity Haul Regulations	Highways Hauling Permit
	Dangerous Goods Transportation Act	Permit – Certificate for Transport of Dangerous Goods
Department of Environment	*Environment Act*	
	Air Emission Regulations	Air Emissions Permit
	Special Waste Regulations	Special Waste Permit
	Solid Waste Regulations	Solid Waste Permit

Responsible Agency	Act or Regulation	Authorization(s) Required
Department of Community Services	*Environment Act*	
	Storage Tank Regulations	Storage Tank Systems Permit
	Forest Protection Act	
	Forest Protection Regulations	Burning Permit
	Building Standards Act	Building Permit Plumbing Permit
	Electrical Protection Act	Electrical Permit
	Gas Burning Devices Act	Gas Burning Devices Permit Gas Installation Permit
	Boiler and Pressure Vessel Act	Pressure Vessel Boiler Permit
Department of Tourism and Culture	*Historic Resources Act*	Archaeological Sites Permit
Department of Health and Social Services	*Public Health and Safety Act*	
	Sewage Disposal System Regulations	Permit to Install a Sewage Disposal System
Workers' Compensation Health and Safety Board	*Occupational Health and Safety Act*	
	Occupational Health and Safety Regulations	Blaster's Permit

1.2 Eagle Gold Project Screening Chronology

The assessment process and timelines for screenings are set out in the *Rules for Screenings Conducted by the Executive Committee* and this section provides an overview of the assessment tasks and timelines. The chronology of the Eagle Gold Project screening is set out in Table 3, which provides an outline of key assessment dates and stages. For more detailed assessment information, please visit the YESAB Online Registry (YOR) at www.yesab.ca/registry or the YESAB Document Registry located at the YESAB Head Office. Section 2.4 provides more details on document accessibility.

Table 3 Eagle Gold Project Assessment Chronology

Adequacy Review Period	
December 20, 2010	VIT submits proposal to the Executive Committee.
January 21, 2011	Executive Committee notifies VIT that they have met their consultation requirements under s. 50(3) of YESAA.
March 23, 2011	Executive Committee extends the adequacy review period.
March 29, 2011	Executive Committee issues Adequacy Review Report.
May 24, 2011	VIT submits response to Adequacy Review Report.
June 14, 2011	Executive Committee holds working group meeting to consider issues related to water balance and water quality of surface water and groundwater.
June 23, 2011	Executive Committee extends the adequacy review period.
July 15, 2011	VIT submits updated proposal to the Executive Committee.
July 18, 2011	Executive Committee determines that the proposal is adequate to commence the screening.
Screening	
July 22, 2011	Executive Committee issues Preliminary Statement of Scope of Project.
July 22, 2011	Executive Committee commences comment period. (July 22 to August 22, 2011)

Screening	
August 12, 2011	Executive Committee extends comment period. (August 22 to August 31, 2011)
August 24, 2011	Executive Committee holds a public meeting in Mayo.
September 1, 2011	Comment period ends and Executive Committee commences consideration of comments received.
September 14, 2011	Executive Committee issues Notice of Change to Preliminary Statement of Scope of Project.
September 16, 2011	Executive Committee issues a Supplementary Information Request.
December 2, 2011	VIT submits response to Supplementary Information Request.
December 16, 2011	Executive Committee notifies VIT that the supplementary information response is adequate and commences preparation of Draft Screening Report.
February 17, 2012	VIT indicates verbally that they are considering modifications to certain elements of the proposal.
February 27, 2012	VIT provides notice of Project modifications related to their feasibility study Project design.
March 2, 2012	Executive Committee notifies VIT that revised proposal information is required in relation to the proposed changes.
May 11, 2012	VIT submits additional proposal information.
May 14, 2012	Executive Committee solicits views and information from interested persons regarding the additional proposal information. (May 14 to June 4, 2012)
June 4, 2012	Period for soliciting comments ends and Executive Committee considers comments received.
June 20, 2012	Executive Committee issues a Request for Additional Information.
July 26, 2012	VIT submits response to Request for Additional Information.

Screening	
August 21, 2012	Executive Committee notifies VIT that the additional information response is adequate.
August 31, 2012	Executive Committee completes Draft Screening Report and commences comment period.
October 4, 2012	Public comment period ends and Executive Committee commences consideration of comments received.
October 24, 2012	Executive Committee issues a Request for Additional Information.
November 23, 2012	VIT submits response to Request for Additional Information.
December 17, 2012	Executive Committee issues a Request for Additional Information.
January 23, 2013	VIT submits response to Request for Additional Information.
February 5, 2013	Executive Committee notifies VIT that the additional information response is adequate.
Report and Recommendation	
February 19, 2013	Executive Committee issues the Screening Report and Recommendation

1.3 PROPONENT CONSULTATION

Pursuant to s. 50(3) of YESAA, a proponent is required to consult any First Nation in whose traditional territory the project will be located or might have significant environmental or socio-economic effects, as well as the residents of any community in which the project will be located or might have significant environmental or socio-economic effects, before submitting a proposal to the Executive Committee. This duty to consult is to be exercised in the manner described in s. 3 of YESAA.

Before commencing a screening of a project, the Executive Committee must determine whether, in its opinion, the proponent has consulted First Nations and the residents of communities in accordance with s. 50(3).

Based on the information provided in the proposal, the Executive Committee determined that for the purposes of s. 50(3), the Proponent was required to consult:

- the First Nation of Na-Cho Nyak Dun (NND), being the First Nation in whose territory the Project "will be located or might have significant environmental or socio-economic effects"; and
- the residents of Mayo, being the community in which the Project "will be located or might have significant environmental or socio-economic effects".

After considering the proposal and the information provided by the Proponent, the Executive Committee determined that, in its opinion, with respect to the Eagle Gold Project, the Proponent consulted with NND and residents of Mayo in accordance with s. 50(3) of YESAA.

The Executive Committee notified the Proponent in writing of its determination on January 21, 2011.

1.4 Access to Assessment Documentation

As required by s. 118 of YESAA, YESAB maintains a register that contains all documents produced, collected or received by the Executive Committee in relation to this screening. The register can be accessed electronically through the YESAB Online Registry (YOR) www.yesab.ca/registry, or in person at the YESAB Head Office in Whitehorse.

1.5 Environmental and Socio-economic Assessment Methodology

The Executive Committee has employed a valued component based assessment methodology to assess the environmental and socio-economic effects of the Eagle Gold Project. The assessment methodology is outlined below.

1.5.1 Assessment Methodology

- Determine project scope that accounts for all proposed activities through all stages of the project (i.e. construction, operation, reclamation and closure, post-closure).
- Include activities identified in the proposal and any other activity that it considers so likely to be undertaken in relation to an activity so identified and sufficiently related to it to be included in the project.
- Give full and fair consideration to scientific information, traditional knowledge and other information provided during the assessment (s. 39 of YESAA).
- Determine the scope of assessment based on:
    - matters to be considered (s. 42(1) and (2) of YESAA);
    - views and information provided during the assessment;
    - key issues identified; and
    - Valued Environmental and Socio-economic Components (VESECs).

- Consider baseline information.
- Evaluate the proponent's approach to modelling and predicting changes from baseline caused by project activities.
- Conduct a project effects assessment.
- Determine spatial and temporal overlap between project activities and values. For example, the use of heavy machinery may occur spatially within wildlife habitat and temporally when wildlife are known to be using that habitat (e.g. summer habitat).
- Characterize potential project effects. The consequence of overlap between an activity and a value is an effect, which can be either positive (i.e. beneficial) or negative (i.e. adverse).
- Determine the significance of adverse project effects. Consider the Proponent's assessment of adverse effects and their conclusions. Evaluate the effectiveness of mitigation measures proposed by the proponent and non-discretionary legislation that may mitigate these effects.
- Identify terms and conditions to mitigate significant adverse project effects so that they are no longer significant. Terms and conditions may include:
    - alternatives to the project or alternative ways of undertaking or operating it;
    - mitigative measures; and
    - measures to compensate.
- Determine if there are residual significant adverse effects that require additional terms and conditions.
- Conduct a cumulative effects assessment.
- Identify the spatial and temporal boundaries for cumulative effects to a particular value.
- Identify projects for which proposals have been submitted to YESAB and other existing or proposed activities occurring within these boundaries.
- Determine the spatial and temporal overlap between all activities and values.
- Characterize the residual effects of activities from projects and how they interact.
- Determine the significance of adverse cumulative effects. Consider the proponent's consideration of adverse effects and their conclusions. Evaluate the effectiveness of the mitigation measures proposed by the proponent and non-discretionary legislation that may mitigate these effects.
- Identify terms and conditions to mitigate significant adverse cumulative effects.
- Determine if there are residual significant adverse cumulative effects that require additional terms and conditions.

1.5.2 Matters to be Considered

The scope of the assessment encompasses the matters considered in the screening. Consistent with s. 42 of YESAA, the Executive Committee considered the following matters during the screening of the Eagle Gold Project:

- the purpose of the project;
- all stages of the project;
- the significance of any environmental or socio-economic effects of the project that have occurred or might occur in or outside Yukon, including the effects of malfunctions or accidents;
- the significance of any adverse cumulative environmental or socio-economic effects that have occurred or might occur in connection with the project in combination with the effects of:
  - other projects for which proposals have been submitted under s. 50 (1); or
  - other existing or proposed activities in or outside Yukon that are known to the Executive Committee from information provided to it or obtained by it under YESAA.
- alternatives to the project, or alternative ways of undertaking or operating it, that would avoid or minimize any significant adverse environmental or socio-economic effects;
- mitigative measures and measures to compensate for any significant adverse environmental or socio-economic effects;
- the need to protect the rights of Yukon Indian persons under final agreements, the special relationship between Yukon Indian persons and the wilderness environment of Yukon, and the cultures, traditions, health and lifestyles of Yukon Indian persons and other residents of Yukon;
- the interests of residents of Yukon and of Canadian residents outside Yukon;
- any matter that a decision body has asked it to take into consideration;
- any matter specified by the regulations;
- the need for effects monitoring; and
- the capacity of any renewable resources likely to be significantly affected by the project to meet present and future needs.

1.5.3 Determining the Significance of Adverse Effects

To determine if a particular effect was significant, the Executive Committee examined the characteristics of the effect as well as the context, or circumstances, within which the effect occurred. Criteria for determining significance include the level of adversity (i.e. magnitude, extent, duration, frequency, reversibility), acceptability (i.e. socio-economic context, reasonable expectation), and likelihood (i.e. probability of adverse effect occurring). YESAA requires that the Executive Committee mitigate those project and cumulative effects that it determines are adverse and significant in order to recommend that a project proceed. This screening report contains the Executive Committee's recommended mitigations for all significant adverse effects.

2.0 PROJECT OVERVIEW

2.1 PROPONENT INFORMATION

Victoria Gold Corp. is a Canadian company with projects in Canada and the United States. The company is primarily engaged in acquisition, evaluation, exploration, and development of gold properties with a view to commercial production. The company's head office is located in Toronto with regional offices in Vancouver, Whitehorse and Reno.

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2.2 PROJECT DESCRIPTION

The Proponent is proposing construction, operation, reclamation and closure of an open pit gold mine in central Yukon. The Eagle Gold Project will produce 92 million tonnes of ore and 132 million tonnes of waste rock over a 9.2-year active mining phase, plus an additional one to two years of gold extraction. The proposed Project is located within the Dublin Gulch watershed. The Project is located approximately 350 km north of Whitehorse, 45 km directly northeast of the Mayo, and 85 km from Mayo by road. Road access to the mine site is along the Silver Trail, South McQuesten Road and Haggart Creek Road.

2.2.1 Changes to the Scope of the Eagle Gold Project

The proposal was submitted initially in December 2010. The Proponent advised the Executive Committee in writing on February 27, 2012 that they were proposing the following modifications to the Project under screening:

- 39.4% increase in the volume of the Heap Leach Facility and total ore production;
- 100% increase in the tonnage of waste rock;
- 21.4% increase in the footprint of the open pit;
- 23% increase in the waste rock storage area footprints;
- 13.5% increase in the daily ore production rate; and
- 23.3% increase in mine life (i.e. approximately two years).

The Proponent submitted a Supplementary Information Report to the Executive Committee on May 11, 2012 that contained technical details regarding these modifications.

2.2.2 Scope of the Eagle Gold Project

Project scoping is conducted in accordance with s. 51 of YESAA and Part 4 of the *Rules for Screenings Conducted by the Executive Committee*. Section 51 of YESAA states, in part:

> *"… the executive committee shall determine the scope of a project to be assessed by it, and shall include within the scope of the project, in addition to any activity identified in the proposal, any other activity that it considers likely to be undertaken in relation to an activity so identified and sufficiently related to it to be included in the project."*

Table 4 is the scope of the Project assessed by the Executive Committee in this screening. The scope reflects the material changes to the Project made since the proposal was submitted in December 2010.

Table 4 Scope of the Project to be Assessed

Project Component	Activities
Construction and Maintenance	• Clearing and grubbing of mine site infrastructure areas and transmission line right-of-way. o Approximately 20 488 m³ of timber will be salvaged and stored until collected, removed, or distributed. o Disposal of approximately 9 933 t of brush by stockpiling or piled and burning. • Construction of infrastructure pads for the crushers, process plant, camp, and administration buildings. • Use of the following heavy equipment: drills, excavators, haul trucks, track dozers, graders, loaders, service trucks, feller/buncher, log skidder, flat bed utility trucks, backhoes, tandem dump truck, mobile crusher, wheel tractor scraper, fork lift, concrete mixing trucks, mobile crane, compactor, light trucks and water trucks. • Use of construction borrow materials sourced from available placer spoils, overburden, silt borrow pits and rock excavations within the Project footprint including: o 830 000 m³ of general fill and/or structural fill for various earthworks structures, including pond berms, building pads and similar structural applications; o 65 000 m³ of transition zone gravel; o 49 000 m³ of Type 2 drainage system material (described as silty colluvium); o 13 000 m³ of rip rap; o 6 500 m³ of coarse concrete aggregate; and

Project Component	**Activities**
	o 4 400 m³ of fine concrete aggregate. • Use of approximately 3 754 m³ of water during the entire construction phase, withdrawn from sediment control ponds and fresh water storage tanks for construction purposes. • Preparation and use of a soil salvage location, to store approximately 1 500 000 m³ of salvaged top soil and organics for reclamation purposes. • Development of a site staging/lay-down area requiring clearing and grubbing of vegetation, levelling the ground surface, and potentially surfacing with gravel. • Installation of fire suppression systems in specific facilities to protect the mine site infrastructure.
Access Roads	• Use of the Silver Trail, South McQuesten Road (SMR), and the Haggart Creek Road (HCR) on a year-round basis for transportation to and from the mine site. • Upgrade the existing 22 km HCR to a two-way single-lane radio controlled access road. General road design of three-metre road width with one-metre shoulders on both sides and the construction of pullouts approximately every 100 to 300 m. • Construction and use of three staging/laydown areas to facilitate the upgrading of the HCR. The three proposed locations are: the South McQuesten River, south of Secret Creek and Haggart Creek crossing. Each staging area will require levelling and grading. The South McQuesten staging area will be retained as a public parking area after completion of upgrades. • Use of road construction materials sourced from side borrows as well as three borrow sources. • Construction of various roads on-site, both for general access and for operations to connect mine site infrastructure and components.
Camp and Site Administration	• Construction and operation of a mine site camp, accommodation and administration buildings in the area of the existing exploration camp. The proposed camp will accommodate 250 people and up to 400 people during construction. • Set up of potable and waste water services: o Up to approximately 120 m³ of potable water per day at peak

Project Component	Activities
	capacity during construction and 60 m³ per day during operation. Potable water will be withdrawn from groundwater wells. o Expansion of existing advanced exploration camp septic system, septic tank and soil absorption system to accommodate the larger permanent camp and administration building facilities. • Installation and operation of a solid waste incinerator on-site. • Disposal of approximately 190 t of solid waste per year and construction/demolition waste at the Mayo Landfill.
Power	• The construction, operation, and decommissioning of a 44 km, 69 kV transmission line from the Silver Trail to the mine site generally following the access road alignment. The transmission line will include a 60 m right of way with a cleared width of approximately 30 m. A distribution sub-station and lower voltage transmission lines will be constructed at the mine site to distribute power. • During construction, approximately 500 kW of power will be required from either on-site diesel generators or through the transmission line. The three generators will remain on-site for back-up power generation. • During operations, the average seasonal forecast operating loads are estimated to be from 15.4 MW up to 18.3 MW, and will be supplied by grid power.
Fuel, Chemical and Explosives Storage	• Set up of three fuel storage facilities. The largest facility will consist of two 750 000 L diesel fuel tanks and the second facility will consist of a 100 000 L fuel tank, both located in the process plant area. The third facility will consist of three 19 000 L propane tanks located adjacent to the permanent camp. All bulk fuel storage tanks will be single-walled tanks placed inside lined, bermed containment areas. Temporary storage of fuel will occur in two double-walled enviro-tanks during construction. • Waste oil will be stored in a 10 000 L steel tank located next to the truck shop and will be burned in the solution heating boiler in the process plant. Waste oil that is usable in a waste oil heater will be used to produce heat. All other wastes in this category will be hauled to an approved disposal facility. • Storage of lime and cement in silos adjacent to the reclaim

Project Component	Activities
	conveyor. Other chemicals including sodium cyanide, caustic, and hydrochloric acid will be stored indoors separately on concrete slabs located adjacent to the adsorption area in the ADR building. Concrete curbing will separate each of the chemical storage areas and provide a minimum of 110 percent containment. • Construction of explosives storage facilities, for approximately 40 t of fixed emulsion and 130 t ammonium nitrate, located southwest of the open pit. The designated areas will be graded and surrounded by a perimeter berm with a minimum height of 1.2 m, and a single gated lockable entry point. Approximately 2 000 to 6 100 t of explosives will be used per year. • Hazardous waste will be hauled to an approved disposal facility.
Open Pit	• Development of an open pit using drill and blast technology. The surface footprint of the open pit is approximately 85 ha. The final highwall crests at 1 409 m above sea level (asl) and the final pit bottom at 847 m asl. • The ore production rate is expected to be approximately 29 500 t/d and up to 10.6 million t/y with a waste to ore strip ratio of approximately 1.45 to 1.
Crushing and conveyor system	• Construction, operation and decommissioning of primary, secondary and tertiary crushers and a covered conveyor system. Covered conveyors will transport ore between crushers and from the tertiary crusher to the HLF for stacking. • Development of a 100-day temporary storage area for stacking primary crushed ore during winter. • Use of approximately 91 000 m³ per year of water for dust suppression for ore crushers. This water will be sourced from groundwater, the Platinum Gulch collection pond, or the open pit depending on water quality.
Heap Leach Facility	• Construction, operation and closure of the HLF extending from within the Dublin Gulch valley and up the Ann Gulch valley. • Construction activities include: o a confining embankment with approximately 800 m in length with a 10 m crest width and a total fill volume of 2 million m³, o an in-heap pond with an operational storage maintained

Project Component	Activities
	between approximately 35 000 m³ and 194 000 m³ and a maximum storage capacity of 459 000 m³; o a pad liner system consisting of: a single linear low-density polyethylene (LLDPE) geomembrane liner system in the upslope area of the pad with a low permeability geosynthetics clay liner, and; a double LLDPE liner system in the in-heap pond area of the pad, a leak detection and recovery system, and a leachate collection and recovery system; o sediment control ponds and surface runoff diversions; o a groundwater drainage system and two event ponds; o a heap-stacking conveyor system to stack ore in 10 m lifts with a nominal stacking rate of approximately 41 300 t/d. • Construction materials include: o 7 500 m³ of silt/fines for Heap Leach Facility liner construction; o 2 000 000 m³ of rock fill for heap containment dyke and diversion embankment, selected from durable mined waste rock. • Water use during operations: o Approximately 1 230 m³ per day of contact water from the open pit and the WRSAs for process make-up water in the HLF; o During dry years, additional process make-up water may be withdrawn from the DGDC or groundwater wells.
ADR Building (Gold Extraction)	• Gold bearing solution will be processed to remove gold by using an adsorption, desorption, and recovery facility and further refined on-site. • 330 000 m³ of fine gravel/coarse sand needed for leachate detection and recovery system.
Cyanide Detoxification Plant	• Detoxify process solution from the HLF using a two-step cyanide removal process. • On-site disposal of sludge from cyanide detoxification plant and mine water treatment plant. Ferric sludge will be stockpiled during operation and moved to a permanent disposal cell at closure. Caustic sludge will be stockpiled during operation and will be disposed of at closure by incorporating it into the low permeability

Project Component	Activities
	cover for the HLF.
Mine Water Treatment Plant	• Construction and operation of a mine water treatment plant (MWTP) in proximity to the process plant area. • Treatment of contaminated surface water and detoxified process solution to a sufficient quality to be discharged to Haggart Creek. Maximum treatment capacity will be 600 m³ per hour.
Water Management (storage and conveyance)	• Construction and of use of water management features including: o Two event ponds with a combined operating capacity of approximately 183 000 m³ to be used as emergency HLF process leach solution and/or contact water storage; o A diversion channel to permanently re-align approximately 2.6 km of Dublin Gulch around the HLF; o Diversion ditches around the HLF and the Platinum Gulch WRSA to divert non-contact water around facilities; o Eagle Pup pond approximately 36 248 m³ (with freeboard) to receive contact and non-contact water from the Eagle Pup WRSA; o Platinum Gulch pond approximately 52 311 m³ (with freeboard) to receive non-contact water from the Platinum Gulch WRSA; o Lower Dublin Gulch south pond approximately 49 749 m³ (with freeboard); o Lower Dublin Gulch north pond approximately 16 563 m³ (with freeboard); and o Groundwater drainage and collection system below the Eagle Pup and Platinum Gulch WRSAs reporting to lined seepage collection ponds.
Waste Rock Storage Areas	• Development of the Eagle Pup WRSA that will contain approximately 116 800 000 t of loose waste rock within a footprint of approximately 103 ha and will require a combined seepage and sediment control pond. • Development of the Platinum Gulch WRSA that will contain approximately 13 700 000 t of loose waste rock within a footprint of approximately 41 ha and will require a seepage control pond, diversion and drainage ditches and a sediment control pond.
Reclamation and Closure	• Development of fish habitat compensation area to provide new habitat and enhance existing low habitat values in lower Eagle

Project Component	Activities
	Creek, Haggart Creek off-channel, and the Dublin Gulch Diversion Channel (DGDC). • Construction and use of three passive treatment systems below the WRSAs and the HLF. • Reclamation and decommissioning of mine site structures. o Progressive reclamation will occur during operation while final reclamation will occur over a ten-year period with an eventual “walk-away” closure condition. o WRSAs will be re-contoured and capped. o Open pit will be stabilized and pit roads removed to allow pit lake to form. Pit lake will drain into PG. o HLF will be detoxified, rinsed, drained, contoured and capped. o Mine site structures will be decommissioned and removed; foundations will be demolished and buried. o Maintain and stabilize key water diversion channels and structures to meet long-term water management objectives. o Re-contouring and re-vegetation of mine site surface areas where appropriate. o Removal and re-vegetation of on-site mine roads. o The transmission line will be decommissioned and removed. The vegetation within the right-of-way will be allowed to regenerate.

2.2.3 Temporal and Spatial Boundaries of Project

In addition to specifying the activities included in the scope of the Project, it is important in the assessment to have a clear understanding of the temporal and spatial boundaries of the Project. These boundaries define the time periods and sequencing of activities as well as the area within which activities, and their effects, are proposed to occur.

Temporal Boundaries

There are four main stages for this Project: construction; operation; reclamation and closure; and post-closure. The sequence and timelines for these Project stages, as provided in the proposal, are set out in Figure 2.

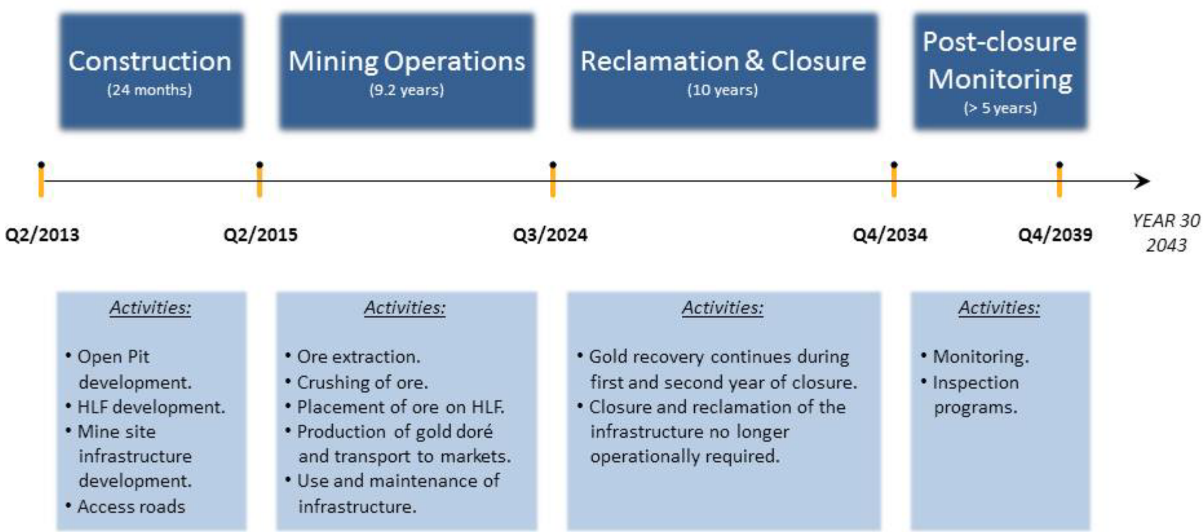

Figure 2 Project Sequencing

Spatial Boundaries

The following figures, taken from the proposal, describe the spatial extent of Project activities:

- Figure 3 General Project Location
- Figure 4 Regional Project Location
- Figure 5 Project Site Layout

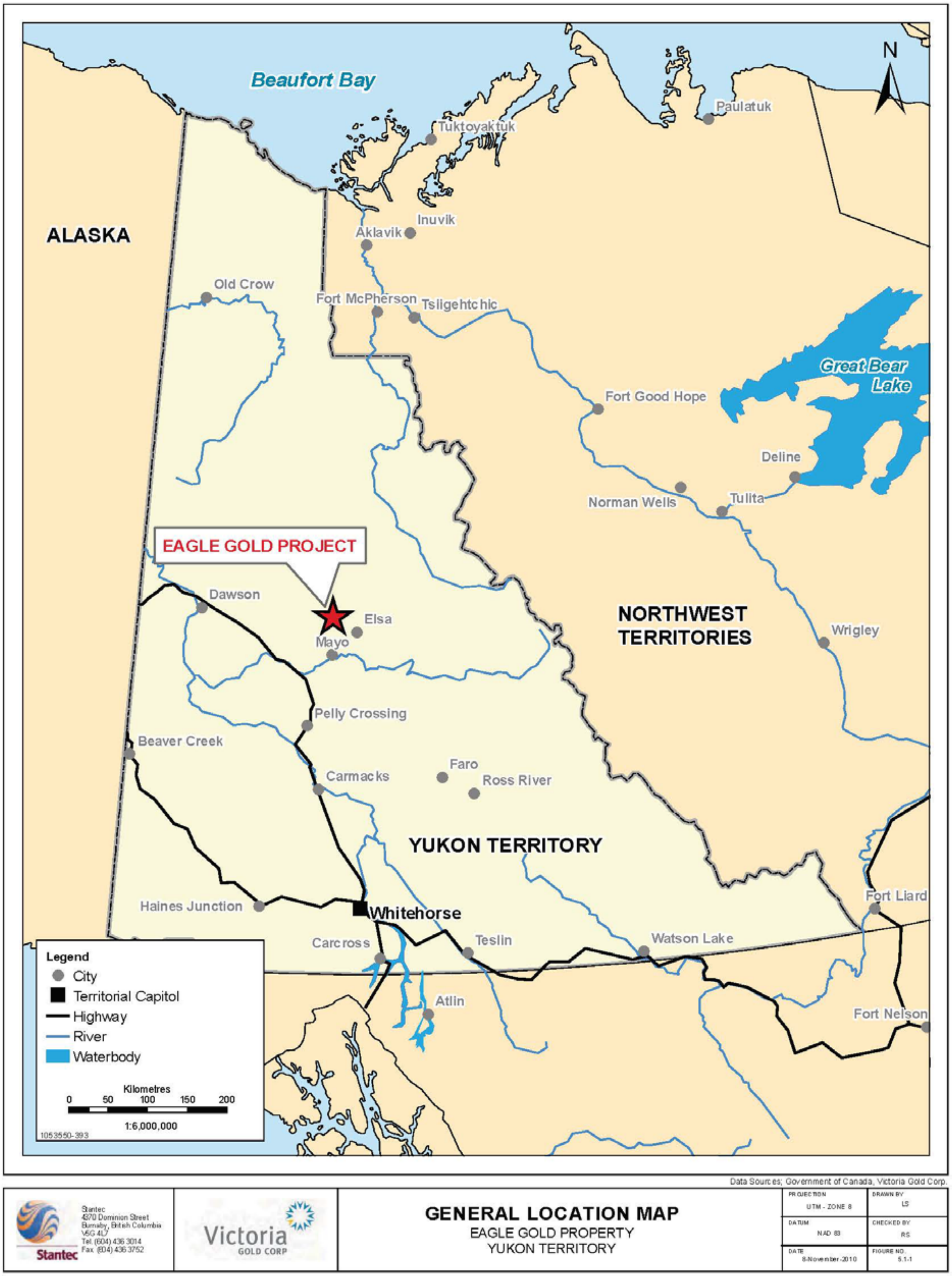

Figure 3 General Project Location

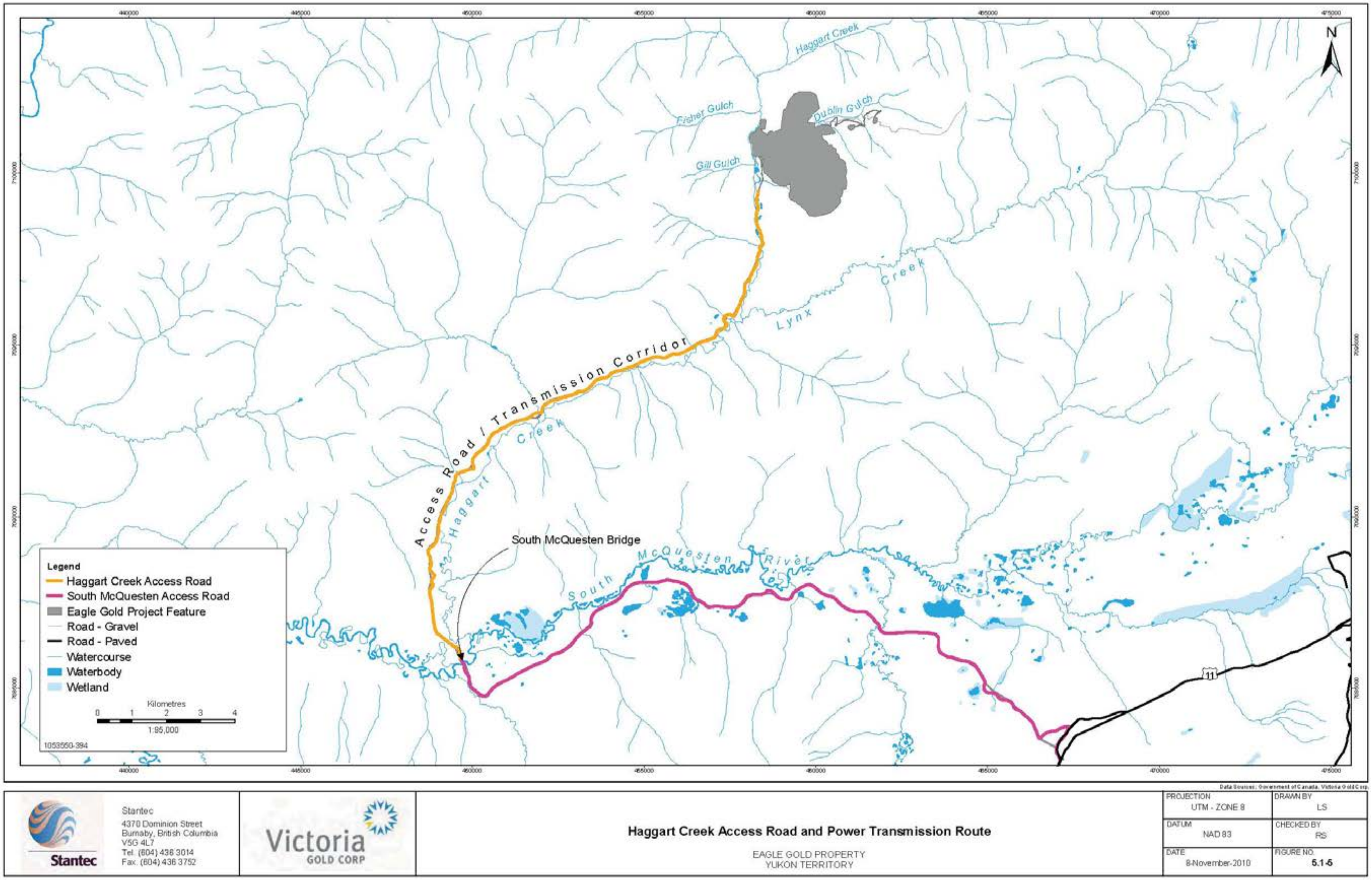

Figure 4 Regional Project Location

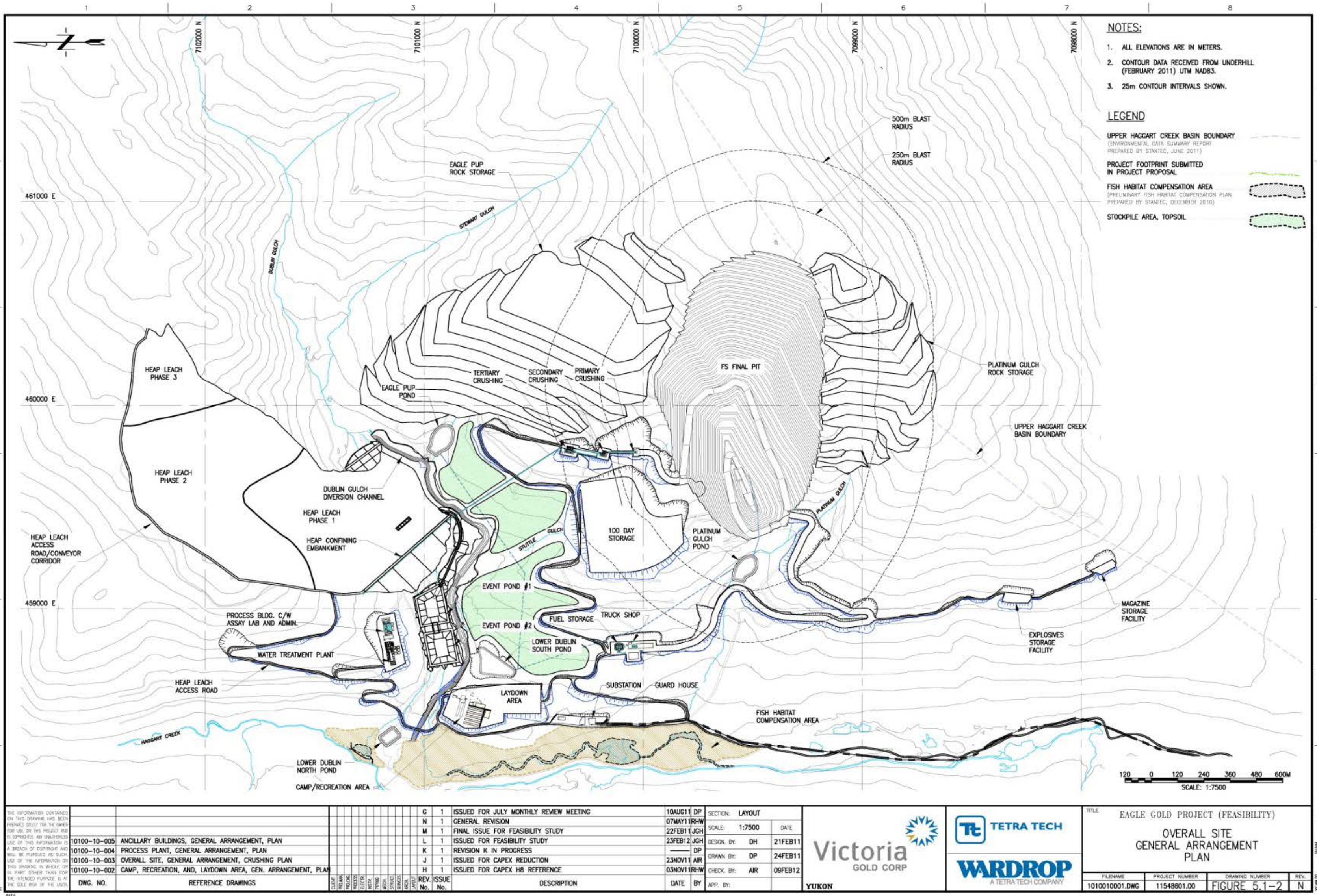

Figure 5 Project Site Layout

3.0 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

Information in this section is reproduced from the proposal and subsequent additional proposal information. References found in this section appear as they were used in the proposal.

3.1 PHYSICAL ENVIRONMENT

The Project is situated within the Yukon Plateau North Ecoregion, in the Boreal Cordillera Ecozone. This ecozone encompasses the Stewart, MacMillan and Pelly plateaus and southern part of the Selwyn Mountains (Smith et al. 2004). It is located northeast of the Tintina Trench.

Geomorphology

The majority of Project area was un-glaciated during the last glacial period (Bostock 1965), and has not been glaciated for more than 200 000 years. The Project area displays physiographic characteristics of the unglaciated areas of the region with narrow, V-shaped valleys and rounded upland surfaces. The valleys are deep and narrow to the head of streams, where they rise steeply and end abruptly. Despite the extensive time since glaciation, evidence of glacial-ice action is still visible. This historic glaciation is responsible for the formation of the tributaries of Dublin Gulch, including, from east to west, Cascallen, Bawn Boy, Olive, Ann, Stewart, Eagle, Stuttle and Platinum gulches. Within these gulches the post-glacial terrain has been modified by gravity, water, and freeze-thaw mechanics, as evidenced by the many headscarps of landslides, and observed rock and debris slides. Most of the landslides are historic, but there are a few areas of ongoing rock fall that continue to modify the terrain, particularly in the Stewart, Bawn Boy, and Olive gulches.

Surficial Geology

The surficial geology of the Project study areas has been substantially affected by historic glaciations over 200 000 years ago, including two major glaciation episodes in the Quaternary period: the pre-Reid (approximately 2.5 Ma to 400 ka BP) and the Reid (approximately 200 ka BP) (Bond 1997a; 1998a; b). Preservation of pre-Reid glacial deposits and landforms is rare. Dominant surficial materials within the Project area are weathered bedrock and colluvium. Competent bedrock outcrops are uncommon. In the larger area, surficial materials along Haggart Creek are mostly un-reclaimed placer tails while, while along the McQuesten Road section, surficial materials are largely coarse-textured fluvial deposits due to the proximity to the river.

Soils and Permafrost

The largest influence on soil development in the area of the Project is climate, and the resulting permafrost that is present in substantial portions of the area. Despite over 200 000 years of soil development, pedogenic processes have been slow due to the cold climate and to the short growing season for vegetation, resulting in a predominance of ice-affected and relatively undeveloped soils (i.e. Cryosols and Brunisols).

Permafrost is discontinuous in the Yukon Plateau North Ecoregion, where its precise location is controlled by microclimatic factors, especially ground surface moisture content and organic layer thickness. At high elevations, permafrost is common and ice content is estimated as low to moderate in colluvial and moraine deposits. Ice wedge polygons, solifluction lobes, blockfields and rock glaciers are common in the ecoregion. Valley floors contain discontinuous permafrost in the silty sediments overlain by organic deposits. Ground temperature measurements in the Mayo area suggest that the base of the permafrost is elevated by convective heat carried by groundwater and resulting in steep ground temperature gradients (0.08°C/m) (Burns, 1991 as referenced in VIT, 2011).

Within the area of the Project, the Proponent encountered permafrost on the plateau and in the lower valley bottoms adjacent to Haggart Creek and Dublin Gulch. In some areas, permafrost was found within the upper 50 cm of the soil profile. A number of subsurface site investigations were conducted by the Proponent as well as predecessor companies. The most recent investigations were conducted in the summer and early fall of 2012. In total, 463 test holes and observations have been drilled within the Project footprint including 122 in the HLF area. The Proponent predicts a total of approximately 770 000 m^3 of ice-rich soils and permafrost is present throughout the Project area and will require some type of management (VIT 2012c).

Non-frozen soils including Brunisols, minor areas of Luvisols (on fine-textured till), and Gleysols (on poorly and imperfectly drained materials) were also found in the Project area. The majority of the soil textures in the area are composed of sand, silt or silt-sand loam matrix with angular or tabular coarse fragments ranging from gravel to boulders.

Bedrock Geology

The proposal reports that the Dublin Gulch property is underlain by Proterozoic to Lower Cambrian-age Hyland Group metasediments and the Cretaceous intrusive Dublin Gulch granodioritic stock. The stock has been dated at approximately 93 million years. The Hyland Group is comprised of interbedded quartzites and phyllitic metasedimentary rocks. The Dublin Gulch stock is comprised of four phases, the most significant of which is granodiorite. Quartz diorite, quartz monzonite, leucogranite and aplite comprise younger intrusive phases that occur predominantly as dikes and sills and cut both the granodiorite and surrounding country rocks. The stock has intruded the Hyland Group metasediments near their contact with the underlying Upper Schist.

The proposal describes the mineralization in the Eagle Zone consisting of sheeted quartz vein systems of differing densities that host gold. Additional to this, disseminated, lower grade gold is found throughout the intrusive body and is associated with arsenopyrite mineralisation, with minor pyrite/pyrrhotite. A model for the mineralization style was published by Craig Hart in 1999, which describes a Reduced Intrusion-Related Gold System (RIRGS).

Geologically, the deposit is simplified and described in the proposal as an intrusive suite, predominantly granodiorite in composition, emplaced within a metasediment package, predominantly phyllitic in nature. The granodiorite has been subdivided into three units, an oxidized unit, an altered unit and an unaltered unit. Alteration tends to be dominated by albite, potassium feldspar, sericite, carbonate and chlorite and only occurs very locally around veining. While mineralization is associated with the intrusive stock, it is not spatially limited to the intrusive. Gold-bearing veins are found in all of the main geological units including the metasediments. Gold occurs primarily as pure gold and in association with very small amounts of metallic bismuth and arsenopyrite. Other vein minerals include pyrite/marcasite, pyrrhotite, sphalerite, chalcopyrite, galena, molybdenite and iron oxides/hydroxides as well as metallic bismuth and sulphosalts.

Hydrology

The Yukon North Plateau Ecoregion is located within the Interior Hydrologic Region. Drainage is generally from the Selwyn Mountains to the east. The ecoregion has a higher relief than the adjacent ecoregions to the west, which results in higher volumes of water from spring snow-melt and higher peak-flows. Several large rivers traverse the ecoregion including the Pelly, Ross, Macmillan, Stewart, Hess, McQuesten and Klondike. Large wetland areas are primarily associated with the lower portions of these large river valleys. Annual stream flow is characterized by a rapid increase due to snowmelt peaking in late May or early June with secondary rainfall generating peaks throughout the summer until freeze up begins in autumn (October). Numerous lakes also occur across the ecoregion.

The majority of the Project site lies within the Dublin Gulch watershed, but there are overlaps with the Eagle Creek and Haggart Creek drainage basins. Elevations in the vicinity of the Project range from 765 m asl near the confluence of Dublin Gulch and Haggart Creek, to 1 525 m asl at the base of the Potato Hills (which forms the eastern boundary of the Dublin Gulch watershed).

Dublin Gulch is a tributary to Haggart Creek that flows to the South McQuesten River. Dublin Gulch, Eagle Creek, and Haggart Creek are all perennial streams. Several of the tributaries in the Project area are intermittent streams (i.e. the stream becomes dry at sections along the watercourse where flow goes subsurface) or ephemeral streams (i.e. the stream channel has little to no groundwater storage and flow is in response to snowmelt or heavy rains).

The Proponent collected stream flow data during the open-water seasons of 2007 through 2009 across the Local Study Area (LSA) using both continuous gauging stations and nine manually gauged stations. The proposal reports an open-water season flow pattern characterized by freshet-generated peak flow in May to early June, followed by a relatively rapid recession to low base flow throughout July and August. Heavy rain events caused short-term increases in stream flow with storm-event recessions being generally rapid in the late summer and fall, both reflective of low groundwater storage capacity of the basins. Winter flows were observed and measured by the Proponent in Haggart Creek and lower Dublin Gulch and are the lowest flows of the year, reflecting base flow contributions.

The Proponent observed that groundwater was generally found deeper at higher elevations (i.e., generally more than six metres below ground) and shallow to artesian at lower elevations or in valley bottoms. Springs and seeps were observed in a few locations where valley bottoms have narrowed. These are typically associated with the re-emergence of a stream from channel deposits. The proposal reports that groundwater levels within the lower Dublin Gulch Valley were observed to have delayed trends related to surface water flows. Higher groundwater levels after spring freshet or rainfall events and lower groundwater levels during dry summer periods.

Climate

The Dublin Gulch area is characterized by a continental-type climate with moderate annual precipitation and a large temperature range. Mean annual temperatures of the ecoregion are near -5°C, but there is strong seasonal variability in temperature further accentuated by elevation. Summers are short and can be hot, while winters are long and cold with moderate snowfall. Rainstorm events frequently occur during the summer and may contribute between 30 and 40 percent of the annual precipitation. Higher elevations are snow-free by mid-June. Frost may occur at any time during the summer or fall.

Regional climatic data are available from several stations in the area (Mayo, Keno Hill, Elsa, Klondike, Dawson), which provide a long-term database. Historical climatic information of the Project site is available from 1993 to 1996.

The Proponent uses two climate stations to record weather in the Project area. 'Camp Station' is located at the bottom of Dublin Gulch at the camp site and was installed in August 2009. 'Potato Hills Station', a historic data collection site, is situated on Potato Hill at a much higher elevation and was installed in August 2007.

The proposal reports that the mean annual temperature for 2008 was -4.2°C at the Potato Hills Station. The mean July 2008 temperature was 10.4°C and the mean January 2008 temperature was -18.5°C. The maximum recorded temperature on-site (Potato Hills Station) was 26.9°C in July 2009 and the minimum recorded temperature was -36.5°C in January 2009. The recorded temperature range at the site is 63.4°C. The terrain elevation for the Potato Hills Station is approximately 600 m higher than Camp Station. During the period in which the Potato Hills Station and Camp Station collected data simultaneously, the Potato Hills Station reported colder temperatures than the Camp Station for most of the time, as is expected at higher elevations. However, autumn and winter temperature inversions do occur at the site, as expected in mountainous regions.

The estimated mean annual precipitation at the Project site ranges from 389 to 528 mm. The Proponent calculated long-term estimates of precipitation using regional climate data from stations in Mayo, Dawson, Klondike, Elsa, and Keno Hill. Based on the regional and local data, monthly precipitation totals are highest in July and lowest in February. Snowfall begins in late September or October, and continues until May. Based on a regression analysis of regional snowfall data, the estimated mean annual snowfall accumulation is 269 cm at Potato Hills and 190 cm at Camp Station. The largest accumulations occur during the period of November through January. Higher elevations have greater snowpacks. Snow depths are usually deepest in early April with snow persisting into May or June. Lower elevation snow depths are greatest in March with the snow gone by the start of May.

3.2 BIOLOGICAL ENVIRONMENT

As discussed above, the proposed mine site is located in the Yukon Plateau-North Ecoregion. Within this ecoregion the Project site is situated in the Boreal Cordillera Ecozone. All of the Boreal Cordillera Ecozone in Canada occurs in Yukon and covers approximately 12 percent (57 091 km^2) of the territory (Smith et al. 2004).

Vegetation

Vegetation within the ecoregion varies from boreal forest to alpine ecosystems. Land in the vicinity of the Project is characterized by a combination of northern boreal forest and subalpine ridges and plateaus. The forested zone extends to approximately 1 225 m asl. The forested portion of the ecoregion is characterized by a mix of coniferous, mixed-wood, and deciduous patches at various successional stages due to forest fire. A recent fire occurred immediately to the south of Dublin Gulch on the south facing slope above Lynx Creek. Black spruce, white spruce, subalpine fir, Alaska birch, and trembling aspen are found on upland forested sites while balsam poplar is present on fluvial sites. Elevations above 1 225 m asl and up to about 1 400 m asl are characterized by discontinuous, open canopy subalpine-fir dominated forest patches and by shrub-lichen dominated ecosystems. Old growth patches of forest are present within boreal and subalpine elevations of the local watersheds. Elevations above 1 500 m asl are dominated by ecosystems containing a mixture of shrubs, grasses, herbs, mosses and lichens.

Wildlife

The Boreal Cordillera Ecozone provides habitat for a wide range of wildlife species typically associated with the boreal forest. The proposal identified several wildlife species in the Project area including: moose (*Alces alces*), woodland caribou (*Rangifer tarandus caribou*), black bear (*Ursus americanus*), grizzly bear (*Ursus arctos*), wolverine (*Gulo gulo*), grey wolf (*Canis lupus*), red fox (*Vulpes vulpes*), American marten (*Martes americanus*), snowshoe hare (*Lepus americanus*), and red squirrel (*Tamiasciurus hudsonicus*).

Local knowledge and data collected by the Proponent indicate that moose are the most common large mammal in the Project area and have been observed in the widest range of habitat types. Information from Government of Yukon, Department of Environment also indicates that the Project area supports relatively dense moose populations, particularly along the South McQuesten River (YOR #2010-0267-197-1). The area contains high quality habitat for moose during summer, fall rutting, spring calving, and late winter habitat. Moose are known to move out of the lowlands and up into the Potato Hills area around the property in late fall. Moose are recognized as an important species for harvest by NND and are also harvested intensively by licenced hunters.

The proposal suggests that based on the habitat types present in and around the Project area and the large size of bear home ranges, the Project area is likely to support a mix of both grizzly and black bears.

The Project area does not directly overlap with any Wildlife Key Areas as identified by Government of Yukon, Department of Environment. The closest Wildlife Key Areas are for woodland caribou fall rutting and woodland caribou wintering areas approximately 30 to 40 km away.

Within the boreal forest, riparian habitats contain greater ecological diversity than the surrounding forest, providing travel corridors, water resources and critical food resources, especially during periods of drought. Portions of the Project are located within riparian habitat that is relatively rare in the ecozone and is particularly important to many wildlife species.

Birds

Yukon is habitat for resident and migratory bird populations. The proposal indicates that game and raptor species in the Project area could include: spruce grouse (*Canachites Canadensis*), dusky grouse (*Dendragapus obscures*), ruffed grouse (*Bonasa umbellus*), and three species of ptarmigan (*Lagopus sp.*), golden eagle (*Aquila chrysaetos)*, red-tailed hawk (*Buteo jamaicensis*), northern hawk owl (*Surnia ulula*), great gray owl (*Strix nebulosa*) and gyrfalcon (*Falco rusticolus*). A variety of passerine or songbird species are also present. They include dark-eyed junco (*Junco hyemalis*), gray jay (*Perisoreus Canadensis*), tree swallow (*Tachycineta bicolor*), and townsend's solitaire (*Myadestes* *townsendi*). Waterfowl species include trumpeter swan (*Cygnus buccinators*), mallard (*Anas platyrhynchos*), and Canada goose (*Branta Canadensis*). Migratory bird nesting generally occurs between May 1 to July 31 in Yukon. The number of bird species is likely related to the variety of terrain and local habitats found on-site, including riparian and wetland habitats.

Species at Risk

Species may also be present in the Project area that have been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as species of special concern and/or listed as special concern status under the *Species at Risk Act* (Table 5 Potential Species at Risk within Project Area

). A species of special concern is defined as having characteristics that make it particularly sensitive to human activities or natural events.

An endangered species is defined as facing imminent extirpation or extinction. A threatened species is defined as likely to become endangered if no action is taken to reverse factors leading to extirpation or extinction. The *Wildlife Act* identifies specially protected wildlife.

Table 5 Potential Species at Risk within Project Area

Species at Risk	SARA/COSEWIC Listing	Wildlife Act
Grizzly Bear (*Ursus arctos*)	Special Concern	
Woodland Caribou (*Rangifer tarandus caribou*)	Special Concern	
Wolverine (*Gulo gulo*)	Special Concern	
Olive-sided Flycatcher (*Contopus cooperi*)	Threatened	
Common Nighthawk (*Chordeiles minor*)	Threatened	
Rusty Blackbird (*Euphagus carolinus*)	Special Concern	
Peregrine Falcon (*Falco peregrinus anatum/tundrius*)	Special Concern	Specially Protected
Horned Grebe (*Podiceps auritus*)	Special Concern	
Short Eared Owl (*Asio flammeus*)	Special Concern	
Cougar (*Felis concolor*)		Specially Protected
Gyrfalcon (*Falco rusticolus*)		Specially Protected

Species at Risk	SARA/COSEWIC Listing	Wildlife Act
Trumpeter Swan (*Cygnus buccinator*)		Specially Protected

Fish

At least 11 fish species are known to occur in the South McQuesten River watershed: Chinook salmon (*Oncorhynchus tshawytscha*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), longnose sucker (*Catostomus catostomus*), Arctic lamprey (*Lampetra camtschatica*), burbot (*Lota lota*), slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), inconnu (*Stenodus leucichthys*), lake whitefish (*Coregonus clupeaformis*), and rainbow trout (*Oncorhynchus mykiss*) (VIT 2011a). Government of Yukon, Department of Environment has noted that rainbow trout are not present within the river system but rather only present in a stocked lake isolated from the river (YOR #2010-0267-337-1). No freshwater fish species on Schedules 1 or 2 of the *Species at Risk Act* (SARA) are present in the South McQuesten River watershed (Government of Canada 2010). Haggart and Lynx creeks are known to contain five fish species: Chinook salmon, Arctic grayling, round whitefish, burbot, and slimy sculpin (VIT 2011a). Ironrust Creek, Dublin Gulch and Eagle Creek are known to be habitat for Arctic grayling and slimy sculpin (Hallam Knight Piésold 1996f, VIT 2011a).

The Proponent conducted fish studies that collected and mapped watercourse biophysical data and included fish sampling through electro-fishing, minnow trapping, snorkeling surveys, angling and visual observations. The field program for this Project captured five fish species from ten different watercourses. Arctic grayling were captured in nine watercourses and slimy sculpin were captured in seven. Burbot were captured in the South McQuesten River and lower Haggart Creek. Chinook salmon and longnose sucker were observed in the South McQuesten during the July 2009 snorkel survey.

Arctic grayling and slimy sculpin were the only species caught during electro-fishing depletion surveys, which were completed in Ironrust Creek, Haggart Creek, Lynx Creek, and in Dublin Gulch. Both species were present in low densities in these watercourses. The mean catch rate for Arctic grayling at all sites during three electro-fishing sampling programs was 1.6 fish per 100 m^2, and mean catch rate for slimy sculpin for all sites was 2.9 fish per 100 m^2. The majority of Arctic grayling in the Project area are thought to overwinter in the South McQuesten River and migrate into Haggart Creek and its tributaries to rear during summer (Pendray 1983). The summer migration of Arctic grayling into Lynx Creek has been observed to occur during June and early July (Pendray 1983). The documented capture of juvenile Arctic grayling in Haggart Creek during May, at a location 19 km upstream from the South McQuesten River (Pendray 1983), suggests that some Arctic grayling may overwinter in the Haggart Creek watershed. As the majority of Arctic grayling in the study area are thought to overwinter and spawn in the South McQuesten River (Pendray 1983), it appears that Arctic grayling primarily use study area streams as summer rearing habitat. Good to excellent rearing habitat was present at sample sites in the South McQuesten River, Bighorn Creek, Haggart Creek, Haldane Creek, Lynx Creek, Ironrust Creek, and North Star Creek. These sites had abundant complex cover and availability of pool, riffle, and run habitats. The quality of potential rearing habitat provided by fish-bearing streams within the proposed Project footprint (i.e. Dublin Gulch and Eagle Creek) was moderate, primarily due to lack of cover, high stream gradients, or insufficient channel depths.

3.3 Socio-economic Environment

The proposed Project is within the traditional territory of the NND and the nearest communities to the proposed Project are Mayo and Keno City. Mayo has a population of approximately 460 people. NND citizens make up 60 to 70 percent of the Mayo population. The NND are culturally affiliated with the Northern Tutchone people of the Selkirk First Nation and the Little Salmon/Carmacks First Nation. Some members of the NND trace their ancestry to the Gwich'in people to the north and Mackenzie people to the east. The name "Na-Cho Nyak Dun" means "big river people." NND signed their land claims and self-government agreements in 1993. The agreements came into effect in 1995.

It is generally recognized that NND have lived on the land for millennia, using the supply of game animals, fish, birds and vegetation in the area. They travelled their traditional territory throughout the year. The people of the area followed a traditional moiety system of Crow and Wolf. The oral history of the NND reveals early contacts and trade relationships with explorers and traders in the area.

The Project area has been used and inhabited by aboriginal people for thousands of years. Multiple heritage sites document the history of the area. More recently, the Project area has been used by trappers, hunters, outfitters and miners.

Mayo, NND and Keno City have a long history with mining projects in the area including several boom and bust cycles. Today the economy of Mayo is linked to providing services for the people of Mayo and the surrounding area. Government services, including First Nation and territorial administration, provide about one-third of the jobs in the community. Placer mining and mineral exploration provide a non-governmental economic base for the community.

The Dublin Gulch property has a long history of exploration dating back to the 1800s. Approximately 110 000 ounces of placer gold have been mined to date in the Dublin Gulch area. In 1990, the proposed property was proven economical through a feasibility study. However, due to market conditions, the deposit was not advanced towards production at that time. Numerous roads and trails exist in the area as a result of past placer mining and quartz exploration.

The Executive Committee is aware of less than ten other current quartz mining Land Use Permits issued and about a dozen current placer mining land use approvals in the South McQuesten Road and Dublin Gulch area. The area has a long history of mining. Access to the proposed Project is via the existing Silver Trail Highway, the South McQuesten Road and the Haggart Creek Road. These roads are used by local people in the fall for hunting, camping and berry picking and in the spring for Arctic grayling fishing. Placer miners access their claims during summer months via the same roads.

Tourism is a growing sector of the local economy. Accommodation, food services, recreation services (e.g. guiding and outfitting) and retail outlets cater to tourists in the area and provide work for local residents. Tourist attractions in the area include the historical mines around Mayo, Keno and Elsa, the Keno City Mining Museum, and the Binet House Interpretive Centre in Mayo; a restored heritage house containing historic photographs and an extensive geological display. Other tourist activities along the Silver Trail include camping and hiking along a section of the Trans-Canada Trail, hunting and fishing on local lakes and rivers, and other outdoor pursuits.

4.0 CONSIDERATIONS OF ALTERNATIVES

Section 50(2) of YESAA requires a proponent, when preparing their proposal, to consider alternatives to the project, or alternative ways of undertaking or operating the project, that would avoid or minimize any significant adverse environmental or socio-economic effects. Similarly, s. 42(1)(e) of YESAA directs the Executive Committee to consider these matters in the assessment.

4.1 ALTERNATIVE WAYS OF UNDERTAKING THE PROJECT

The Proponent reviewed a number of alternative methods and locations for undertaking the Project based on economic, engineering and environmental evaluations (s. 5.8 of the proposal). The following 12 areas were subject to evaluation:

- production capacity;
- mining method;
- processing method;
- HLF site selection;
- process solution storage;
- cyanide detoxification method;
- HLF detoxification technology;
- waste rock storage area site selection;
- mine accommodation options;
- mine site access road route selection;
- power source selection; and
- transmission line route selection.

This section focuses on the process used to choose locations for mine infrastructure. Section 5.8.2.4 of the proposal describes six alternatives considered for the choice of the HLF location and s. 5.8.2.8 describes four potential alternatives for the location of the waste rock storage areas. The Proponent's response (YOR #2010-0267-207-1) to the information request (YOR #2010-0267-205-1) provides further background.

The primary environmental considerations used by the Proponent for assessing alternative locations for infrastructure were the presence of permafrost (i.e. long-term stability and construction management) and watercourse effects (i.e., the need to realign watercourses and impacts to fish habitat). The Executive Committee notes that the Proponent has addressed potential permafrost-related instability by proposing to remove overburden down to bedrock. The Executive Committee agrees that surface water management, particularly with the Project post-closure, is a primary consideration when assessing alternatives.

The Proponent considered the overall extent of the Project footprint in selecting of potential infrastructure locations. A primary objective identified through the consultation and assessment process was reduction of the disturbance area created by the mine site footprint. The chosen HLF (Ann Gulch) and WRSA (Eagle Pup and Platinum Gulch) locations for the Project reflect the target to reduce the overall disturbance area resulting in decreased environmental effects and favourable economics via a reduction in haulage distance. The Executive Committee agrees that overall footprint size is important but locating all infrastructure within a watershed to simplify the management and potential treatment of contact water is more important.

The following summarizes the alternatives considered for the HLF and WRSA locations and provides rationale for the selection presented in the Proposal.

4.1.1 Heap Leach Facility Location

Criteria used by the Proponent in the assessment of the six alternatives for the Heap Leach Facility (HLF) location included engineering, geotechnical stability, earth work requirements, closure and reclamation efforts required, mining, surface water, groundwater, wildlife habitat, fish habitat, archaeological value, and air quality. Details of the Proponent's alternatives analysis can be found in Section 9 of the Pre-Feasibility Study (Scott Wilson Mining 2010, YOR #2010-0267-209-1).

The options evaluated by the Proponent were:

Option 1 – Cross valley type HLF within Dublin Gulch (lower valley). There is sufficient land space available for the design and there is potential for further expansion in throughput. The valley floor is relatively flat, though it has a small footprint that would make operations in the earlier phase slightly more difficult. Initial construction and later stage operation of the heap are relatively straightforward. The major disadvantage of this site is that it would require a significant diversion of Dublin Gulch, both during mine operation and post closure.

Option 2 – Cross valley type HLF within Dublin Gulch (mid-valley). The site for Option 2 is similar to Option 1, in that it also sits across the valley floor but in the mid part of the Dublin Gulch. It has a similar layout and similar foundation conditions as Option 1. It also requires the diversion of Dublin Gulch. It has no advantages over Option 1 but has a considerable disadvantage of steep northern flanks (significantly steeper than 1:2.5), that will result in increased earthworks to effect suitable conditions for liner construction.

Option 3 – Valley type HLF on Potato Hills within Bawn Boy headwaters. Option 3 was the location selected for the HLF that formed the basis of a previous 1996 feasibility study conducted by New Millennium Mining Ltd. The site is a gently sloping upper valley site with the main part of the pad located on a ridge. The foundation conditions are favourable and unlikely to require special treatment. The main disadvantages are that the site is furthest from the Eagle Zone and has a 500 m difference in elevation which is seen as a significant operational disadvantage. In addition, this site would expand the overall footprint of the Project and increase overall environmental impacts to flora and fauna.

Option 4 – Side valley type HLF on slopes below the Eagle Zone ore deposit. Option 4 is a development of the Option 1 site. It is located away from Dublin Gulch to avoid requirements for a river diversion and is located on the side of the valley with a portion of the facility in Eagle Pup. It is immediately down slope of the Eagle Zone and therefore even closer to the mine than Option 1. The major disadvantage of the site is the significant depth of permafrost within colluvial deposits and tills. Significant earthworks in the toe area are required to accommodate the 20 m bluff in the till and colluvium deposits. In addition, perched groundwater on permafrost could de-stabilize the lined base of the HLF.

Option 5 – Valley type HLF on the granodiorite ridge within Olive Gulch headwaters. Option 5 is similar to Option 3 in that it is also largely located on the granodiorite ridge near the catchment boundary with the in-heap pond located in the upper reaches of Olive Gulch. Its main advantage, compared to Option 3, is that it is closer to the Eagle Zone, however, the slope of the creek and valley walls are steeper which present substantial geotechnical challenges making initial operations slightly more difficult. There is limited space for future expansion.

Option 6 – Valley type HLF in Ann Gulch headwaters. Option 6 is a modification of the Option 1 site. It requires the diversion of Dublin Gulch during operation and post closure but not of the same magnitude as Option 1 as it is located on the side of the valley with the main portion of the HLF in Ann Gulch. Therefore, a shorter section of Dublin Gulch would require diversion and the overall realignment would be to a lesser extent. The natural terrain can be used to minimize earthworks for subsequent lifts of the HLFs. The major advantage over Option 4 is a considerable reduction in the amount of permafrost, minimal potential impact from or to groundwater and a simpler geological profile of the colluvium over bedrock.

The alternatives assessed by the Proponent also considered the following factors:

- mining operations – particularly haulage and access;
- other infrastructure layouts – available area given other infrastructure requirements;
- mineral resources – condemnation requirements and potential for future mineral extraction; and
- environmental – potential effects to surface and ground water, fish habitat, wildlife habitat, air quality as well as archaeological, historical and traditional resources.

The results of the review of the leading three potential HLF sites established a clear site location preference for Option 6 – Ann Gulch. The primary environmental constraints that favour Ann Gulch include less permafrost and impact to watercourses. Warm (i.e. typically 0 to -1° C) discontinuous permafrost is present throughout the Project area, and is preferentially located on north-facing slopes. It occasionally contains excess ground ice, especially on the lower north-facing slopes, and adjacent to Eagle Creek. Ann Gulch is a south-facing slope located on the north side of Dublin Gulch. It contains a low density of discontinuous permafrost pockets that are considerably shallower than the other options not requiring diversion of Dublin Gulch. From a long-term stability perspective, Ann Gulch is favourable compared to the other options. While Option 6 includes the need to realign a portion of Dublin Gulch, the realigned portion is located in lower Dublin Gulch valley that has been severely impacted by historical placer mining. The portion of Dublin Gulch that is proposed to be realigned with this option is not currently located in its natural alignment. Realignment of the watercourse will allow for restoration of the watercourse to a more natural flow path with improved habitat values (VIT 2011a, Appendix 23).

4.1.2 Waste Rock Storage Area Locations

Few economically feasible potential locations for WRSAs were put forward as alternatives by the Proponent. Four locations (Stuttle Gulch, Stewart Gulch, Platinum Gulch, and Eagle Pup) were considered, all within the Dublin Gulch/Haggart Creek sub-drainage basins. Eagle Pup and Platinum Gulch were selected and proposed as WRSAs in the proposal. Evaluation of each site was based on storage capacity, location and geology.

Stuttle Gulch Option – Placing waste rock in Stuttle Gulch would interfere with crushing and conveying operations and so it was not considered further.

Stewart Gulch Option – Stewart Gulch is the farthest from the proposed open pit and therefore, the least economically attractive.

Platinum Gulch Option – While close to the open pit, Platinum Gulch has location and elevation characteristics that result in less than ideal pit design and truck haul route. The Proponent determined that Platinum Gulch is less economically feasible as a primary independent storage area so another location was required either as a replacement or in addition.

Eagle Pup Option – The Proponent considered Eagle Pup advantageous for economic and environmental reasons. It is closer than Stewart Gulch, thereby reducing hauling costs that improves Project economics. In addition, because Eagle Pup is closer to the open pit, the overall extent of disturbance by the mine site footprint is reduced.

Given the above considerations, the selection of Eagle Pup and Platinum Gulch WRSAs reduces the overall environmental effects to the lower Dublin Gulch valley when compared to an alternative area in the Stewart Gulch sub-basin. Therefore, the Eagle Pup site was chosen by the Proponent as the primary waste rock storage area and Platinum Gulch was chosen as a supplementary site.

5.0 SCOPE OF THE ASSESSMENT

The scope of assessment identifies the matters considered in the screening. It is determined by considering the matters set out in s. 42 of YESAA (outlined above in Section 2.5.2). The Executive Committee has employed a valued component based assessment methodology to assess the environmental and socio-economic effects of the Eagle Gold Project.

The Valued Environmental and Socio-economic Components (VESECs) are identified, in part, on views and information submitted during the adequacy review stage and public comment period. In identifying VESECs, the Executive Committee considered comments received during the screening and other technical input.

5.1 CONSIDERATION OF COMMENTS

The Executive Committee solicited comments during the adequacy review stage to determine if there was sufficient information to draft a scope of project and commence the screening. Comments were received from Environment Canada and Government of Yukon. These comments were considered in drafting the Adequacy Review Report which outlined additional information required by the Executive Committee. The Adequacy Review Report outlining additional information required was issued on March 29, 2011. Several issues identified during the adequacy review stage for which additional information was required, included:

- water quality and quantity, including site specific water quality objectives (SSWQO), baseline data and modeling, water quality predictions and management, and water treatment process;
- geochemical characterization and waste rock management;
- cyanide use and management including transportation, handling, storage and use, as well as issues related to health and safety and emergency response;
- mine site infrastructure development;
- Haggart Creek Road design and traffic management;
- mine design and engineering, including geotechnical stability;
- passive treatment systems and cover design for closure; and
- habitat and baseline data for fish and wildlife.

Key concerns were related to water quality discharge from the Project site and the potential effects to the downstream receiving environment. The mine water treatment process and water quality objectives were not clearly defined. There were also questions related to water baseline data, water models developed for the Project, and the overall water management plan. The Proponent provided additional proposal information on May 24, 2011, addressing key issues identified in the adequacy review stage. The Executive Committee determined that sufficient information was provided to commence the screening.

The public comment period on the proposal was from July 21 to August 31, 2011. During this period, comments were received from 13 parties. The Executive Committee also hosted a public meeting in

Mayo on August 24, 2012, where additional comments were received. Comments were received from governments, non-governmental organizations, interested parties and individuals. These comments formed the basis of a request for additional information issued on September 16, 2011. Issues raised during the public comment period which required additional information included:

- water balance in the HLF and excess water storage capacities;
- winter water quality baseline data;
- the procedure used to develop SSWQO;
- how water quality objectives (other than SSWQO) were defined and rationale;
- predicted performance of the passive treatment system and any alternatives considered;
- physical properties and predicted behaviour of ore placed on the HLF (i.e. agglomeration testing);
- pore volume calculations for the HLF and relationship to in-heap pond storage capacity and HLF detoxification;
- geotechnical design basis of mine site infrastructure;
- low-grade ore stockpile location and management;
- ferric sludge storage and management;
- fish migration periods and spawning potential in streams within the Project area;
- update on moose surveys conducted by the Proponent;
- air quality modeling and monitoring; and
- ongoing communications with the outfitter and trapper.

The Proponent provided additional proposal information on December 2, 2011, addressing the issues identified in the public comment period. The Executive Committee determined that sufficient information was provided to enable the preparation of the Draft Screening Report (DSR).

In May 2012 the Proponent submitted additional proposal information in the form of the Supplementary Information Report (SIR). The SIR outlined modifications to components of the Project based on a Feasibility Study prepared by the Proponent. The Executive Committee determined that a number of the modifications were material to the screening, and also determined that to meet the objectives of YESAA, interested persons and members of the public should have an opportunity to provide comments on the proposed modifications. The Executive Committee solicited comments on the additional information submitted and accepted comments over a period from May 14 to June 4, 2012. Comments received formed the basis of a request for additional information issued June 20, 2012. Issues raised during this period included:

- HLF water balance and modeling assumptions and process leach solution management;
- geochemical characterization of new ore and waste rock proposed to be disturbed; and
- suitability of the HLF liner system based on proposed changes.

The Proponent provided additional proposal information on July 26, 2012 addressing the issues identified. There was a considerable amount of additional information provided surrounding the HLF, including water balance and modeling as well as the design and construction of the facility. The Proponent also provided detailed information on the HLF liner system being proposed. The Executive Committee determined that sufficient information was provided to enable the finalization of the DSR. Although the Proponent provided sufficient additional information, key issues still remained and these issues are discussed further in the DSR.

The public comment period on the DSR lasted from September 4 to October 3, 2012. During this period, comments were received from 11 parties including the Proponent. Comments were received from governments, non-governmental organizations, interested parties and individuals. These comments formed the basis of two requests for additional information issued on October 24 and December 17, 2012. Issues raised during the public comment period which required additional information included:

- HLF Water Balance Model (WBM);
- water management;
- HLF in-heap pond freeboard requirements;
- Project compliance related to the Metal Mining Effluent Regulations;
- delineation of permafrost; and
- revised Water Quality Model

The Proponent provided additional proposal information on November 23 and January 25, 2013, addressing the issues identified. There was a considerable amount of additional information provided on the HLF WBM, the site WBM and on-site water management. The Executive Committee determined that sufficient information was provided to enable the finalization of the screening report. Although the Proponent provided sufficient additional information, key issues still remained and these issues are discussed further in the screening report.

A list of submissions provided during all stages of the screening is included in Appendix C and D. These submissions are available for review on the YESAB Online Registry (YOR) located at www.yesab.ca/registry or in paper copy at the YESAB Head Office.

5.2 Consideration of Technical Support

The Executive Committee retained technical experts to review certain aspects of the proposal. Technical input provided by these experts assisted the Executive Committee with the screening.

During the adequacy review stage, technical input was provided in two areas. AMEC Americas Limited was retained to review all aspects of the Project related to the transportation, use, and management of cyanide. The final report provided by AMEC outlined various aspects of the Project which required additional information, as well as possible mitigations (AMEC 2011). Issues identified by AMEC informed the Executive Committee in preparing Adequacy Review Report, and preparation of the DSR and included:

- cyanide purchasing and transportation to the mine site;
- sodium cyanide handling, storage and reconstitution;
- on-site management systems and operating procedures related to cyanide detoxification, water management, cyanide water quality objectives, seepage to groundwater, and spill prevention;
- quality assurance/quality control during construction of cyanide related facilities;
- environmental monitoring plans/programs;
- decommissioning procedures;
- personnel health and safety and overall emergency response;
- training of personnel and dialogue with communities and stakeholders.

EcoMetrix Incorporated was retained to review all aspects of the Project related to mine design and engineering, waste management (i.e. geochemical characterization, waste rock, ore/tailings), and mine site water balance and predicted water quality. The technical memo provided by EcoMetrix outlined various aspects of the Project which required additional information as well as possible mitigations (EcoMetrix 2011).

Issues identified by EcoMetrix informed the Executive Committee in preparing the Adequacy Review Report as well as the DSR and included:

- HLF design basis, management, and detoxification including liner system, design flood event, event ponds, process leach solution management, QA/QC program, and environmental management plans;
- assumptions made to predict water quality source terms from geochemical characterization as well as validation of predictions;
- SSWQO and mine water treatment objectives;
- passive treatment options based on Project characteristics;
- open pit and waste rock storage area (WRSA) management including post-closure cover systems;
- hydrology baseline data and water management including the water balance model and water management plan;
- water quality baseline data and water quality model; and
- fish habitat compensation plan and aquatic receiving environment.

During preparation of the DSR additional technical input was provided in two areas. EcoMetrix was retained to review aspects of the Project related to updated information provided in the SIR. EcoMetrix produced a technical memo and a technical report that outlined key areas of concern and potential adverse effects that may occur as a result of the Project (EcoMetrix 2012a and EcoMetrix

2012b). Additionally, they outlined a number of mitigation measures that should be considered in the DSR. Key issues identified by EcoMetrix included:

- geotechnical design for the HLF, including liner design construction materials;
- geotechnical stability of the Dublin Gulch Diversion Channel (DGDC), HLF and WRSAs;
- water management infrastructure design, including design flood events, peak flow calculations, and emergency spillways;
- water balance model and predictions of downstream effects;
- geochemical characterization of new ore and waste rock proposed to be disturbed;
- predictions of source term concentrations, including use of scale up factors, analog limits, and lack of new geochemical characterization;
- passive treatment system (PTS) development, testing, and monitoring as well as the suitability of PTS in northern climates;
- the procedure used to develop SSWQO; and
- fish habitat compensation plan and aquatic receiving environment.

EcoMetrix was retained to provide further technical input on comments provide on the DSR, review of additional information submitted by the Proponent, and finalizing the Screening Report. Additional technical input was provided in the following areas:

- HLF WBM and site WBM;
- on-site water management; and
- potential mitigation measures.

Mr. John Maissan from Leading Edge Projects was retained to review aspects of the Project related to electricity requirements and the supply of electricity from the Yukon grid. Technical input was provided on the DSR and the final screening report. Issues identified by Leading Edge Projects included:

- stability and capacity of Yukon’s electricity grid;
- increased carbon emissions; and
- electrical rates.

5.3 Consideration of Cyanide

Issues and concerns regarding cyanide transportation, handling, management, use, and detoxification were raised during public comment period, at the public meeting, and by technical experts retained by the Executive Committee. Potential effects related to cyanide have the potential to affect several VESECs and, as a result, are addressed in Section 6.

5.4 Mayo Lake Drawdown

In their comments submitted during the public comment period on the proposal and the DSR, the Yukon Conservation Society (YCS) indicated concern that the Project would result in the drawdown of Mayo Lake to provide power (YOR #2010-0267-201-1 and YOR #2010-0267-341-1). The Project requires up to approximately 20 MW of power which will be supplied by the Yukon Energy Corporation's (YEC) electrical grid. YCS indicates that the Project, as well as other projects and power users, are causing YEC to investigate additional sources of power such as the extra drawdown of Mayo Lake.

The Executive Committee has considered the potential effects related to the use of power from the YEC power grid (Section 14.3.3). These effects include stability and capacity, increased carbon emissions; and effects electrical rates for consumers. However, the Executive Committee has determined that the potential drawdown of Mayo Lake is beyond the scope of assessment for this Project.

It is understood that YEC is currently considering an application to allow for additional drawdown of Mayo Lake. However, this application has not been finalized. The Eagle Gold Project does not require, or make it likely, that YEC will proceed with a proposal to drawdown Mayo Lake. If YEC decides to proceed with an application to drawdown Mayo Lake, an assessment under YESAA will be required and the potential effects related to the drawdown of Mayo Lake will be addressed at that time.

5.5 Valued Environmental and Socio-economic Components

To assess the potential effects of the Project, the Executive Committee identified valued environmental and socio-economic components (VESECs). VESECs were identified using views and information submitted, comments received during the screening, and technical input from experts. To examine the environmental and socio-economic effects of a project, potential adverse effects on these VESECs are assessed. Table 6 sets out the VESECs considered in this assessment and the corresponding sections of the report.

Table 6 Valued Environmental and Socio-economic Components

Values	Section
Cyanide and Other Hazardous Materials	6.0
Hydrology	7.0
Aquatic Ecosystems	8.0
Environmental Quality	9.0
Vegetation	10.0
Wildlife	11.0
Heritage Resources	12.0
Land and Resource Use	13.0
Local Services and Infrastructure	14.0
Health and Safety	15.0
Cultural and Community Well-being	16.0
Security and Bonding	17.0

PART II EFFECTS ASSESSMENT

This Part presents the Executive Committee's assessment of environmental and socio-economic effects related to the Eagle Gold Project. For each VESEC identified in Table 6, an overview of the VESEC is provided, followed by the analysis of project effects and cumulative effects on the component. Where effects have been determined to be significant and adverse, the Executive Committee has recommended terms and conditions to mitigate (i.e. eliminate, reduce, or control) those adverse effects.

6.0 CYANIDE AND OTHER HAZARDOUS MATERIALS

This section addresses potential effects of the Project due to the use of cyanide and other hazardous materials on several VESECs including aquatic ecosystem, health and safety, vegetation, wildlife, and environmental quality. Potential effects related to uncontrolled release of cyanide and other hazardous materials are considered. The Executive Committee has determined that the Project will result in significant adverse effects due to the use of cyanide and other hazardous materials. However, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee. The following sections provide a rationale for this determination.

6.1 OVERVIEW

The Project is proposing to heap leach ore for gold using a sodium cyanide (NaCN) solution. Potential effects related to cyanide mismanagement or accidental releases were frequent concerns raised during the screening. Effects on multiple VESECs are being considered in one section because:

- potential effects related to cyanide affects all the VESECs through the same pathway (i.e. exposure to cyanide and/or its chemical derivatives is acutely toxic); and
- the mitigations to decrease the significance of potential exposure to cyanide to each value are all similar. All mitigations relate to the proper use, management and control of cyanide as well as emergency response if a cyanide accident was to occur.

Potential adverse effects related to cyanide could occur anywhere cyanide and cyanide chemical derivatives are being transported, handled, stored or used. The acute toxicity of cyanide depends on the form of cyanide or cyanide complex, the amount or concentration of the cyanide, the type of exposure, as well as the VESEC exposed to the cyanide (i.e. the receptor).

6.1.1 Cyanide Chemistry and Toxicity

Cyanide is a reactive compound with complex chemistry. In the environment, cyanide is often present in several different forms. The specific form of cyanide that occurs in a particular solution is determined by solution chemistry, especially pH, as well as temperature and pressure. It is important to understand the different forms of cyanide as they can have very different toxicities. The different forms of cyanide are represented in Figure 6.

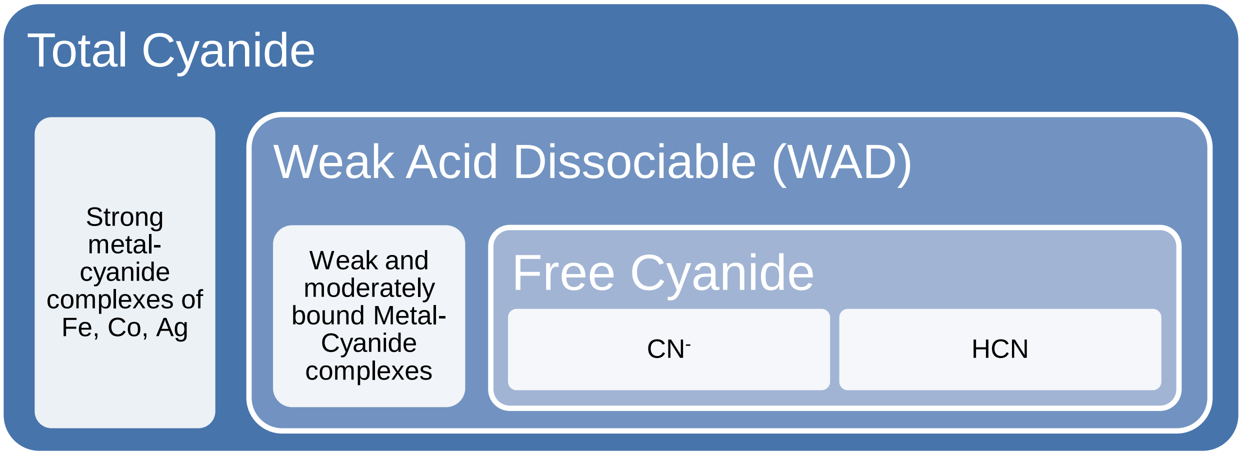

Figure 6 Forms of Cyanide

Total cyanide refers to all of the cyanide compounds in a solution (Smith and Mudder 1991). Total cyanide includes the least toxic groups of cyanide compounds, which are the stable strong metal-cyanide complexes. For example, iron cyanide complexes are very stable and essentially non-toxic. Total cyanide is not a very good measure of solution toxicity.

Weak acid dissociable (WAD) cyanide includes both the weak and moderately strong complexes of cyanide and free cyanide. WAD cyanide is very common when cyanide is dissolved in water. The pH or acidity of the solution is the most important determinant of whether the cyanide is present in weak or moderately strong metal complexes or as free cyanide. Weak or moderately strong bound cyanide is more common when the solution is more alkaline (i.e. basic). If the solution becomes increasingly acidic and reaches a pH of about 4.5, the bound cyanides will convert to free cyanide. WAD cyanide is the recognized form of cyanide when measuring for monitoring purposes as the level of WAD cyanide in a solution can provide a good indication of its toxicity, which may be useful in determining potential effects (Australian Government 2008).

Of greatest concern is free cyanide as it includes the least stable and most toxic forms of cyanide. Free cyanide is composed of cyanide ions (CN-) and hydrogen cyanide (HCN). Depending on the pH of the solution, the cyanide will tend to either stay in solution as CN- or form HCN gas and evaporate out of the solution. HCN is a gas at room temperature making it more difficult to control, easier to inhale and more dangerous. In an alkaline solution, above a pH of around 9.2, the main form of free cyanide is CN-, which will stay in solution. In a neutral to acidic solution, at or below a pH of around 7.0, CN- converts to HCN gas and will evaporate out the solution. Minimizing the creation of HCN gas, particularly in confined environments, is important because relatively low concentrations of HCN are toxic to humans.

Cyanide does not bioaccumulate and because of its reactivity is not persistent in the environment. Unlike some other chemical compounds (e.g. heavy diesel fuel, arsenic, cadmium) the high reactivity of cyanide that makes it acutely toxic also results in it breaking down into less toxic forms relatively quickly if released into the environment (i.e. exposed to air, water or sunlight). Examples from tailings impoundments show a 50 percent reduction in total cyanide in less than three weeks and a near-total elimination of cyanide in less than 100 days (Schmidt et al. 1981). Since cyanide naturally attenuates and degrades and can be readily treated, concerns with cyanide are focused on conditions that could result in acute toxicity.

6.1.2 Cyanide and Humans

Cyanide is generally considered acutely toxic (i.e. toxic with a short-term, high-dose exposure) rather than chronically toxic (i.e. toxic with long-term, low-dose exposure). Small doses of cyanide are quickly detoxified in the human liver to produce a compound called thiocyanate that is less toxic and is then excreted in urine over a period of several days. Increased concentrations of thiocyanate due to chronic cyanide exposure may result in adverse effects to the thyroid. Small doses are not known to cause birth defects, cancer, or other effects to humans.

Cyanide poisoning in humans can occur through inhalation, ingestion, and absorption through skin or eye contact. In toxic doses, cyanide is a relatively fast acting poison. Cyanide causes tissue hypoxia and cyanosis (i.e. bluish discoloration of skin) by binding to key iron-containing enzymes required by cells to use oxygen (Logsdon et al. 1999). Essentially, when cyanide is ingested, it causes oxygen starvation and suffocation even if oxygen is available. The respiratory system cannot provide oxygen to cells and, if untreated, will lead to death. The lethal dose of cyanide ranges from 50 mg to 200 mg (1 mg to 3 mg per kg body weight) when ingested or inhaled. When absorbed through the skin, the lethal dosage is about 100 mg per kg body weight. HCN is the most toxic form of cyanide to humans. Effects of cyanide poisoning may occur when exposed to concentrations of 20 to 40 ppm of HCN while death occurs within minutes at concentrations around 250 ppm or greater.

6.1.3 Cyanide and Aquatic Life

In general, cyanide is acutely toxic to fish and other aquatic life even in small concentrations. Aquatic life are killed by cyanide concentrations in the microgram per litre range (parts per billion), whereas bird and mammal deaths result from cyanide concentrations in the milligram per litre range (parts per million).

Freshwater fish are generally the most cyanide-sensitive group of aquatic organisms. High mortality in fish has been documented at WAD cyanide concentrations >20 µg/L and adverse effects on swimming and reproduction at >5 µg/L (Eisler and Wiemeyer 2004, Logsdon et al. 1999). During toxicity testing in the laboratory, some fish species have 24-hour LC_{50} concentrations (i.e. concentrations at which 50 percent of the individuals die) as low as 40 µg/L WAD cyanide (Australian Government 2008) Some tolerance in fish to low concentrations of WAD cyanide has been observed both in the field and in the laboratory. As such, additional research on the long-term effects of low-level cyanide on aquatic biota has been identified as a research priority (Eisler and Wiemeyer 2004).

In fish, cyanide affects organs where gas exchange occurs; that is, principally the gills and the surface of egg capsules. The Mineral Policy Center (1998) list factors that affect cyanide toxicity in fish as follows:

- Cyanide concentration: Toxicity increases with higher concentrations of cyanide.
- Oxygen concentration: Cyanide toxicity increases with any reduction in dissolved oxygen below 100 percent.
- Temperature: Toxicity increases three-fold with a 12°C decrease in temperature.

- pH: Slight decrease in toxicity at pH above about 8.5 due to conversion to CN-.
- Chloride: Greater than about 8.8 parts per thousand of chloride decreases survival time.
- Other dissolved constituents: The presence of zinc and ammonia results in a greater-than additive increase in toxicity.
- Other factors: Toxicity will also depend on the age and health of the fish, the amounts of water ingested, and the stress level on the animal.

Aquatic insects, other invertebrates, algae, aquatic plants, have shown moderately more tolerance to WAD cyanide. LC_{50} values for aquatic invertebrates range upwards from around 90 µg/L at ambient temperatures. Aquatic plants show effects at water concentrations from 30 µg/L to several milligrams per litre (Australian Government 2008).

Aquatic life are also more vulnerable than animals and birds to cyanide releases as they are much more limited in their ability to avoid water containing toxic concentrations of WAD cyanide.

6.1.4 Cyanide and Animals and Birds

The principal concern for animals and birds is the ingestion of cyanide. Livestock have been poisoned by consuming forage high in cyanide compounds, but the primary concern is the ingestion of WAD cyanide in water. Unless terrestrial wildlife is drinking from affected surface water, the wildlife is generally not at high risk from cyanide toxicity. For this reason terrestrial wildlife is generally less of a concern and the focus is generally on migratory waterfowl.

Waterfowl often travel in flocks and are looking to use water bodies for staging/feeding/resting areas during their migrations. In the early 1990s thousands of waterfowl, particularly ducks, were killed by WAD cyanide in mining solution storage ponds in Nevada, USA. Since controls were implemented limiting the WAD cyanide concentrations in uncovered ponds to <50 ppm waterfowl deaths have dropped by over 80 percent. Less than 50 ppm of WAD cyanide is not acutely toxic to ducks, which have been shown to be very sensitive to cyanide as compared with other waterfowl and wildlife (Logsdon et al. 1999). Bats have also been shown to be vulnerable to WAD cyanide toxicity.

Exclusion from cyanide solutions or reductions of cyanide concentrations to nontoxic levels are the only certain methods of protecting terrestrial vertebrate wildlife from cyanide poisoning (Eisler and Wiemeyer 2004).

6.1.5 Cyanide and Vegetation

Many plants are known to produce cyanide compounds and some plant species have been shown to metabolize cyanide (EPA 1978). Plants growing in riparian and terrestrial environments with elevated cyanide do not consistently reflect the higher cyanide concentrations of their environment (e.g. Howe and Noble 1985). The major effect of cyanide on plants is the inhibition of respiration which can lead to reduced plant health.

The relationship between cyanide availability and plant uptake is not well understood. This is largely due to the lack of understanding of cyanide chemistry, mobility and availability in soils. In general, plants can tolerate relatively high concentrations of cyanide.

6.1.6 Experience with Cyanide at Other Mines

Cyanide has been used to extract gold from ore in mines around the world. About 80 percent of the annual global gold production uses cyanide (Australian Government 2008). Where there has been cyanide mismanagement or accidents, cyanide toxicity has resulted in the death of humans, fish, aquatic life and birds.

Lessons have been learned about effective and safe cyanide management practices at previous mining projects.

Brewery Creek, Yukon Territory, Canada

Brewery Creek was a producing open pit, heap leach gold mining operation located in the northwestern region of Yukon. A total of 278 484 ounces of gold was produced from seven near-surface oxide deposits along the property's Reserve Trend from 1996 through 2002.

Open pit mining was carried out each year on a seasonal basis from early April through early November. Between 1.4 and 2.6 million tonnes of ore were placed on the leach pad in this timeframe. Active leaching was carried out year-round.

The mine facility consisted of a large permanent HLF, an adsorption, desorption and gold recovery (ADR) facility, process and overflow ponds and ancillary facilities, including a power plant, water supply systems, mine service buildings and an assay laboratory.

The leach pad was divided in seven discrete cells. Although the pad capacity was expandable, it ultimately provided space to accommodate 18 million tonnes of stacked, run-of-mine ore. A multiple-layer liner system was installed under the heap to collect process solution and direct it to the recovery plant, as well as prevent leakage to the environment. The possible loss of solution to the ponds and subsequent freezing of the drip-emitter system during an equipment failure was of prime concern because of the severe winter conditions. The following features were incorporated into the design to prevent this freezing:

- emitters were placed into the surface to act as an insulator;
- all outside piping was insulated and heat traced;
- waste heat from diesel generator engine was used to heat the outgoing barren solutions; and
- a waste oil fired heat exchanger was used to heat circulating solutions.

Ore processing employed a sodium-cyanide heap leach on run-of-mine gold ore. Gold recovery from pregnant leach solutions was by activated carbon adsorption and pressurized caustic solution desorption, followed by electrowinning onto steel wool and on-site smelting to gold bullion.

In September 2000, Brewery Creek Mine ceased active mining operation and no additional ore was added to the heap leach. Active cyanide leaching continued until December 2001. Mine reclamation began shortly after the mine closed in 2002. Approximately 300 hectares of land was disturbed during the life of the mine.

Post-mining reclamation was extensive. In 2002, the detoxification and drain-down of the heap inventory solution was completed. A majority of the mine and reclamation activities related to re-vegetation of pits, dump and mine site roads has also been completed. The facilities and mine were placed on care and maintenance in the winter of 2002-2003. Reclamation of the property was successfully completed at the end of 2007.

Fort Knox, Alaska, USA

The Fort Knox Gold Mine is an open pit gold mine within the Fairbanks mining district in Alaska. The area has a sub-Arctic climate with long cold winters and short summers.

Mining is carried out on a year-round basis, seven days a week. Production from Fort Knox is up to 45 000 tonnes per day of low grade ore, using two mineral processing technologies (carbon-in-pulp milling for higher grade ore and heap leaching for lower grade ore). Production from the heap leach began in late 2009.

On May 4, 2010, the failure of the automated process control system resulted in a release of an estimated 1 388 000 L of cyanide-containing process leach solution. Approximately 1 251 000 L remained within the building, while the remaining 137 000 L spilled onto the gravel roadway and parking area. Pumps were used to recover process fluids from within the secondary containment of the building. These fluids were returned to the mill for re-use. Contaminated soils and gravels were removed and placed on the lined HLF for processing. "*The process water contained a low concentration of sodium cyanide at a controlled pH, and did not present an inhalation hazard to responders according to mine officials and environmental consultants"* (ADEC 2010). ADEC reported no injuries or deaths resulting from the incident and no resulting environmental contamination.

On August 23, 2012 a bulldozer riper blade accidently damaged a buried leach solution pipe that was conveying barren leach solution up to the heap. Approximately 205 000 L of leach solution containing cyanide was spilled on the mine access road (ADEC 2012). Pumps were shut off and contaminated soils were trucked to the HLF. Much of the spill was over the lined area of the HLF. The Alaska Department of Environmental Conservation reported no injuries or deaths resulting from the incident and Fairbanks Mining Inc. will be providing ADEC with a sampling and analysis plan for their review and approval.

Cyanide Accidents

Where mines have not contained, managed or responded to an uncontrolled release of cyanide, the toxic effects of these releases have affected surrounding values. Examples of several failures to control cyanide in mining are listed below in Table 7.

Table 7 Major Recent Incidents Involving Cyanide (From Australian Government 2008)

Major recent incidents involving cyanide
In May 1998, loss of 1800 kg of NaCN to the Barskaun River, Kyrgyzstan, followed a truck accident en route to the Kumtor mine.
In 1995, thousands of migratory and non-migratory waterbirds were killed at the tailings dam of the Northparkes mine, NSW, Australia, due to a po.or understanding of the significance cyanide chemistry and inappropriate analytical procedures
In 2000 the tailings impoundment at Baia Mare, Romania, was breached, releasing a cyanide plume which travelled for 2000 kilometres downstream, killing very large numbers of fish in the Tisza and Danube rivers, and disrupting the water supply. Excessive treatment of cyanide with hypochlorite and chlorine exacerbated the problem.
A pallet of dry cyanide product which fell from a helicopter en route to the Tolukuma gold mine in Papua New Guinea in 2000 was successfully cleaned up.
Cyanide solution from an incompletely discharged ISO-tainer was allegedly released on the roadside after a delivery truck left a mine in the Northern Territory in 2002.
Due to confusion over the number of valves in the cyanide plant at the San Andres mine, Honduras, 1200 litres of cyanide solution was discharged into the Lara River in January 2002.
Water contaminated with cyanide entered the Asuman River from the Tarkwa gold mine in the Wassa West District of Ghana in October 2001, killing fish and disrupting local water supplies. Another discharge into the river from a ventilation shaft in January 2003 rekindled community health and safety concerns, although this water was later shown to be potable.
In February 2007, a road train carrying three 20-tonne containers of solid sodium cyanide in the Northern Territory tipped over, spilling pellets onto the side of the road and into a non-flowing watercourse. Most spilled product was collected, and contaminated water and soil were cleaned up and disposed of at a nearby mine site.

Key Issue

The Proponent proposes to maintain control over cyanide during all phases of the Project. The key issue is the uncontrolled release of cyanide or cyanide chemical derivatives during Project activities resulting in toxic exposure to VESECs (aquatic ecosystems, wildlife and wildlife habitat, and health and safety).

6.2 Evaluation of Baseline Information

Soil, water and air testing at the mine site by the Proponent demonstrated that background cyanide concentrations are very low and at times below detection limits. The Proponent reports in the proposal that “More than 90% of [water] samples analyzed for cyanide (total and weak acid dissociation) had levels below the analytical detection limit” (VIT 2011a, Appendix 16, Environmental Baseline Report: Water Quality and Aquatic Biota).

The Proponent proposes to manage cyanide so as not to expose receptors to toxic concentrations. Cyanide breaks down relatively quickly in the environment so VESECs close to where cyanide is being transported, stored, used or disposed of by the Project are at greatest risk. For the purposes of this assessment, the Executive Committee considered activities associated with the Project potentially affected by cyanide release including:

- personnel or visitors at the mine site;
- land users in the vicinity of the mine site;
- water users of Haggart Creek downstream of the mine site;
- personnel and others along the transportation route to the mine site (i.e. the Silver Trail, SMR and HCR);
- fish and aquatic life downstream and down gradient of the mine site (i.e. in Dublin Gulch, Haggart Creek, South McQuesten River);
- fish and aquatic life along the transportation route to the mine site (i.e. Yukon River, Pelly River, Stewart River, South McQuesten River, Haggart Creek); and
- birds and wildlife in the vicinity of the mine site.

Project Transportation of Cyanide

The Project requires almost 6 000 kg of NaCN a day. The Proponent has indicated that dry compacted briquettes of NaCN will be trucked to the mine site. The briquettes will be packaged in sealed bulk bags (i.e. super sacs) to protect the NaCN from moisture and then in wooden boxes. To ensure safe transportation, NaCN containers will be standard weights with blocking and bracing. The Proponent has indicated that a pilot vehicle and/or convoys will be used to escort trucks carrying NaCN when deemed necessary by a risk assessment. For example, pilot vehicle and/or conveys may be used during inclement weather.

Project Management and Use of Cyanide

Gold extraction by the Project will utilize cyanide heap leaching technology. NaCN is proposed to be the source of cyanide for the Project. NaCN briquettes will arrive at the mine site in trucks where the NaCN will be moved and stored in the adsorption, desorption, and recovery (ADR) facility. All chemicals at the mine site, except for lime and cement, will be stored inside the ADR building on concrete slabs. Concrete berms will be used to separate each of the chemical storage areas to prevent interactions and maintain a minimum of 110 percent containment in the event of a spill. Lime and cement will be stored in silos outdoors. Storage requirements in the ADR building are reproduced from the proposal in Table 8.

Table 8 Reagent Storage Requirements

Item	Packaging	Daily Consumption	Recommended Minimum Storage
Sodium Cyanide	1 000 kg Bulk Bags Packed in Plywood Boxes	5 859 kg	2 weeks
Sodium Hydroxide	25 kg Bags	90 kg	2 weeks
Hydrochloric Acid (32%)	200 L Drums, or 1 m^3 Totes	454 L	2 weeks
Antiscalant, Leach	1 m^3 Totes	308 L	2 weeks
Antiscalant, Strip	200 L Drums	1.20 L	2 weeks
Lime (CaO)	Up to 24 t in Pneumatic Trucks	24 t	60 t
Cement [1]	20 to 30 t in Pneumatic Trucks	24 t	60 t
Fluxes	50 kg Bags	NA [2]	1 pallet
Hydrogen Peroxide (50%)	19 m^3 (5,000 gal) Tanker Truck	NA [2]	1 truckload
Copper Sulfate (Pentahydrate)	50 kg Bags	NA [2]	1 pallet

NOTES:

[1] *Only required in first two years of operations*

[2] *Daily consumption varies, as required*

To create the process leach solution, the NaCN will be mixed with water in the ADR building. The process solution will then be pumped up to drip-emitters buried in the heap for application to the ore. The Proponent has indicated that sprinklers may be used to apply NaCN during late spring and summer. This would allow the Proponent to use evaporation as a measure to maintain the water balance.

After percolating down through the heap, the leach solution containing dissolved gold (pregnant leach solution, PLS) will be directed by liner(s) and pipes to a solution collection system. The Proponent has provided details and rationale for the liner design (VIT 2012b). The PLS will then be pumped to the ADR for processing and gold recovery. The barren leach solution will be reconditioned and reapplied to the heap.

In addition to in-heap storage, process solution can be temporarily stored in two lined ponds. Each pond has a leak detection and recovery system. The Proponent proposes that any excess process solution during operations or produced during rinsing of the heap will be conveyed to the cyanide detoxification plant prior to treatment in the mine water treatment plant. This will enable efficient destruction of residual cyanide and prevent release of it to the environment.

6.3 EFFECTS RELATED TO USE OF CYANIDE AND OTHER HAZARDOUS MATERIALS

The Executive Committee retained AMEC Americas Limited to provide specific technical input on cyanide use and management during the adequacy review and screening on this Project (YOR #2010-0267-068-1). The following sections address potential effects identified by the Executive Committee with input from AMEC Americas Limited.

6.3.1 Consideration of the Cyanide Code

The Executive Committee received comments from various parties regarding the "International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold" (Cyanide Code). The Selkirk Renewable Resources Council (YOR #2010-0267-181-1), Mayo Renewable Resources Council (YOR #2010-0267-196-1), Yukon Conservation Society (YOR #2010-0267-341-1), and NND (YOR #2010-0267-346-1) all recommended that the Proponent become a signatory to the Cyanide Code to reduce potential effects associated with the management and transportation of cyanide. The public posed further questions during the public meeting held in Mayo on August 24, 2011, as to why the Proponent has not become a signatory to the Cyanide Code and if YESAB would make it a recommendation.

The Cyanide Code was developed by a multi-stakeholder steering committee under the United Nations Environmental Program (UNEP) and International Council on Metals and the Environment (ICME) and officially launched in 2002. Support for the Cyanide Code comes not only from the gold mining industry, (including eight of the ten largest mining companies, many smaller operations and the World Gold Council), but also from important multilateral organizations and nation-states. For example, the G8 nations endorse the ICMC as a certification system "for increasing transparency and good governance in the extraction and processing of mineral raw materials and to reduce environmental impacts" (Solidaridad 2011). Environment Canada recommends that the transportation, storage, use, and disposal of cyanide and cyanide-related materials be done "in a manner consistent with practices described in the International Cyanide Management Code." (Solidaridad 2011)

The Cyanide Code is a voluntary program for companies engaged in the production of gold using cyanide, as well as manufacturers and transporters of cyanide used at gold mines. It aims to provide comprehensive guidance for best practice in the use and management of cyanide in gold mining. The Code is performance based and requires that mine sites be certified in compliance through periodic, independent, third-party audits by certified auditors.

The Cyanide Code's nine principles and standards of practice include:

- Production: Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.
- Transportation: Protect communities and the environment during cyanide transport.

- Handling and Storage: Protect personnel and the environment during cyanide handling and storage.
- Operations: Manage cyanide process solutions and waste streams to protect human health and the environment.
- Decommissioning: Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.
- Personnel Safety: Protect personnel health and safety from exposure to cyanide.
- Emergency Response: Protect communities and the environment through the development of emergency response strategies and capabilities.
- Training: Train personnel and emergency response personnel to manage cyanide in a safe and environmentally protective manner.
- Dialogue: Engage in public consultation and disclosure.

The Proponent has not committed to becoming a signatory to the Cyanide Code although the Proponent has indicated "VIT is committed to following the Code's Principles and implementing its Standards of Practice." (VIT 2011a, Appendix 30). As a result, the Project will not be required to undergo auditing of its operations by an independent third-party auditor to maintain Cyanide Code certification.

Audits under the Cyanide Code allow for thorough and transparent verification of a mine's cyanide management system. Independent Code-certified auditors review cyanide management using verification protocols set out in the Cyanide Code. Summary audit reports and any resultant Corrective Action Plans are available to the public on the Cyanide Code website.

An independent third-party audit would increase confidence that the Project's cyanide management systems represent industry best practices and that the cyanide management systems are being properly implemented to minimize cyanide-related accidents and releases. Third-party auditing, as required under the Cyanide Code would further increase the confidence of the Executive Committee, and others, that the likelihood, frequency and magnitude of cyanide accidents related to the project would decrease.

The Executive Committee strongly encourages the Proponent to become a signatory to the Cyanide Code. Alternatively, the Proponent should adopt independent third-party auditing and reporting consistent with the Cyanide Code.

The Proponent has committed to following the Cyanide Code's nine principles and implementing its standards of practice. The Executive Committee is of the view that if these aspects of the Cyanide Code are properly implemented along with additional industry best practices, the Project will not have significant adverse effects related to cyanide management.

6.3.2 Cyanide Use and Human Health and Safety at the Mine Site

The potential effects to human health and safety associated with the use and management of cyanide are examined in this section. Uncontrolled releases of cyanide may occur due to accidents, malfunctions, and/or poor management practices during storage, handling, and use on-site. If cyanide is improperly managed on-site, Project personnel or visitors may be exposed to cyanide or its chemical derivatives.

The likelihood of exposure of personnel or visitors to the mine site to toxic levels of HCN is low. However, the effects related to HCN exposure are potentially fatal.

The unloading and mixing process for NaCN is a key part of the on-site management of NaCN. On-site spills to the environment or personnel exposure can occur while moving the NaCN briquettes from the vehicles used to transport the solid cyanide to the storage area, in the process for mixing the solid cyanide with water in the NaCN mix tank and at the liquid NaCN storage tank. In addition, solid cyanide needs to be stored to prevent contact with water and possible release of hydrogen cyanide (HCN) gas. Accidental release of cyanide may also occur if storage, containment, and other cyanide related facilities are not adequately constructed and maintained.

Inhalation of HCN gas is the pathway by which Project personnel or others could be exposed to toxic amounts of cyanide at the mine site. It is critical for human health and safety at the mine site that the Proponent minimizes the generation of HCN gas and that the mine site has appropriate detectors and alarms if HCN gas is produced. HCN is the most toxic form of cyanide to humans. Effects of cyanide poisoning may occur when there is exposure to concentrations of 20 to 40 ppm of HCN, while death occurs within minutes at concentrations around 250 ppm or greater.

Dry NaCN is relatively stable, but when exposed to water will form more reactive WAD cyanide (CN- and HCN). It is important that NaCN in storage is kept dry. NaCN is mixed with water to form the leach solution. HCN will evolve out of the leach solution if the pH of the solution approaches neutrality or acidity (see section above on “Cyanide Chemistry and Toxicity”). Maintaining and managing the pH of a solution is common practice in mining and industrial applications (e.g. precipitating metals out of acidic mine effluent). The primary method of controlling cyanide exposure to humans on-site is to avoid producing HCN.

If HCN is produced, detectors and alarms on-site and on personnel, should immediately inform personnel so they can respond to the risk. Designing project infrastructure with passive and active venting can evacuate HCN to the atmosphere and decrease the likelihood of HCN reaching toxic levels.

The Proponent has committed to implement Cyanide Management and Emergency Response Plans to direct the actions of personnel if HCN is detected. Cyanide antidote kits, as well as first aid supplies and communications equipment at the ADR building, and other locations at the mine site, would support immediate response to personnel experiencing cyanide toxicity.

A publication issued by the Australian Government (2008) states:

> *“Despite its high human toxicity, there have been no documented accidental human deaths due to cyanide poisoning in the Australian and North American mining industries over the past 100 years which indicates that the hazard of cyanide to humans has been controlled by minimising the risk of its handling and of industrial exposure.”*

The Executive Committee recognizes the commitments made by the Proponent to minimizing cyanide-related risks to personnel and visitors. The Proponent has committed to following the nine principles and implementing the standards of practice from the Cyanide Code. The Executive Committee has determined that if these aspects of the Cyanide Code (see Section 6.3.1) are properly implemented, along with additional industry best practices, and mitigative measures recommended in this screening, the Project will not have significant adverse effects from cyanide related to human health and safety at the mine site.

6.3.3 Cyanide Effects on Adjacent Land and Water Users

Controls on cyanide at the mine site are expected to decrease the likelihood, frequency and magnitude of potential effects of cyanide to nearby users. The reactivity and natural attenuation of cyanide are expected to result in cyanide breaking down relatively quickly in the environment with no significant chronic or acute toxic cyanide exposure expected to adjacent land users.

A cyanide release into Haggart Creek would carry WAD cyanide downstream. Depending on the amount of cyanide released and the flow of Haggart Creek it is conceivable that water users downstream could come into contact with water containing toxic levels of WAD cyanide. Immediate notification of downstream users in the event of an uncontrolled release of cyanide into any of the local streams would decrease the likelihood of downstream users contacting or ingesting water containing WAD cyanide. The Executive Committee is not aware of any users, immediately downstream of the Project, who use Haggart Creek as a source of potable water. In the event of a release, signage and notices should be posted along the reaches of streams affected until the concentrations of WAD cyanide have decreased to acceptable levels.

The Executive Committee has determined that if the standards of practice set out in the Cyanide Code and the mitigative measures recommended in this screening are implemented, the Project will not have significant adverse effects from cyanide related to the health and safety of adjacent land and water users.

6.3.4 Cyanide Effects on Humans and Aquatic Ecosystems During Transportation

Transportation of cyanide is one of the higher risk elements of the cyanide supply chain. Of eight major incidents involving cyanide releases from mining activity, three were associated with the transportation of cyanide to or from a mining operation (Australian Government 2008). Most of the accidental releases of cyanide related to mining in Australia have been during transportation (Australian Government 2008). Accidental release or spills of cyanide may occur due to traffic accidents, malfunctions of transportation equipment, and/or poor shipping and containment practices. The magnitude and extent of potential effects will vary based on several factors including the amount of cyanide released, the location (i.e. in water or on land), and the environmental conditions (i.e. seasons and current weather).

A cyanide release during transportation could affect aquatic ecosystems and human health and safety at locations distant from the mine site. Identification of risks related to cyanide release along the transportation route and proper planning will minimize the likelihood and frequency of cyanide releases due to traffic accidents. The Executive Committee notes, however, these risks cannot be eliminated. Regardless of the level of preparation and training, accidents do occur due to human error, mechanical failure, and environmental factors. The Proponent has committed to several cyanide-specific measures to prevent vehicle accidents and spills during the transportation of cyanide for the Project including:

- cyanide briquettes will be packaged in sealed bulk bags (i.e. super sacs) to protect the NaCN from moisture and then in wooden boxes. NaCN containers will be standard weights with blocking and bracing;

- a pilot vehicle and/or conveys will be used to lead cyanide shipments when deemed necessary by a risk assessment;
- cyanide shipments will be tracked using GPS;
- a certified cyanide transporter will be used and appropriate driver training, radio contact capabilities, vehicle maintenance, and emergency clean-up kits will be ensured; and
- a Cyanide Transportation Management Plan will be developed as part of the Environmental Management Plans (VIT 2011a, Appendix 30) outlining contractor responsibilities, emergency response procedures, and training requirements.

Responding to cyanide accidents during transportation is more difficult than at the mine site because immediate spill responders do not have the emergency response equipment and environmental controls that would be available at the mine site. Furthermore, off-site, it is more difficult for the Proponent to keep people, and other receptors, away from the spill location to minimize exposure to cyanide and its chemical derivatives.

In the event of a cyanide spill during transportation, notification to responders and people potentially directly affected by a cyanide spill is the immediate priority. Containment of the spill is the first physical priority, in conjunction with notifications, to decrease exposure of receptors to the cyanide. Attempts to chemically treat cyanide once it has been released to the environment (especially in water) are generally not effective and can result in additional harmful environmental effects (Mudder and Botz 2001).

The Executive Committee has determined that adherence to the standards of practice set out in the Cyanide Code, compliance with non-discretionary legislation (e.g. *Transportation of Dangerous Goods Act*) and implementation of mitigation measures proposed by the Proponent and the mitigative measures recommended in this screening, the Project will not have significant adverse effects on humans or aquatic ecosystem due to cyanide transportation.

6.3.5 Cyanide Effects on Aquatic Ecosystems

The Project will require the diversion of Dublin Gulch and is located immediately upgradient of Haggart Creek. The proximity of the Project to surface water increases the risk that cyanide could be introduced into surrounding streams. Fish and other aquatic life are much more susceptible to cyanide toxicity than terrestrial biota.

The most likely source of cyanide to surface waters around the mine site would be a release of cyanide process leach solution. A release of leach solution could be due to solution storage being exceeded, HLF or event pond liner failure, solution conveyance (i.e. pumps and pipes) failure, cyanide destruction plant failure or human error. Effects of cyanide on aquatic ecosystems resulting from solution storage exceedance and cyanide detoxification plant failure are considered in Section 8.4.7 of this report.

The Executive Committee notes that the cyanide management procedures in place to protect personnel at the mine site will also decrease the likelihood, frequency and magnitude of cyanide releases to adjacent surface water. These cyanide management procedures in turn reduce the potential for effects to aquatic ecosystems.

The Proponent has described the rationale behind the liner design of the HLF and event ponds. Liner performance is influenced by both design and construction. Quality assurance and quality control during construction is key to maximizing liner performance of the in-heap and event ponds solution storage areas.

6.3.5.1 Heap Leach Facility Liner System

The HLF requires an engineered liner system to manage and contain process leach solution containing cyanide. The liner system is the most important piece of containment infrastructure to ensure that process leach solution does not leak out of the HLF and contaminate the surrounding groundwater and surface water. The loss of process leach solution to the environment would result in the release of potentially toxic process leach solution containing cyanide and elevated metals.

The design of the liner system is also critical to ensure the stability of the HLF. A liner system that has not been designed appropriately may also contribute to geotechnical failure of the HLF (i.e. slope failure and slide of HLF) and release of process leach solution and crushed ore/tailings to the surrounding environment.

A number of factors must be considered in designing a liner system to ensure that it can properly manage and contain process leach solution and remain stable. These include:

- northern and site-specific conditions;
- foundation conditions and liner-bed surface preparation;
- loading including weight and height of ore;
- liner characteristics including puncture resistance;
- membrane permeability, surface characteristics and friction;
- liner construction quality assurance and quality control;
- hydraulic head, and hydrostatic head controls;
- UV resistance (if and as required);
- ambient and solution temperatures;
- run-on and run-off controls;
- chemical composition of the solutions the membrane may come into contact with;
- groundwater recharge, solution seepage, seepage controls;
- membrane anchoring methodology;
- site-specific data/conditions and operational requirements including membrane jointing; and
- HLF closure strategy.

The Proponent provided a revised liner system for the HLF in the SIR submitted in May 2012 (p. 37 and Fig. 5.4-3). The liner system in the in-heap pond portion of the HLF includes two linear low density polyethylene (LLDPE) geomembranes, one geosynthetic clay liner (GCL), one leak detection and recovery system (LDRS), and one low permeability layer. The liner system in the upslope area of the HLF includes one LLDPE geomembrane and one geosynthetic clay liner. The Proponent has indicated that the liner system is based on Nevada State Guidelines (Nevada Administrative Code) and best available technology. Table 9 provides an overview of the liner system.

Table 9 Proposed HLF Liner System

Liner System Component	Description
Overliner System (over entire liner system)	
Overliner	≥ 1 m of crushed ore or waste rock to protect the liner system. A pipe network (450, 375, 250 and 100 mm diameter corrugated dual-wall perforated ADS N-12 pipe) is designed to limit the head over the liner to < 1 m.
Single composite liner in the low head, upper heap leach, low-head areas upgradient of the in-heap pond. (One geomembrane over a geosynthetic clay layer over a prepared foundation layer.)	
Primary Geomembrane	60 mil LLDPE geomembrane.
Geosynthetic Clay Liner (GCL)	CETCO Bentomat DNM, or equivalent, installed over the entire HLF area.
Double composite liner in areas with higher head including the in-heap pond.	
Upper liner	60 mil LLDPE geomembrane.
Leak detection and recovery system (LDRS)	High load geocomposite used to collect and direct upper liner seepage to the LDRS sump.
Lower liner	60 mil LLDPE liner over GCL over fine grained subgrade. GCL to have maximum permeability equivalent to 300 mm of 1×10^{-6} cm/s soil.
Soil Liner	Low permeability seal zone to be constructed of compacted, low-permeability soil on the upstream slope of the HLF confining embankment.
Underdrain System (under entire liner system)	
Underdrain	Clean gravel french drains with corrugated dual-wall perforated ADS N-12 pipes and geotextile.

The original proposal (p. 5-20 and Fig. 5.4-11) proposed a liner system in the in-heap pond portion of the HLF that included three poly-vinyl chloride (PVC) geomembrane liners, two leak detection recovery systems (LDRS), and two low permeability layers. The liner system in the upper area of the HLF included two PVC geomembrane liners, one leak detection recovery system, and two low permeability layers.

The Proponent referenced the Nevada State Guidelines and best available technology. Information is based on: the Nevada Administrative Code (NAC), Chapter 445A Water Controls, sections 350 – 447 applicable to relevant minerals projects in the State of Nevada; and the Best Available Demonstrated Control Technology (BADCT) Guidance Manual applicable to relevant minerals projects in the State of Arizona.

Submissions received from the NND (YOR #2010-0267-295-1) and the Yukon Conservation Society (YOR #2010-0267-291-1) identified concerns with the revised liner system. It was unclear how the revised liner system took into account site-specific characteristics including the northern location, local hydrological and hydrogeological regimes (i.e. proximity to surface and groundwater), increased height, weight and volume of ore on the HLF, and, the amount of hydraulic head predicted below and above the liners system. Furthermore, there was concern that the Nevada State Guidelines, used by the Proponent as the minimum design basis for the liner system, were developed for use in an area with a warmer and arid climate and much lower groundwater. There was concern that these guidelines were not applicable based on Yukon's climate and site-specific conditions (i.e. proximity to groundwater and surface water).

The Executive Committee is of the view, corroborated by EcoMetrix (YOR #2010-0267-0331-1), that the Nevada State Guidelines and Arizona BADCT reflect the climates, conditions, and regulatory requirements, as well as provide a reference point, for projects in their respective States. When designing a project in Yukon, these guidelines may provide a useful reference point but the northern location, local hydrological and hydrogeological regimes, increased height, weight and volume of ore on the HLF, and, the amount of hydraulic head predicted below and above the liners system must be taken into consideration. In their July 2012 response (VIT 2012b), the Proponent provided additional information on the HLF liner system demonstrating that northern climate and local conditions were taken into consideration in their liner design.

The Executive Committee agrees with EcoMetrix (2012b) conclusions that the Proponent, in their July 2012 response to request for additional information, demonstrated that northern climate and local conditions have been taken into consideration. This information indicates that the HLF design was prepared in accordance with generally accepted engineering practices and best available technology to provide a high level of groundwater protection.

NND indicated concern regarding the lack of a leak detection and recovery system (LDRS) below the entire HLF. The in-heap pond portion of the HLF has higher hydraulic head due to the process solution storage in the pond. The upper portion of the HLF has lower hydraulic head due to the flow through nature of the HLF as well as its location on a slope and up gradient of the in-heap pond.

The amount of hydraulic head (i.e. water pressure) on a particular portion of the liner is one of the most important parameters determining the risk of liner leakage (EcoMetrix 2012b). The risk of leakage increases as hydraulic head increases. Therefore, a more conservative liner design is required to minimize liner leakage. Decreasing hydraulic head allows for a less conservative liner design, while maintaining liner performance and avoiding leakage.

In the upper portion of the HLF, hydraulic head will be <1.0 m. Hydraulic head will be maintained and reduced through the use of a free-draining overliner system and the nature of the ore in the upper portion of the HLF. Ore in the upper portion of the HLF will remain in an unsaturated state and PLS will naturally flow down gradient towards the in-heap pond. Furthermore, the Proponent has indicated that piezometers will be installed within the HLF to monitor and validate hydraulic head predictions during operations.

The liner in the upper portion of the HLF is designed to prevent or minimize measurable leakage. The primary geomembrane (LLDPE) will overlie the Geosynthetic Clay Liner (GCL). The GCL consists of a layer of bentonite between two nonwoven geotextiles. If PLS leaks through the primary membrane and contacts the GCL, the sodium bentonite will swell. This swelling and expansion creates a hydraulic seal which the Proponent predicts to have low hydraulic conductivity (5×10^{-9} cm/s). The Proponent provided estimates of the rate of liquid migration through the proposed liner systems in a technical memo titled Eagle Gold Project – Heap Leach Facility Feasibility Design – Liner Leakage Analysis (VIT 2012b, Appendix R6-A). The Proponent predicts that the rate of liquid migration through the upper portion of the HLF will be 2.77×10^{-8} m^3/s per defect (11.3 mm diameter hole) in the primary geomembrane liner. Using this leakage rate the Proponent estimates a total potential leakage of 386 Litres per day (Lpd) in the upper portion of the HLF (i.e. 301 Lpd in Phase 2 + 85 Lpd in Phase 3 of the HLF). This compares to an estimated total potential leakage of 122 Lpd from the in-heap pond area of the HLF.

The entire HLF liner system includes an underdrain system designed to drain groundwater below the HLF to reduce upper pressure on liner system. Underdrains constructed of geofabric wrapped around granular drain rock and perforated pipes will be placed at regular intervals below the PLS header pipes as this will be where flows are concentrated during active leaching. Although not designed as a LDRS, this underdrain system can provide certain leak monitoring capabilities for the upper HLF. Any water collected in the system will report to a sump at the toe of the embankment. The sump will allow for monitoring, measuring, isolating flows, and in the event that water does not meet discharge criteria, direct flows to the event ponds. The underdrain system will also be constructed with independent drainage zones with non-perforated header pipes specific to each zone. If a leakage is detected, this will enable the Proponent to narrow down specific areas of the HLF that may be compromised.

While the underdrain system is designed to collect water beneath the HLF, depth to groundwater is approximately 15 to 25 m below the surface. As development of the HLF progresses, it is anticipated that groundwater recharge to the area will be decreased due to the liner system covering most of the Ann Gulch drainage basin. The Proponent anticipates that groundwater levels below the upper portions of the HLF will decrease over time and that the underdrain system in this area will likely be dry.

The Proponent has provided the following mitigative measures that may be implemented if water quality from the underdrain monitoring system exceed standards (YOR #2010-0267-345-1):

- cessation of leach irrigation in the affected area(s);
- inspection of ore pile for signs of instability or movement;
- regular inspections by a qualified engineer; and
- evaluation of mitigation alternatives such as:

- removal of ore to investigate liner damage as recommended by the engineer (depending on lift height);
- repair of any damaged or defective liner as needed; and
- placement of a secondary (interlift) liner in the affected area(s).

If constructed properly, there is a low risk of significant volumes of process leach solution leaking through the composite liner in the upper portion of the HLF. However, the composite liner could become compromised either during construction or through accidents. During construction, if the liner is not installed correctly or quality assurance and quality control (QA/QC) programs are not properly employed, the liner may leak. If the composite liner were to be compromised and process leach solution were to leak, cyanide may be discharged to the environment. The Proponent has committed to develop and carry out a rigorous QA/QC program for the liner construction (VIT 2012a). A summary of the QA/QC results along with "as-built" drawings will be submitted to regulators.

The HLF will be constructed in three phases. Phase 1 will include construction of the double composite liner system with LDRS in the in-heap pond portion of the HLF. Phase 1 construction is anticipated to commence in Q2 of 2013 and would be completed with a target date of loading ore by Q3/Q4 of 2014. Phases 2 and 3 are an extension of the HLF and include the construction of the single composite liner system in the upper portion of the HLF. Phase 2 and 3 construction is anticipated to commence in years two and six respectively of operations. It is expected that the Phase 1 HLF liner system will be constructed and operational prior to commencing Phase 2 construction. This phased approach to the HLF construction will allow the Proponent and regulators to evaluate the more robust Phase 1 liner system prior to construction of the Phase 2 and 3 liner system. The Proponent will be able to review the construction techniques and QA/QC programs and results as well as compare actual performance to predicted performance.

The Executive Committee recognizes that the Proponent has proposed a sampling and testing program for seepage collected in the LDRS. However, a leak through the liner in the upper portion of the HLF could result in cyanide reporting to the underdrain system or being uncontrolled. Although the likelihood of process leach solution leakage from the single composite liner system in upper portion of the HLF is low, the magnitude and extent of leakage is uncertain and could be high depending on the nature of the leak. The Executive Committee has determined that additional mitigations are necessary to reduce the likelihood, frequency and magnitude of PLS leakage through the liner in the upper portion of the HLF. The Executive Committee is of the view that means to monitor and measure possible leakage of process solution through the liner in the upper portion of the HLF should be in place. This means that water collected in the underdrain system should be regularly tested for the presence of cyanide (as an indicator of PLS leakage). The Executive Committee recommends that the Proponent evaluate the construction, QA/QC programs and results, and monitor the performance of the Phase 1 liner system (i.e. the double composite liner system with LDRS in the in-heap pond area of the HLF) and compare actual performance to predicted performance. Should the performance of the Phase 1 liner system not meet predictions, the Proponent shall review the Phase 2 and 3 liner systems and if necessary, modify the design to include a LDRS.

The Executive Committee has determined that with adherence to the standards of practice set out in the Cyanide Code, compliance with non-discretionary legislation and implementation of mitigation measures proposed by the Proponent and the mitigative measures recommended in this screening, the Project will not have significant adverse effects on fish and other aquatic life as a result of leakage from the HLF.

6.3.5.2 Event Ponds Liner System

The Proponent proposed the construction of two event ponds with a combined operational storage capacity of approximately 183 000 m³. In the proposal and the SIR the Proponent indicated that the event ponds would be constructed with double composite liner systems that included a leak detection and recovery system (VIT 2011, VIT 2012a). However, in subsequent information VIT indicated that the event ponds will be constructed with a single composite liner similar to the liner proposed for the upper portion of the HLF (VIT 2012b). In their comments on the DSR, NND indicated concern that the event ponds would be constructed with no leak detection (YOR #2010-0267-346-1).

This change in liner design was based on Arizona BADCT which indicates that ponds which contain process solution for a short duration due to process upset conditions or rainfall events can be designed with a single geomembrane liner. The Proponent indicated that the event ponds would be empty during normal HLF operating conditions and would only be used for short-term periods of excess water balance conditions due to storm events or upset operational flows. Any process leach solution in the event ponds will be pumped out and returned to the leach solution process circuit within a short period of time.

The water balance model presented in the proposal originally predicted a negative water balance in the HLF (VIT 2011, VIT 2012a). However, in the November response to a request for supplementary information, the Proponent has provided a revised HLF water balance model (VIT 2012c, HLF Water Balance – Revision 3). The revised model indicates that after year three of operations, the HLF will become net positive (i.e. the HLF will no longer require fresh make-up water and the Proponent will need to discharge excess water).

The Proponent has confirmed that the event ponds will continue to be used *“as temporary storage for excess water for wet months in which the heap experiences excess rainfall or serve as temporary storage for recycle water”* (VIT 2012c). Temporary use of the event ponds may occur under two scenarios: if excess water from various mine site infrastructure exceeds the design capacity of the MWTP (600 m³/h); and/or the discharge from the MWTP exceeds the 10:1 dilution ration in Haggart Creek (i.e. ten parts Haggart Creek to one part MWTP discharge) (VIT 2012d). Based on predictions from the site water balance model, the Proponent does not anticipate these scenarios, and therefore do not require the use of event ponds for storage, during normal HLF operating conditions under average, wet, or dry precipitation conditions.

The Proponent has indicated that although they anticipate the event ponds will not be needed during normal operating conditions, they may be used during emergency conditions such as high magnitude, low frequency rainfall or snowfall events (VIT 2012d). The event ponds would only be used for short periods of time before water is: sent to the MWTP for treatment and discharge; used as HLF solution make-up water; or recycled to inactive areas of leached ore on the HLF (i.e. short term storage in the HLF). The Proponent anticipates that conditions set by regulators will define maximum allowable short-term storage (e.g. less than 30 days) based on the current design of the event ponds (i.e. single composite liner with no LDRS).

Any water stored in the event ponds will exert water pressure (i.e. hydraulic head) on the liner system. As discussed previously, the amount of hydraulic head on a particular portion of a liner is one of the most important parameters determining the risk of liner leakage (EcoMetrix 2012b). The higher the hydraulic head, the greater the risk of leakage and the more conservative the liner design required to minimize liner leakage. At full capacity, the event ponds will have 10 m of water over the liner. The Proponent predicts that at full capacity, the event ponds single composite liners would have a total potential leakage rate of 497 Lpd in event pond 1 and 487 Lpd in event pond 2 (VIT 2012b, Appendix R6-A).

A leak through the liner system of the event ponds could result in cyanide being uncontrolled and discharged to groundwater or surface water. The magnitude and extent of potential discharge is uncertain. Although the Proponent has provided estimated total potential leakage rates, it is unclear how often the event ponds may be used for short-term storage of high magnitude low frequency precipitation events. The water quality in event ponds is also difficult to predict given that the precipitation events that would warrant the use of the event ponds would dilute any cyanide bearing process leach solution within those ponds. Furthermore, there is the potential for the event ponds to be required for operational use based on uncertainties related to the HLF water balance model (discussed further in section 7.3) as well as the predicted positive HLF water balance occurring after year three of operations.

The Executive Committee has determined that the revised liner system may be suitable for use in the event ponds for short-term storage during emergency conditions or high magnitude low frequency precipitation events. However, based on uncertainties as outlined above, the Executive Committee is of the opinion there is a reasonable likelihood that the event ponds will be used under normal operating conditions. Therefore the Executive Committee has determined that the proposed liner system (i.e. single composite liner with no LDRS) may lead to uncontrolled discharge at a rate that results in significant adverse effects.

Based on information available at the time of this screening, the Executive Committee has determined that the original liner design (i.e. double composite liner with LDRS) will reduce significant adverse effects. However, the Executive Committee recognizes that there may be other options in liner design to adequately mitigate the significant adverse effects. We also acknowledge that the Proponent will be required to provide updated information to responsible regulators during the regulatory review process including: updated baseline data, revised water quality model, updated site water balance model, and updated water management plan. This information may demonstrate to the satisfaction of the regulators that a different liner system would be adequate to mitigate significant adverse effects from uncontrolled discharge from the event ponds.

6.3.5.3 Metal Mining Effluent Regulations

The *Fisheries Act*, including the *Metal Mining Effluent Regulations* (MMER), provides Environment Canada with regulatory authority to control water pollution including mining effluent. In their comments on the DSR Environment Canada indicated that design modifications may be required for the upper liner system to comply with the MMER (YOR #2010-0267-339-1). MMER requires effluent flow rates from all discharge points to be measured within 15 percent accuracy (Section 9) and prohibits dilution of effluents prior to monitoring and discharge (Section 6).

In response to a request for additional information, the Proponent provided additional information on proposed MMER compliance points and their relationship to the HLF liner system (VIT 2012c). The MWTP final discharge point is proposed to be the MMER compliance point during operations. During post-closure and reclamation phases, the MMER compliance point will shift to the discharge points from the proposed passive treatment systems. The Proponent has indicated that all effluent at these compliance points will meet MMER requirements.

Recognizing predicted leakage due to defects in the liner and installation, the HLF liner system has been designed to prevent high magnitude uncontrolled discharge of process leach solution to the environment. As such the Proponent does not consider the HLF liner to be a final discharge point. The entire HLF system is designed to discharge to the MWTP. Measureable leakage from the HLF through the liner system would be considered a malfunction and not anticipated during normal operating conditions. In the event of measureable discharge from the HLF, the Proponent has identified measures to monitor and capture leakage and ultimately direct it to the MWTP (as discussed above).

The Executive Committee believes that if outflow volumes or water quality cannot be appropriately measured, the effluent will be difficult to properly monitor and regulate. The Proponent has indicated that they will finalize all MMER compliance points with Environment Canada, Government of Yukon, and Yukon Water Board Secretariat (VIT 2012c). The Executive Committee has determined that compliance with non-discretionary legislation and implementation of mitigation measures proposed by the Proponent the Project will not have significant adverse effects on fish and other aquatic life related to MMER compliance points.

6.3.6 Cyanide Effects to Wildlife

Though not as sensitive as aquatic life, birds and wildlife are also affected by cyanide toxicity. Managing cyanide to minimize exposure to birds and wildlife is the preferred approach to minimize effects. The Executive Committee notes that many of the mitigations proposed to control and manage cyanide at the mine site will decrease the likelihood, frequency and magnitude of bird and wildlife exposure to cyanide.

The most likely pathway for birds and wildlife to be affected by toxic levels of cyanide is through ingestion of cyanide process leach solution. The likelihood of wildlife drinking process solution is low given the deterrents of noise, human presence, equipment activity and barriers to movement at the mine site. Birds, particularly waterfowl, have been shown to be much more vulnerable to cyanide poisoning at mine sites.

At Nevada mine sites during 1990 and 1991, 9 512 carcasses of over 100 species were reported. Of these, birds comprised 80-91% of vertebrate carcasses reported annually. This reporting was voluntary and considered an underestimation. At Northparkes, Australia in 1995, 1 583 bird carcasses were recorded following a tailings incident. Eventually, 2 700 bird deaths were documented over a four-month period. Donato et al. 2007 states that avian deaths at mine sites employing cyanide are usually undetected and significantly underestimated, leading to a perception that a risk does not exist.

As a result of bird fatalities at mine sites, best practices have evolved including maintaining WAD cyanide in tailings ponds at levels <50 mg/L, restricting avian access to the ponded areas and avoiding water releases to the environment. Maintaining the concentrations of WAD cyanide in uncovered ponds of cyanide solutions to <50 mg/L is credited for reducing the mortality birds in Nevada by 83 percent from

1990 to 1995 (about 1 300 bird mortalities reported in 1990 to 220 in 1995, Logsdon et al. 1999). Bird monitoring data supports the contention that 50 mg/L limit to WAD cyanide is a safe level. (Australian Government 2008)

Other operational steps can be taken to further limit waterfowl exposure to cyanide in open ponds. Netting has been useful in covering small process ponds, noisemakers and air cannons deter birds, and plastic balls or other floating devices are increasingly being used to cover the entire surface of small process ponds (Logsdon et al. 1999).

The Executive Committee notes that the Proponent committed to reduce wildlife mortality in the HLF area and event ponds by implementing the following mitigations (VIT 2011a, Table 6.9-10):

- fence off and will control (minimize) the growth of vegetative cover at any mine site location with compromised water quality (e.g. event ponds);
- not reclaim events pond shorelines;
- use Bird Balls™ or a reasonable alternative to deter waterfowl or other birds from landing on ponds that would pose a health risk to them (e.g. containing the heap leach pregnant solution); and
- design ditches and sediment ponds to reduce potential for entrapment of wildlife.

Government of Yukon, Department of Environment has recommended that these mitigation measures be implemented if concentrations WAD cyanide in event ponds is greater than 50 mg/L (YOR #2010-0267-337-1). It is likely that any water in event ponds will have concentrations of cyanide greater than 50 mg/L.

The Executive Committee has determined that adherence to the standards of practice set out in the Cyanide Code, compliance with non-discretionary legislation and implementation of mitigation measures proposed by the Proponent, the Project will not have significant adverse effects on birds and wildlife due to exposure to cyanide.

6.3.7 Consideration of the Proponent’s Management Plans

The Proponent has developed a number of plans to minimize the uncontrolled release of cyanide into the environment, manage cyanide safely on-site and respond effectively in the event of a cyanide spill. Minimizing the likelihood, frequency and magnitude of uncontrolled release of cyanide is the most effective approach to minimize the significant adverse effects of cyanide on VESECs.

6.3.7.1 Cyanide Management Plan

The Proponent provided a conceptual cyanide management plan (VIT 2011a, s. 12 of Appendix 30, Conceptual Environmental Management Plans) that outlines the key commitments to limit workforce exposure to cyanide and to prevent releases of cyanide to the environment. The Proponent has indicated that a detailed and comprehensive cyanide management plan will be completed as required by the Water Use Licence and Quartz Mining License applications.

The cyanide management plan for the Project outlines how the Proponent will manage cyanide in four areas: production and purchasing; transportation; handling, storage, and use; and monitoring. Cyanide will be purchased from either manufacturers that are signatories to the Cyanide Code or manufacturers that adhere to the standards of practice outlined in the code. The conceptual cyanide management plan for the Project includes the standards of practice outlined in the Cyanide Code for transportation as well as handling, storage, and use.

In addition to the standards of practice outlined in the Cyanide Code, the Proponent outlined key aspects of a Cyanide Transportation Plan that will form part of the contract with the cyanide transport contractor. This plan includes details on:

- packaging and labelling of shipments;
- chain of custody documentation and tracking of inventory and movement;
- interim storage of cyanide during transportation;
- use of escorts, convoys and web-based GPS tracking of shipments;
- maintenance of transportation equipment;
- training for personnel operating cyanide handling and transport equipment;
- prepare emergency response plans and emergency notification and reporting;
- remediation of releases; and
- evaluate transportation routes and response procedures.

This plan also includes a risk assessment of the transportation route and will be reviewed at regular intervals. The Proponent has indicated that other stakeholders will be involved in the risk assessment of transportation related issues.

Cyanide handling, storage and use will also adhere to the standards of practice outlined in the Cyanide Code. Appendix 30 to the proposal provides further details on how the Proponent will handle, store and use cyanide at the mine site including:

- unloading and storage in well ventilated areas away from people and sources of water;
- operations and methods to prevent overfilling cyanide solution storage tanks;
- storage and mixing areas located on concrete with concrete curbs with 110 percent containment;
- storage and mixing of cyanide for use; and
- safety considerations relating to design, construction, operation, maintenance, and monitoring/inspections of facilities.

Details were also provided on cyanide-specific monitoring. The Proponent will develop a detailed environmental monitoring plan relating to cyanide management that will include key criteria related to safety and will adhere to the principles and standards of practice consistent with the Cyanide Code.

6.3.7.2 Spill Contingency Plan

The Proponent provided the objectives of a spill contingency plan (Section 13 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The final plan will outline procedures and steps for response and remediation of fuel and hazardous materials spills. The Proponent will develop the final plan in accordance with regulatory and permitting requirements. Further details on the emergency response for a spill are included in the conceptual emergency response plan (VIT 2011a, Appendix 33).

6.3.7.3 Emergency Response Plan

The Proponent provided a conceptual emergency response plan (VIT 2011a, Appendix 33, Emergency Response Plan) that outlines the key risk management planning and contingency response measures to address accidents, malfunctions, and emergencies. The Proponent has indicated that a detailed and comprehensive emergency response plan (ERP) will be completed as required by the Quartz Mining License. Furthermore, the plan will be modified throughout the life of the project when necessary. The ERP will be applicable to the mine site area and the Silver Trail, SMR, and the HCR.

The Proponent has indicated that the purpose of the ERP is:

> *"to provide a course of action in responding to accidents, system failures, or other emergency situations which may occur at the mine site during any phase of the Project. In particular, the ERP identifies the appropriate course of action for the following typical emergency situations":*
>
> - *Release of hazardous or toxic substances (spill)*
> - *Fire or explosion*
> - *Slope failure (open pit and waste rock storage areas)*
> - *Heap Leach Facility breach*
> - *Natural disaster*
> - *Security breach or threat to personnel or facilities*
> - *Transportation emergencies*
> - *Medical emergencies*
> - *Missing persons*
> - *Site evacuation.*

The ERP also includes procedures for internal and external notification of relevant external agencies, services, and potentially affected parties. Details are provided for roles and responsibilities, inspections and maintenance, security, identification and mitigation of hazards, and emergency response procedures.

6.3.7.4 Occupational Health and Safety Plan

The Proponent provided the objectives of an occupational health and safety plan (Section 11 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The objectives will be to promote safety awareness to all on-site personnel, public, and area stakeholders. The plan will incorporate guidance from the National Institute for Occupational Health and Safety as well as relevant territorial regulations. Health and safety procedures will be communicated during mandatory site orientation sessions.

6.3.7.5 Access Road

The Proponent outlined the proposed access route to the mine site as well as traffic management strategies in the proposal and several appendices. Appendix 19 (Eagle Gold Access Road Report) outlines the current existing access route conditions as well as the required upgrades for the Project. The Project will access the site using public roads. Total driving distance from Mayo is approximately 85 km. From Mayo, the first 40 km is on the Silver Trail (Highway 11 to kilometre 87.2) followed by 23 km on the SMR to the South McQuesten River bridge. After the bridge, the HCR continues 22 km to the mine site.

There is no road use data available for the SMR and the HCR. The proposal indicates that traffic data was collected by the Government of Yukon in two locations on the Silver Trail at km 0, just east of the Stewart Crossing bridge, and at km 63.4, north of Mayo towards Keno City. Average daily traffic between 1997 and 2008 ranged from 71 to 262 vehicles at km 0 and 90 to 147 vehicles at km 63.4.

The Proponent provided the objectives of a traffic and access management plan (Section 10 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The final plan will include:

- the location of signage and pullouts for the single-lane two-way HCR;
- measures to mitigate potential hazards associated with construction-related truck movement;
- procedures for road maintenance and monitoring; and
- mine site security measures.

The conceptual traffic and access management plan also lists measures that will be implemented to convert the existing HCR to a single-lane two-way access road. The Proponent indicates that the final plan will be developed with Government of Yukon, Department of Highways and Public Works and will be consistent with Yukon regulatory and policy requirements.

6.3.8 Use of Other Hazardous Materials

The potential effects to health and safety associated with the use and management of hazardous materials are dealt with in these sections.

The Proponent has identified four categories of hazardous materials including:

- petroleum products (i.e. diesel fuel and gasoline);
- reagents (i.e. lime, sodium hydroxide, hydrochloric acid, hydrogen peroxide, smelting fluxes, copper sulphate pentahydrate, antiscalants, and cement);
- lubricants (i.e. oils, degreasers, and solvents); and
- blasting compounds (i.e. ammonium nitrate, mineral oil, diesel fuel).

Potential effects to health and safety related to hazardous materials are related to the accidental release or misuse of these materials. Accidental releases may occur due to accidents, malfunctions, and/or poor management practices during transportation, storage, handling, and use.

Depending on areas of accidents or malfunctions, hazardous materials may contaminate soil, air, or water. A release may directly affect a host of values including human health and safety of both the public and personnel at the mine site, wildlife, environmental quality, water quality and aquatic resources. There may also be indirect effects to certain values. For example, the release of a hazardous material may indirectly affect community and cultural well-being due to the direct loss of fish and fish habitat. The magnitude and extent of potential effects will vary based on several factors including the nature of release (i.e. amount and type of hazardous material released), the location (i.e. in water or on land), and the environmental conditions (i.e. seasons and current weather). Storage, handling and use of hazardous materials at the mine site may pose a serious risk to the health and safety of personnel. If hazardous materials are improperly managed on-site, personnel may be exposed.

Potential effects to human health and safety associated with the accidental release of hazardous materials have a wide range and may be serious including injury and death. Exposure to some hazardous materials may only result in minor irritation such as exposure to fumes from gasoline. Other materials, such as sodium hydroxide and hydrochloric acid, are corrosive and may cause severe chemical burns if exposed to skin and eyes. If ingested in sufficient quantities, many hazardous materials will cause death. These effects are considered to be significant.

6.3.9 Recommended Terms and Conditions

In determining the significance of effects related to the use of cyanide and other hazardous materials, the Executive Committee has considered the following non-discretionary legislation:

- *Quartz Mining Act*, and *Quartz Mining Land Use Regulations*;
- *Waters Act,* and *Waters Regulations*;
- *Occupational Health and Safety Act*, and *Occupational Health and Safety Regulations*;
- *Public Health and Safety Act*, and *Public Health Regulations*;
- *Transportation of Dangerous Goods Act*;
- *Wildlife Act,* and regulations;
- *Migratory Birds Convention Act,* and *Migratory Birds Regulations; and*
- *Highways Act,* and *Highways Regulations*.

The Executive Committee has determined that adherence to the standards of practice set out in the Cyanide Code, compliance with non-discretionary legislation and implementation of mitigation measures proposed by the Proponent and the mitigative measures recommended in this screening, the Project will not have significant adverse effects related to cyanide and other hazardous materials.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental and socio-economic effects of the Project related to cyanide.

To ensure cyanide related facilities are constructed in a manner to minimize the risks of potential cyanide release:

1. The Proponent shall implement quality assurance and quality control (QA/QC) programs during construction of the cyanide facilities (i.e. cyanide unloading, storage, mixing facilities and other cyanide facilities). QA/QC records shall be retained for third-party review.
2. The Proponent shall have appropriately qualified personnel to: (i) review the cyanide facilities construction; (ii) provide documentation that the facility has been built as proposed; and (iii) approve the construction.

To ensure the ongoing safety of on-site personnel who are in close contact with cyanide and cyanide related facilities:

3. The Proponent shall develop and implement documented operating procedures describing how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces and equipment decontamination prior to maintenance will be conducted to minimize personnel exposure. These procedures should require, where necessary, the use of personal protective equipment (PPE) and address pre-work inspections. The documented operating procedures should include a management of change section to require review of proposed process and operational changes and modifications for their potential impacts on personnel health and safety, and incorporate the necessary personnel protection measures.
4. The Proponent shall determine the appropriate pH for limiting the evolution of HCN gas during mixing and production activities. Where the potential exists for significant cyanide exposure, the Proponent shall use ambient or personal monitoring devices to confirm that controls are adequate to limit personnel exposure to HCN gas and cyanide dust to 10 ppm on an instantaneous basis and 4.7 ppm continuously over an eight-hour period.
5. The Proponent shall identify areas and activities where personnel may be exposed to cyanide in excess of 10 ppm on an instantaneous basis and 4.7 ppm continuously over an eight-hour period and require the use of PPE in these areas or when performing these activities.
6. The Proponent shall maintain, test and calibrate HCN monitoring equipment as directed by the manufacturer, and retain records of these activities for at least one year.
7. To prepare personnel to safely manage cyanide the Proponent shall:
    a. Train personnel to perform their normal production tasks, including unloading, mixing, production and maintenance, with minimum risk to personnel health and safety and in a manner that prevents unplanned cyanide releases.
    b. Identify training elements necessary for each job involving cyanide management in training materials.
    c. Use appropriately qualified personnel to provide task training related to cyanide management activities.

d. Provide refresher training on cyanide management to ensure that employees continue to perform their jobs in a safe and environmentally protective manner

e. Evaluate the effectiveness of cyanide training by testing, observation or other means.

f. Retain personnel employment records documenting the training they receive, and ensure the records include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

8. The Proponent shall place warning signs where cyanide is used advising personnel that cyanide is present, and that smoking, open flames and eating and drinking are not allowed, and that, if necessary, suitable PPE must be worn. This will include the identification of unloading, storage, mixing and process tanks and piping containing cyanide to alert personnel of their contents, and to designate the direction of cyanide flow in pipes.

9. The Proponent shall locate showers, low-pressure eye wash stations and dry powder or non-acidic sodium bicarbonate ($NaHCO_3$) fire extinguishers at strategic locations throughout the operation and maintain, inspect and test them on a regular basis.

10. The Proponent shall have water, oxygen, a resuscitator, antidote kits and a radio, telephone, alarm system or other means of communication or emergency notification readily available for use at cyanide unloading, storage and mixing locations and elsewhere in the operation.

11. As proposed, the Proponent shall ensure a certified cyanide transporter is used and appropriate driver training, radio contact capabilities, vehicle maintenance, and emergency clean-up kits will be on trucks carrying NaCN. Furthermore, the Proponent shall ensure that emergency clean-up kits include equipment to contain NaCN as well and material to protect from, and respond to, cyanide toxicity in spill responders.

12. The Proponent shall inspect its first aid equipment regularly to ensure that it is available when needed, and to store, test and replace materials such as cyanide antidotes as directed by their manufacturer to ensure that they will be effective when needed.

13. The Proponent shall provide information on first aid procedures and other informational materials (e.g. material data safety sheets [MSDS]) on cyanide safety in the areas where cyanide is managed.

14. The Proponent shall develop and implement procedures to investigate and evaluate cyanide exposure incidents to determine if the programs and procedures to protect personnel health and safety, and to respond to cyanide exposures, are adequate or need revising.

15. The Proponent shall provide its own on-site capability to provide first aid or medical assistance to personnel exposed to cyanide.

16. The Proponent shall develop procedures to transport personnel exposed to cyanide to locally available qualified off-site medical facilities.

To minimize exposure of wildlife and birds to toxic levels of cyanide in the HLF area and event ponds:

17. The proponent shall implement the mitigation measures committed to in the proposal at Table 6.9.10 No. 13 and 17. If wildlife mortality occurs despite the implementation of these measures, the proponent shall:
    a. report the incidence of mortality to the responsible regulator; and
    b. develop and implement further mitigation measures to avoid or prevent wildlife mortality as directed by the responsible regulator.
18. The Proponent shall ensure that the use of sprinklers to apply process leach solution to the Heap Leach Facility will not result in dispersion of cyanide to the surrounding environment. Consideration must be given to sprinkler placement, environmental conditions, and proximity of wildlife.

To ensure the appropriate emergency response plans (ERPs) are in place should there be a cyanide emergency:

19. The Proponent shall develop an emergency response plan (ERP) that considers the potential cyanide failure scenarios appropriate for the Eagle Gold Mine site, the transportation route within Yukon to site and considers site-specific environmental and operating circumstances. The ERP should describe specific response actions (as appropriate for the anticipated emergency situations) such as clearing site personnel and advising potentially-affected nearby land-users and communities, use of cyanide antidotes and first aid measures for cyanide exposure, control of releases at their source and containment, assessment, mitigation and future prevention of releases.
20. The Proponent shall include local response agencies and medical facilities in Mayo, and if appropriate, in Whitehorse, in the cyanide emergency planning and response process. The Proponent shall make formalized arrangements with the available qualified off-site medical facilities (either Mayo and/or Whitehorse) so that these providers are aware of the potential need to treat patients for cyanide exposure.
21. The Proponent shall involve key stakeholders in the cyanide emergency response planning process.
22. To ensure cyanide-related elements are included in the ERP, the Proponent shall include in the plan the following:
    a. Requirement for appropriate training for emergency responders.
    b. Call-out procedures for the coordinators and response team members.
    c. Duties and responsibilities of the coordinators and team members.
    d. Procedures to inspect emergency response equipment to ensure its availability.
    e. Roles of outside responders, medical facilities and communities in the emergency response procedures.
23. The Proponent shall ensure that the following communication elements are in the ERP:

a. Notification to management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency.

b. Notification to potentially affected communities of the cyanide related incident and any necessary response measures.

c. Communication protocols with the media.

24. The Proponent shall ensure that the ERP remains current and effective by:

    a. Reviewing and evaluating the cyanide-related elements of its ERP for adequacy on a regular basis.

    b. Evaluating and revising the ERP after any cyanide-related emergency requiring its implementation.

    c. Regularly reviewing the ERP with stakeholders.

25. The Proponent shall periodically conduct emergency drills to test response procedures for various cyanide exposure scenarios, and incorporate lessons learned from the drills into response planning.

26. The Proponent shall commit to soliciting and actively considering personnel input in developing and evaluating health and safety procedures at the project.

To ensure adequate communication in the case of a cyanide emergency:

27. The Proponent shall advise potentially affected communities regarding appropriate communications and response actions that would be taken in the event of a cyanide emergency.

28. In the event of a cyanide release or exposure incident in Yukon related to the Project, the Proponent shall make publicly available the following information:

    a. Hospitalization or fatality related to cyanide exposure;

    b. Nature of release on or off the mine site requiring response, remediation, or reporting under applicable regulations;

    c. Nature of release that exceeds applicable cyanide limits or that causes applicable limits to be exceeded.

To ensure process leach solution leakage through the liner system in the upper portion of the Heap Leach Facility (HLF) can be monitored, captured and controlled:

29. The Proponent shall implement quality assurance and quality control (QA/QC) programs during construction of the HLF and liner system. QA/QC records should be retained for third-party review.

30. The Proponent shall have appropriately qualified personnel: (i) review design and oversee construction of the HLF and liner system; (ii) approve the final construction; and (iii) provide documentation to responsible regulators that the facility and liner system has been built in accordance with regulatory approvals.

31. The Proponent shall ensure that seepage collected in the underdrain system reports to a point of control (e.g. lined sump) to allow the Proponent to monitor, collect, and manage seepage. Seepage shall be sampled and monitored prior to discharge to surface water.
32. The Proponent shall sample water collected from: the proposed Leak Detection Recovery System; the underdrain sump; and additional surface and ground monitoring locations as dictated in the HLF Operations and Maintenance System plan required as part of the Water Use Licence and Quartz Mining License application guidelines.
33. Prior to completion of the HLF liner system, the Proponent shall develop a plan satisfactory to responsible regulators that includes sampling frequency, reporting timelines, and response measures.
34. In conjunction with responsible regulators, the Proponent shall evaluate the construction, QA/QC reports, and performance of the Phase 1 HLF liner system prior to construction of the Phase 2 and 3 HLF liner systems. Should the actual performance of the Phase 1 HLF liner system not meet predicted performance, the Proponent shall, in conjunction with responsible regulators, review the Phase 2 and 3 HLF liner systems and if necessary, modify their design.

To ensure process leach solution leakage through the liner system in the event ponds is minimized:

35. Unless otherwise demonstrated to the satisfaction of the responsible regulators that a different liner system will adequately mitigate adverse effects from uncontrolled discharge, the Proponent shall construct double geomembrane liner systems for the event ponds which include leak detection and recovery systems and allow for independent monitoring of each pond.

6.4 Cumulative Effects Assessment

Adverse Project effects due to cyanide are all related to the uncontrolled release of cyanide, or its chemical derivatives. Contact with cyanide through ingestion, inhalation or absorption, can result in sickness, injury or death.

The residual effects of the Project related to cyanide are the toxic response of VESECs to released cyanide (i.e. human health and safety, aquatic ecosystems, wildlife and wildlife habitat, vegetation). This cumulative effects section addresses the interaction of Project-related cyanide toxicity with residual effects of other projects that could have a cumulative effect by:

- making uncontrolled releases of cyanide more likely or frequent;
- contributing residual toxicity to the values potentially affected by the Project; or
- increasing the toxicity of cyanide if it released by the Project.

The Executive Committee is not aware of any other active commercial users of cyanide in the Haggart Creek watershed or within a 50 km radius of the Project. As described previously, cyanide is an acute toxin that is reactive and breaks down into chemical derivatives relatively quickly in the environment. Cyanide does not bio-accumulate within organisms or bio-magnify up food chains. As a result, no other projects would contribute residual cyanide toxicity to that of the Project and the Executive Committee has determined that there is not a cumulative effect.

Cyanide can occur in the environment in different forms and of varying toxicities. Free cyanide (CN- and HCN), the most toxic form, is formed when NaCN is added to water at circum-neutral pH (i.e. baseline or natural water conditions). The activities of other projects that could alter water chemistry and water quality would not result in more free cyanide being produced, in the event of an uncontrolled release of cyanide due to the Project. Due to a lack of interactions between residual effects there is not a potential cumulative effect.

The residual effects of other projects do not increase the likelihood of uncontrolled cyanide release at the mine site. However, Project traffic along the Silver Trail, SMR and HCR can interact with traffic from other projects in the area. Increased traffic can result in increased likelihood and frequency of vehicle-vehicle collisions that can, in turn, result in an uncontrolled release of cyanide.

The Proponent will complete a transportation route risk assessment as part of the detailed cyanide transportation management plan. It will consider certain factors along the route including: population; infrastructure; geographical and topographical information; road characteristics and conditions; and presence of water and watercourses. The Proponent will review this risk assessment on a regular basis and/or when conditions along the transportation route change.

The Proponent has committed to use a pilot vehicle and/or conveys to escort truck shipments of NaCN when deemed necessary by the transportation route risk assessment (e.g. particularly during inclement weather). This will decrease the likelihood of vehicle-vehicle collisions. The proposal also includes the commitment to construct frequent and adequate pull-outs along the HCR to permit safe and effective use of the HCR by all users. Furthermore, the HCR will be a radio-controlled road.

While the residual effects of Project traffic and traffic from current and future projects may slightly increase the likelihood of a vehicle-vehicle accident, but these cumulative effects are not significant.

The Executive Committee has determined that by complying with relevant legislation and mitigation measures proposed by the Proponent, the residual effects of the Project related to cyanide will not interact with past, present or known future projects to result in significant adverse cumulative effects.

6.5 Conclusion of the Cyanide and Other Hazardous Materials Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects related to cyanide and other hazardous materials.

7.0 HYDROLOGY

This section addresses potential effects of the Project related to management of water through and around the mine site. The Executive Committee considered the water balance model, infrastructure design, diversion and storage of mine site contact and non-contact water, and groundwater model. The Executive Committee has determined that impacts related to hydrological conditions in the Project area will result in significant adverse effects. However, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant non-discretionary legislation, and the implementation of mitigative measures specified by the Executive Committee. The following sections provide a rationale for this determination.

7.1 OVERVIEW

The Project is located primarily in the Dublin Gulch and Eagle Creek watersheds. Portions of the Project overlap Haggart Creek and Platinum Gulch. Dublin Gulch is a tributary to Haggart Creek which flows to the South McQuesten River. There are both intermittent streams (i.e. the stream becomes dry at sections along the water course where flow goes subsurface) and ephemeral streams (i.e. the stream channel has little to no groundwater storage and flow is in response to snowmelt) in the Project area.

Figure 7 is reproduced from the proposal and provides an overview of the hydrology in the Project area. Prior to any watershed disturbance, all tributaries within the Project area other than Platinum Gulch flowed into Dublin Gulch then Haggart Creek. Several streams have been rerouted through years of historic placer mining. Eagle Creek, which begins at the confluence of Eagle Pup and Stuttle Gulch originally discharged to Dublin Gulch. It has been rerouted from its original discharge to flow south parallel to Dublin Gulch. It then flows east through historic settling ponds and channels and discharges directly to Haggart Creek downstream of the Dublin Gulch discharge.

For this assessment, hydrology, which describes surface water as well as groundwater flow and quantity, is considered a VESEC because of the following reasons:

- the Project proposes changes to surface water drainage patterns; e.g. the Dublin Gulch Diversion Channel (DGDC) will be a permanent structure and not be reclaimed after closure;
- the Project will result in changes to surface water flows;
- changes in evapotranspiration and infiltration due to land clearing;
- surface water flow and quantity are directly responsive to extreme precipitation conditions;
- design and sizing of infrastructure as well as the mine water management plan is based on baseline and predicted surface water flow and quantity; and
- water usage from wells at the HLF and the camp could potentially impact groundwater which can directly affect surface water.

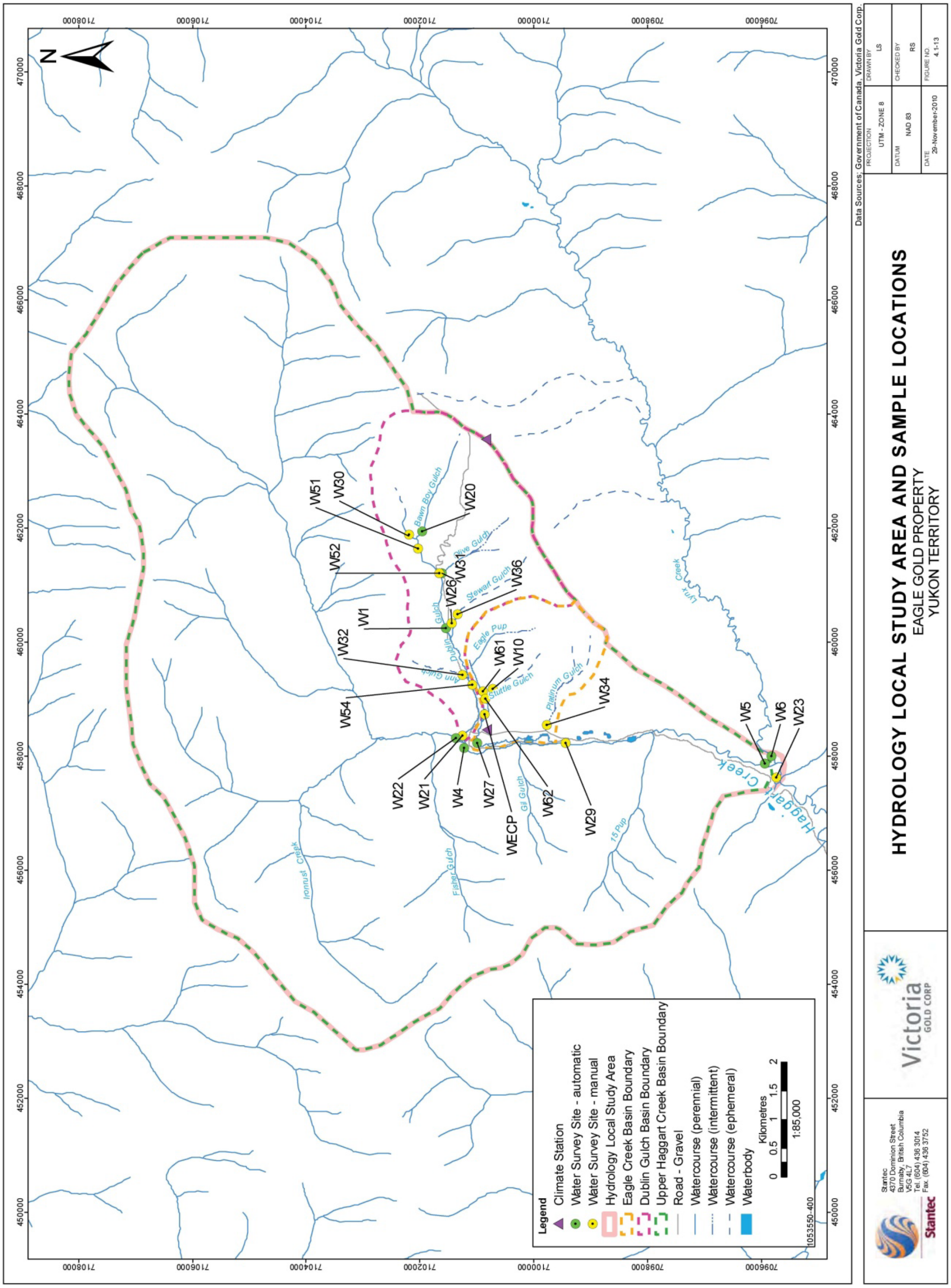

Figure 7 Hydrology Local Study Area and Sample Locations

The Proponent proposes: to divert clean water in the DGDC around mine components and into Eagle Creek; to alter several tributaries within the mine footprint; to pump and store groundwater in the open pit during construction/operation and closure/decommissioning; to pump groundwater for usage in the HLF and camp; and to discharge treated effluent to Haggart Creek. All of these activities could affect water quantity and flow.

Based on the comments submitted during the Public Comment Periods, technical experts retained by the Executive Committee and internal review, the Executive Committee has focused on the following potential effects to hydrology:

- effects of exceedances of design capacity, breach, or failure of the water conveyance and storage infrastructure; and
- effects of contact water seepage to groundwater.

Accidents and malfunctions of surface water management infrastructure may result in further potential effects such as the discharge of contact water with high concentrations of metals or cyanide. This could result in potential effects to values such as aquatic ecosystem, wildlife, environmental quality, and human health and safety.

7.2 Evaluation of Baseline Information

The proposal provides an extensive amount of baseline information related to hydrology. Additional information has been submitted by the Proponent in response to various requests for additional information. The information presented is based on studies done by the Proponent in support of the Project, scientific publications, and other studies/data collected by mining companies and/or Government of Yukon that are accessible to the public. The following section will describe pre-development hydro-meteorological conditions that are relevant to the Project.

7.2.1 Climate

The climate baseline information provided is made up of on-site data as well as regional historical data from various weather stations including Dawson, Klondike, Mayo, Keno Hill, Elsa/Calumet. In terms of spatial distribution this project baseline information is considered adequate, although a longer period of record for one of the meteorological stations on-site would reduce some uncertainty. The Proponent installed two meteorological stations at the Project site. The higher elevation Potato Hills station (1 420 m) was established in August 2007. Data from 1993 to 1996 from Strata Gold is also available for this site. The lower elevation camp station (823 m) was established in August 2009. While the meteorological stations continue to be operational, the period of record for data presented in the proposal ends in October 2009. Only three months of baseline data for the camp station was used by the Proponent in development of the proposal. Furthermore, only one winter of snow data from the site has been considered. The Proponent has confirmed that on-site hydro-meteorological and snow survey data collection is ongoing and will be used for the permitting process.

It is acknowledged that the Proponent took regional data to augment the amount of on-site data. However, parts of Yukon have experienced both record high winter snowpack and summer rainfall events in recent years resulting in significant flooding. Climate models predict that temperatures will increase by

2 to 5°C by 2050 and that precipitation will increase by 11 percent by 2030 (NCE 2011, 2012). Climate trends at Mayo suggest that summer, winter and annual temperatures have increased by approximately 1.5, 2.0 and 1.5°C respectively since 1925. In addition, annual precipitation has increased by approximately 20 percent while summer precipitation has increased by approximately 25 percent (Purves 2006, 2010).

Precipitation is a critical source of water input when modeling mine site water balance as well as groundwater. Precipitation data further determine calculations made for designing the storm events and therefore determine the volumes needed at the infrastructure on-site (e.g. various ponds and diversion ditches) and/or mine design in general.

The Proponent developed precipitation estimates for the mine site using Project site rainfall data and snow surveys together with regional station data. Annual precipitation estimates for the Project were developed based on the relationship between precipitation and elevation using central Yukon regional stations. A log Person III theoretical probability distribution was used to obtain precipitation estimates at various return periods using the regional data. Estimates are provided for mean annual and 20-year wet and dry return periods. The annual distribution of precipitation across the Project site was based on data from the Keno Hill (1 473 m) meteorological station which operated from 1974 to 1982.

The Executive Committee is satisfied with the extent, quality and use of the hydro-meteorological data for predictions of precipitation for the site water balance and associated modeling.

7.2.2 Surface Water

The Proponent provided baseline surface hydrology information for various locations within the Project area. Data was collected for mean monthly flows, low flows, and peak flows. However, the proposal provides limited assessment of low flow conditions in the study area other than that provided synthetically with the surface water balance model.

Stream flow data has been collected at numerous sites, including both continuous data and spot flow measurements. Continuous stream flow data has been collected for key and relevant locations in the Project area (e.g. Dublin Gulch and Haggart Creek).

Although the period of record for the site stream flow data is short, the data provided indicates the relative contributions of study area watercourses. Limited stream flow data is available for non-open water periods (e.g. November through April). The Proponent provided a summary of regional stream flow data to augment collected data at the mine site.

As the Proponent has confirmed that surface water data collection is ongoing and will be used for the permitting process, the Executive Committee is satisfied with the extent of surface water data presented and used for predictions made.

7.2.3 Groundwater

The Proponent provided baseline data for groundwater levels and quality. This data was collected in 1995 and 1996, and from spring to fall in 2009 and 2010. During 2009 and 2010 the Proponent conducted baseline hydrogeologic studies resulting in a better description of the hydrogeologic and hydrostratigraphic units and their spatial variability, availability of groundwater measurements, a characterization of seasonal patterns in groundwater levels, a quantification of the hydraulic properties of the hydrostratigraphic units, as well as groundwater chemistry information.

The field programs consisted of drilling, installing and developing wells, conducting hydraulic tests, conducting an aquifer pumping test, measuring groundwater levels, and sampling wells for select analytical parameters. This field work also included working with the previously installed monitoring wells (installed in 1995 and 1996).

The baseline data provided by the Proponent does not include data from winter months. The short period of record for the groundwater levels and chemistry, and in particular the absence of data between late fall and early spring, introduces uncertainty in both the annual groundwater flux in the area and representative groundwater chemistry throughout the year. In the four continuously monitored wells, the total recorded changes in groundwater levels were relatively small (approximately 0.1 to 1.2 m depending on well) over the three to four month monitoring period. Although response rates varied considerably among the wells, each well exhibited characteristics reflective of seasonal recharge due to spring break-up and subsequent response. Furthermore, while groundwater levels were generally responsive to recharge events (i.e. break-up and in some cases storm events), the data suggests they were lowest in the winter and early spring due to little or no recharge during the winter and were highest immediately after break-up or soon thereafter.

Given the Proponent has confirmed that groundwater data collection is ongoing and will be used for the permitting process, the Executive Committee is satisfied with the extent of hydrogeological data presented and used for predictions.

7.3 Effects Related to Hydrology

This section addresses potential effects of the Project related to management of water through and around the mine site. The effects assessment uses the local study area (LSA) and regional study area (RSA), as defined in the proposal. The LSA includes the mine site and access roads, and the RSA includes a broader area around these features.

7.3.1 Water Balance Model

The Proponent developed two water balance models for the Project: a site water balance model (WBM) and a HLF WBM. The HLF WBM was developed for the HLF and directly associated components (e.g. leak detection recovery system) and is fully integrated into the site WBM. The site WBM was developed using GoldSim® modeling software. The HLF WBM was created using Excel® software using the same inputs and assumptions used in the site WBM. The HLF WBM predicts make-up water requirements and/or surplus water generated by the HLF under average operating conditions on a monthly basis. The site WBM predicts water deficit or excess water over a range of climatic conditions (e.g. average, dry, and wet operating conditions). The GoldSim® modeling software used for the site WBM can simulate monthly precipitation inputs as probability functions (i.e. stochastic inputs). This stochastic site WBM is able to predict make-up water requirements and/or surplus water for the HLF, as well as all mine components, and present it as average, dry, or wet operating conditions.

The Proponent developed the site WBM and the HLF WBM to provide a detailed quantitative description of how water and process leach solution (PLS) moves through the area under average, wet, and dry conditions on a monthly basis. The models were then used to develop a water management plan outlining different strategies to ensure contact water is captured and treated and non-contact water is kept clean, diverted around mine infrastructure, and discharged. The water management plan outlines storage capacity requirements for emergency conditions.

7.3.1.1 Site Water Balance Model

The site WBM presented simulates the effect of land use changes within the Dublin Gulch and Eagle Creek drainage basins through all phases of mine activity under various hydrologic conditions and mine scenarios. It considers the spatial distribution and layout of natural and engineered water conveyance structures proposed including the:

- DGDC and other stream diversions;
- open pit and dewatering/depressurization system;
- HLF and associated process and storage ponds;
- WRSAs and associated sediment control ponds;
- mine water treatment plant (MWTP) system; and
- various storage and control ponds and other smaller water storage/conveyance structures around the mine site.

The Proponent developed a site WBM and HLF WBM as part of the original proposal (VIT 2011a, Appendix 21) based on a HLF capacity of 66 million tonnes and WRSAs capacity of 66 million tonnes. A new site WBM was developed and submitted as part of the SIR (VIT 2012a, Appendix 9) based on a HLF capacity of 92 million tonnes and WRSAs capacity of 132 million tonnes as well as changes to the design of the DGDC. Additional information on the site WBM and HLF WBM was provided in response to information requests by the Executive Committee (VIT 2012c and 2012d).

All WBMs considered each phase of the Project including construction, operation, closure and reclamation, and post closure. In both site WBMs presented (in the proposal and the SIR), the Proponent considered climatic variability, specifically precipitation, and evaluated average, wet, and dry conditions. Wet and dry conditions were evaluated in two ways:

- using specified wet and dry year scenarios that were developed using baseline precipitation data collected for the Project; and
- using average, wet (95th percentile), and dry (5th percentile) scenarios developed using Monte Carlo-type simulation.

For both site WBMs developed, a sensitivity analysis was conducted by varying key model parameters (e.g. runoff coefficients). Higher runoff coefficient values were applied for the new site WBM presented in the SIR resulting in greater surface water flows being generated and managed. The modeling of water movement through the WRSAs considers both infiltrated contact surface water and groundwater.

EcoMetrix indicated that the site WBM and assessment of water management for the Project is detailed and is consistent with industry standards (EcoMetrix 2012b). The scenarios evaluated (i.e. average, wet, and dry) by the Proponent in the site WBM and water management plan are appropriate and have been further evaluated using two different techniques. However, EcoMetrix further indicated that the site WBM should be extended downstream sufficiently to support the water quality model. Flow changes and effects to the aquatic ecosystems are considered below in Section 8. To have a clear understanding of potential changes to the downstream environment and allow for adequate monitoring of stream flow changes, the Proponent should extend the site WBM and predict the flow changes in Haggart Creek. The model should, at a minimum, be extended to downstream of the confluence with Lynx Creek. It is our understanding that that Proponent is currently extending the site WBM downstream to below the confluence with Lynx Creek based on recommendations in the DSR (VIT 2012c). This information should be completed and provided to regulators during the regulatory approval process.

Uncertainties with regards to the site WBM would be reduced if the model was updated using stream flow estimates, specifically those for Haggart Creek, with any additional stream flow data collected since the original proposal. This would provide a better understanding of baseline hydrology and relative impact of potential changes to hydrologic flow regime in Haggart Creek.

Environment Canada has expressed concerns with regards to the modeling assumptions used for the site WBM (YOR #2010-0267-292-1). The approach taken by the Proponent considers water management facilities as flow through elements. In other words, direct precipitation to and evaporation from water management facilities is not considered. The Proponent ran the model using a monthly time-step to predict flows which may smooth out short-duration peak hydrologic events. YCS also expressed concern that peak hydrologic events could overwhelm water management infrastructure (YOR #2010-0267-0341-1).

The approach taken by the Proponent leads to uncertainties with the site WBM. Mine site water management facilities are designed based in part on the results of the water balance model. Uncertainties in the model may lead to inappropriate design and/or insufficient capacity to deal with contact water on-site (e.g. water management facilities may not be sized appropriately).

Environment Canada notes that a more realistic approach may be to run the site WBM including precipitation to and evaporation from ponds and reservoirs (YOR #2010-0267-292-1). Furthermore, running the model with shorter time-steps (e.g. weekly or daily) would provide additional certainty. These different scenarios may identify cases where peak flows, such as rainfall combined with snowmelt during freshet, may overwhelm water management infrastructure. Shorter time-steps may provide additional confidence that water management infrastructure can handle short-duration peak hydrologic events. Government of Yukon, Department of Environment concurred with Environment Canada that ponds should be modeled as reservoirs and that smaller time steps would ensure that shorter duration events or events occurring during critical periods would be captured (YOR #2010-0267-337-1).

The Executive Committee concludes that uncertainties in the site WBM may lead to inappropriate design and/or insufficient capacity to deal with contact water on-site. However, measures proposed by the Proponent as well as additional measures to update and revise the site WBM and to extend the model downstream will ensure uncertainties are adequately addressed and resulting effects are not significant.

7.3.1.2 Heap Leach Facility Water Balance Model

The Executive Committee issued an information request on June 20, 2012 to address concerns related to the HLF WBM after comments were received on the SIR from NND (YOR #2010-0267-295-1) and Environment Canada (YOR #2010-0267-292-1). In response, the Proponent provided additional information which included details on modeling assumptions, sequencing of ore loading and leach solution application, changes to total amount of process leach solution inventory over time, and estimates of draindown timing and leach solution travel times. Part of the response included a technical memorandum titled "Eagle Gold Heap Leach Facility Water Balance – Revision 2" (VIT 2012b, Attachment R7-A) which provided additional information on the HLF WBM. NND provided comments on the DSR outlining concerns with the HLF WBM and operational draindown estimates (YOR #2010-0267-346-1). Specifically, NND expressed concern that the tables included in this technical memorandum indicated that the HLF WBM does not account for sequencing of leaching and ore placement. As a result, NND was concerned that the HLF WBM did not accurately predict operational draindown volumes or the total volume of PLS in the HLF at closure.

Considering comments received on the DSR, the Executive Committee requested additional information from the Proponent to address concerns related to the HLF WBM. Additional information on the HLF WBM, seepage and draindown evaluation, and site WBM was provided. In responding to the request, the Proponent found that the prior HLF WBM (Revision 2), the HLF draindown model, and overall site WBM submitted in July 2012 underestimated the total PLS inventory at closure. To address these errors, the HLF WBM was revised and submitted as HLF WBM Revision 3 (VIT 2012c).

The PLS inventory at the end of operations has increased from 1.7 million m^3 (HLF WBM Revision 2) to 7.7 million m^3 (HLF WBM Revision 3). However, it is important to note that this volume is anticipated to be total moisture content at closure (approximately 13.3 percent) and is not considered free solution that could drain completely (i.e. there will be 8.6 percent residual moisture content). Table 1 provides an estimated HLF PLS inventory for WBM Revisions 3 (VIT 2012c, Table 3).

HLF WBM Revision 2 predicted a net negative water balance throughout operations. Therefore, during operations, the HLF required up to 90 000 m^3 of fresh make-up water per month. Fresh make-up water was to be sourced from contact water from the mine-site (e.g. water collected from the waste rock storage areas and open pit) or from groundwater. The HLF WBM Revision 2 did not predict the need to treat PLS through the cyanide detoxification plant and mine water treatment plant for discharge during normal operating conditions.

The new HLF WBM Revision 3 predicts the HLF to operate with a negative water balance for the first three years of operation. Under normal operating conditions, the HLF is predicted to require fresh make-up water for the first 3 years of operation. Starting in year 4, the HLF will operate with a net positive water balance. Table 10 below has been reproduced from information provided by the Proponent (VIT 2012c, Table 3). As outlined in Table 10, excess water will range from 11 709 to 75 847 m^3.

Table 10 Summary of Estimated Heap Leach Solution Inventory for Water Balance Model Revision 3

Estimated Volume in m^3	Phase 1			Phase 2			Phase 3			
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Estimated total volume of solution in heap at end of period	652 638	1 509 269	2 474 020	3 340 488	4 186 154	5 024 035	5 872 414	6 718 081	7 563 747	7 684 174
Average operating volume of in-heap pond	35 718	38 708	117 315	172 315	182 226	174 743	184 300	186 710	186 270	172 451
Total annual fresh water make-up requirements	210 513	212 122	62 151	0	0	0	0	0	0	0
Total annual excess water released to MWTP	0	0	0	12 363	11 709	0	75 847	70 944	62 599	0

During normal operating conditions, excess PLS will be managed by treatment and discharge to the environment. During upset or emergency conditions, PLS will be managed using the following four prioritized options:

- used as make-up water;
- recycled to inactive leach areas on the HLF (i.e. put into short-term storage);
- transferred to the event ponds for short-term storage and recycling back to the HLF process circuit; and
- delivered directly to the cyanide detoxification plant and mine water treatment plant for treatment and discharge.

Additionally, HLF WBM Revision 2 indicated that the in-heap pond operating capacity would be maintained at approximately 133 000 m^3 while Revision 3, as outlined in Table 10, indicates the capacity will range from approximately 35 000 m^3 in Year 1 to a maximum of 186 710 m^3 in Year 8.

The Executive Committee concludes that uncertainties in the HLF WBM may lead to inappropriate design and/or insufficient capacity to deal with contact water from the HLF (e.g. HLF may not be sized appropriately). However, measures proposed by the Proponent as well as additional measures to update and revise the HLF WBM will ensure that uncertainties are adequately addressed and resulting effects are not significant.

7.3.2 Heap Leach Facility and Event Ponds Storage Capacity

The HLF in-heap pond and the event ponds are the main storage facilities proposed to manage excess water containing PLS during upset or emergency conditions. These facilities provide storage capacity to deal with unanticipated excess water so that other management options, such as water treatment and discharge, can be used to return to normal operating conditions. If the HLF in-heap pond and event ponds storage capacities are not adequate, there may be potential for discharge of untreated PLS or contact water with high concentration of contaminants into the surrounding environment. The discharge of untreated PLS or contact water may have potential effects on various VESECs including Aquatic Ecosystems, Environmental Quality, Wildlife, and Health and Safety. As discussed in other sections of this report, these potential effects are considered adverse and significant.

The site WBM, HLF WBM, and water management plan are the basis for design capacities in the HLF in-heap pond and event ponds. The HLF in-heap pond will have a maximum storage capacity of 459 000 m^3 (507 000 m^3 including freeboard capacity). In their proposal, the Proponent defined freeboard as a safety margin to prevent overtopping of an impoundment. Freeboard calculated for the proposal is the difference between the elevation of the spillway invert and the elevation of the crest of the embankment. In other words, if freeboard capacity is being used excess water will also be flowing over the spillway. Under normal operating conditions, the volume of the HLF in-heap pond will be maintained between 35 000 m^3 in Year 1 and 186 710 m^3 in Year 8, with a maximum operational volume of 194 000 m^3. The event ponds have a total operational storage capacity of approximately 183 000 m^3 plus one meter of freeboard. Including freeboard, the event ponds have a capacity of approximately 217 000 m^3. The total combined system has a storage capacity of approximately 642 000 m^3 without freeboard and 724 000 m^3 with freeboard. Freeboard is considered further in section 9.3.2.

The site WBM defines excess water conditions for the HLF in-heap pond when volumes exceed 194 000 m^3. Under normal operating conditions, excess water from the HLF is directed to the MWTP to be treated and discharged to the environment. This operational rule is designed to maintain a storage capacity of approximately 265 000 m^3 in the HLF in-heap pond and 183 000 m^3 in the event ponds to meet upset or emergency conditions. In the event that inflow to the MWTP exceeds the design capacity of 600 m^3/h or the dilution ration in Haggart Creek is less than 10:1, water is recycled to areas on the HLF that are not under active leaching. During upset or emergency conditions, excess water will be managed using the following four prioritized options:

- used as make-up water;
- recycled to inactive leach areas on the HLF (i.e. put into short-term storage);
- transferred to the event ponds for short-term storage and recycling back to the HLF process circuit; and
- delivered directly to the cyanide detoxification plant and mine water treatment plant for treatment and discharge.

The design basis for sizing of the HLF in-heap pond is to manage a combination snowmelt and severe rainfall event. The event ponds provide additional storage capacity in the event the HLF in-heap pond reaches its maximum capacity. The Proponent has developed five scenarios to represent storage capacities available for upset or emergency conditions (VIT 2012d). The Proponent notes that the each scenario was modeled individually and cumulatively. The scenarios were developed as worst case to ensure storage requirements are available. This ensures storage requirements are available for a worst case emergency precipitation scenario. The scenarios, as defined by the Proponent, include (VIT 2012d):

- *Scenario 1: Normal Operating Conditions (i.e. during wet, average, or dry conditions).*
- *Scenario 2: In-Heap Pond at Max Operating Capacity + Maximum Average Snowmelt Event.*
- *Scenario 3: In-Heap Pond at Max Operating Capacity + Maximum Average Snowmelt Event + 72 hour drain-down.*
- *Scenario 4: In-Heap Pond at Max Operating Capacity + Maximum Average Snowmelt Event + 72 hour drain-down + 100-year, 24-hour rainfall.*
- *Scenario 5: In-Heap Pond at Max Operating Capacity + Rain on Snow Event + 72 hour drain-down + 100-year, 24-hour rainfall.*

The estimated snowmelt volume used for Scenarios 2, 3, and 4 was a maximum average snowpack melting instantaneously over the Phase 1 HLF area. The Proponent chose to calculate the maximum average snowmelt volume for the Phase 1 HLF area rather than the entire HLF area at full build-out (Phases 1 – 3). The end of Phase 1 of the HLF is considered the most critical stage for water management. Once Phase 1 is completed and ore is stacked to the same elevation as the embankment, there will be a relatively small amount of fresh ore available to attenuate a snow melt event (i.e. small amount of pore space to contain excess water). As the HLF is built out in Phases 2 and 3, the HLF will provide significantly more pore space for emergency storage.

In addition, the maximum average snowmelt was calculated with no lag time for infiltration and percolation or accounting for loss of snow through sublimation (i.e. snow loss to air by changing to water vapour without melting to water). In other words, the snowmelt event reports instantaneously to the in-heap pond with no losses. This provides further conservatism as snowmelt is highly dependent on ambient conditions and will likely include slower melting over time, infiltration and percolation lag time into the HLF, as well as sublimation.

Scenario 5 estimates the cumulative volumes from a 100-year, 24-hour rainfall event on a wet year snowpack melt event plus an additional 48 hour snowpack melt for Phase 3 full build-out. The wet year snowpack and 100-year, 24-hour rainfall event were equivalent to the 1:20 year snowpack. The snowmelt that would occur with the 100-year, 24-hour rainfall event was calculated using an empirical calculation provided by the Government of British Columbia (Coulson 1991). The Proponent has indicated that this scenario provides a less conservative prediction of water that requires management than Scenarios 1 through 4. Scenario 5 requires a number of assumptions that are difficult to estimate. Furthermore, the estimates of water that requires management provided in Scenario 5 are lower than Scenario 4.

Table 11 provides a summary of the HLF systems emergency storage capacity under these five scenarios. It has been reproduced from Table R2-1 in the Proponents response to an information request (VIT 2012d).

Under the worst case scenario developed by the Proponent (Scenario 4 as presented above in Table 11) there will still be some remaining storage capacity. There will be approximately 50 000 m^3 of excess storage capacity in the event ponds if the combined 100-year, 24-hour rainfall event, 72-hour draindown event, and the maximum average snowmelt event were to occur simultaneously and instantaneously. In this scenario, the full capacity of the MWTP would be available to treat other mine-influenced contact water.

NND in their comments on the DSR expressed concern that water management infrastructure should be *“sufficient to contain combinations of operational solutions, climatic inputs and draindown events”* (YOR #2010-0267-346-1). NND recommends that the HLF, in-heap pond, and event ponds are sized to be able to fully contain the combination of:

- maximum operational capacity;
- longer duration draindown event that may arise from winter conditions, widespread flooding, or forest fires (e.g. one to two weeks); and
- more severe combination of climatic events (e.g. 100-year snowmelt + wet summer, 100-year 24-hour precipitation at critical time + average conditions, or 100-year 3-month wet period at critical point in time).

The HLF in-heap pond and event ponds as proposed are not sized to account for the combination of events that NND has outlined. For instance, the largest potential volumes of water that would need to be managed under conditions proposed by NND would be a longer duration draindown event. If a scenario were to occur where the HLF were free draining at a rate of 2 770 m^3/h for one or two weeks the volumes of PLS would be 465 530 m^3 and 930 720 m^3 respectively.

The Proponent may be able to manage a one week draindown event during normal operating conditions (i.e. Scenario 1). At maximum HLF operating volume there would be approximately 448 000 m^3 available excess storage capacity. In addition, under normal operating conditions, the MWTP would also be able to treat up to 600 m^3/h (or 100 800 m^3/week). However, the system would become overwhelmed if a one week draindown event were to occur in combination with wet or more severe climatic event, if the MWTP were not operational, or a longer period of continuous draindown.

As outlined in Table 11, the Proponent has shown that they have storage capacity in the HLF in-heap pond and event ponds to manage various high magnitude events as well as various combinations of high magnitude events. In addition, there is capacity to manage certain emergency or upset events beyond those that have been identified in the scenarios presented by the Proponent. For example, Scenario 2 could manage a larger than maximum average snowmelt event as there is an additional 382 000 m^3 of combined excess storage capacity. That being said, there are limits to the amount of storage capacity on-site and the scenarios that can be managed.

In assessing the potential for significant adverse effects related to the capacity of the HLF in-heap pond and event ponds, the Executive Committee has considered the magnitude of potential effects and the likelihood that they occur during the life of the Project. There is a relatively high probability that the Project will experience certain high magnitude events at some point in time. It is likely that an emergency or upset condition such as a large rainfall or snowmelt event, or operational draindown requirement will occur over the 20-year operational phase and reclamation and closure phase. However, there is a lower probability that these upset or emergency events occur concurrently.

The Executive Committee believes that the scenarios modeled by the Proponent, in particular Scenarios 4 and 5, although high magnitude, have a relatively low probability of occurring. Furthermore, the Executive Committee believes that there is conservatism built into the scenarios (e.g. use of maximum HLF operating volume, instantaneous melting of snow, and no accounting for attenuation effects). The Proponent has estimated the maximum average snowmelt for the Phase 1 HLF as it is considered the most critical stage for water management. Additional conservatism is built into the Proponent’s scenarios as during Phase 1 there will likely be additional storage capacity in the HLF in-heap pond as well as less water reporting via surface runoff. The average operating volume of the HLF in-heap pond will be approximately 35 700 m^3, 38 700 m^3, and 117 000 m^3 in Years 1 to 3 respectively. Furthermore, surface water runoff above the Phase 1 HLF will be diverted around the HLF and not report to the in-heap pond or event ponds.

In addition to storage capacities in the HLF in-heap pond and event ponds, the Proponent has outlined water management options to ensure excess water is not released untreated to the environment. During normal operating conditions, excess water will be managed by treatment in the MWTP and discharge to the environment. During upset or emergency conditions, excess water will be managed using the four prioritized options outlined above on pp. 87-88.

Table 11 Summary of HLF System Emergency Storage Capacity Under Various Scenarios

	Scenario 1 (m³)	Scenario 2 (m³)	Scenario 3[1] (m³)	Scenario 4[2] (m³)	Scenario 5[3] (m³)
Max HLF Operating Volume	194 000	194 000	194 000	194 000	194 000
Max. Average Snowmelt from Phase 1 HLF	0	66 000	66 000	66 000	0
72-hour Drain-down Volume	0	0	199 000	199 000	199 000
100-year, 24-hour Rainfall for Phase 3 full build-out[4]	0	0	0	133 000	0
Rain-on-snow Event (100-year, 24-hour rainfall on a wet year snowpack melt event + 48-hour melt) for Phase 3 full build- out[4]	0	0	0	0	193 000
Total Storage Volume Requirements	194 000	260 000	459 000	592 000	586 000
In-heap Pond Excess Capacity	265 000	199 000	0	0	0
Event Ponds Excess Capacity	183 000	183 000	183 000	50 000	56 000
Combined Excess Capacity	448 000	382 000	183 000	50 000	56 000

NOTES:

[1] Scenario 3 represents the criteria used to size the in-heap pond

[2] Scenario 4 represents the rain-on-snow event at end of mine life assuming the 1:100 year 24-hour event and snowmelt over 72 hours from snowpack during wet year (95th percentile 1:20 year return period)

[3] Scenario 5 represents the criteria used to size the in-heap pond and the events ponds

[4] Assumes Phase 3 heap surface of 1.13 million m² plus the additional catchment area of 150,000 m² in the Ann Gulch basin that could report to the events ponds if the interceptor ditches were not functioning.

The Proponent has included redundancies in pumping capabilities to deal with excess water and ensure that the MWTP capacity will not be exceeded. For example, as stated by the Proponent in the SIR, *"the combined pumping rate of treatment and solution recycling (i.e., 80 900 m³/day) is more than twice the total daily volume that is estimated to drain to the Events Ponds during a 1:100 year 24 hour storm during freshet (i.e., 33 000 m³)." (VIT 2012b)* The HLF in-heap pond is equipped with solution transfer pumps with a normal operating capacity of 2 770 m³/h and back-up pumps with a capacity of 693 m³/h. Furthermore, the operational volume maintained in the in-heap pond will be approximately 13 to 42 percent of its total capacity.

In the event that the HLF in-heap pond and both event ponds are at full capacity and an additional upset or emergency event occurs, the Proponent has provided additional management options for excess water (VIT 2012a and 2012d). They include:

- continued treatment of contact water through the MWTP at a rate of 600 m³/h (14 400 m³/day);
- modification of the barren solution pipeline to pump excess process solution as a spray on the HLF. This spray would form snow during cold weather or encourage evaporation during warm weather;
- use back-up transfer pump to double solution recycling and use unsaturated portion of HLF for storage;
- use the open pit as temporary storage for an additional capacity of 50 000 to 275 000 m³ depending on the phase of pit excavation; and
- construction of an additional emergency short-term storage event pond in anticipation of an emergency climatic event.

The Proponent has indicated that, if an emergency climatic event could be predicted (e.g. very deep snowpack at critical times of year, forecasted heavy rains, or reduced storage capacity due to operations), an additional emergency short-term event pond could be constructed within days using on-site equipment and low-permeability material. The pond could be designed to contain approximately 90 000 m³ of excess PLS. The Proponent has identified an appropriate location immediately down gradient from the two event ponds, north of the DGDC.

The Executive Committee has determined that the additional management options for excess water as identified by the Proponent are reasonable so long as equipment is available on-site to implement those options in a timely manner.

Considering all of the water management options proposed by the Proponent, the Executive Committee has concluded that the sizing of the HLF in-heap pond and event ponds is appropriate to manage excess water that may arise from high magnitude, low probability upset or emergency conditions. However, there are inherent uncertainties in all calculations used to estimate and predict storage capacities requirements. For example, the scenarios developed using the water management plan rely on predictions in climate baseline data, site WBM, HLF WBM, etc. Furthermore, it will not be entirely possible to predict the exact operating conditions that will exist until the Project is underway and the Proponent is able to monitor based on actual performance. Operational volumes in the HLF in-heap pond may be higher than anticipated or the event ponds may be required to manage storm run-off on a more frequent basis.

Conditions observed by monitoring during operations as well as refinement of normal operating conditions may lead to changes in the overall water management plan. This could lead to higher predictions of excess water during emergency or upset conditions and thus a requirement for additional storage capacity. The Executive Committee recommends that the Proponent develop an adaptive management plan to compare the actual on-site conditions to predicted conditions. This includes monitoring and refining the HLF WBM, site WBM, and water management plan, to ensure adequate sizing of the HLF in-heap pond and event ponds to manage excess water. In conjunction with responsible regulators the Proponent should define monitoring requirements as well as thresholds and responses. This will provide greater certainty that the goals and objectives identified in the water management plan and in particular the HLF in-heap pond and event ponds storage capacity will be achieved.

For example, the Proponent could monitor the operational volume of the HLF in-heap pond and the frequency of the event ponds usage. If the volumes of water reporting to the HLF in-heap pond or the event ponds during normal operating conditions are greater than anticipated and reach a certain threshold (e.g. volume, frequency, or duration), the Proponent would initiate a specified response. Responses could include construction of an additional permanent event pond to the same specifications as the two proposed event ponds, installing additional pumping capacity, or increasing mine water treatment capacity.

The Executive Committee concludes that the uncontrolled release of excess water due to inappropriately sized water storage facilities may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to develop and implement an adaptive management plan will ensure measures are in place to manage excess water.

7.3.3 Heap Leach Facility Design Basis

The design basis, or Inflow Design Flood (IDF), for the HLF embankment spillway associated with the in-heap pond was the Probable Maximum Flood (PMF) determined by the water balance model. EcoMetrix indicated that the design basis appears reasonable and consistent with industry standards (EcoMetrix 2012b). Furthermore, they noted that the IDF was computed using the Type III antecedent moisture content soil saturation conditions and makes the correct design assumption of “wetter” than normal soil conditions prior to the design event.

While the design basis for the HLF embankment spillway included the PMF, Environment Canada has expressed concern that all infrastructure associated with the stability of the HLF should be designed to this basis (YOR #2010-0267-339-1). They reference the Environmental Code of Practice for Metal Mines (Environmental Code) which recommends that tailings management facilities and associated structures should be designed to the PMF for long-term stability (Environment Canada 2009). While the Environmental Code doesn’t speak specifically to heap leach facilities, Environment Canada considers them “to be analogous to a tailings impoundment facility, suggesting an equivalent design standard” given that, at closure, they contain spent ore materials (YOR #2010-0267-339-1). It is uncertain whether or not the entire HLF has been designed to the PMF.

EcoMetrix identified a concern with regards to the HLF embankment spillway design. The spillway design uses a weir discharge coefficient of 3.0 which is typical for a sharp-crested weir spillway. For a broad-crested weir such as the HLF embankment, a weir discharge coefficient in the range of 1.6 to 1.7 would typically be applied. EcoMetrix suggests the proposed weir discharge coefficient assumptions related to using a coefficient of 3.0 should be reviewed and confirmed at the detailed design stage. After this review, the spillway should be sized accordingly. This will ensure stability of the HLF embankment in the event that the spillway is required.

The Executive Committee concludes that the use of an inappropriate weir discharge coefficient may result in significant adverse effects. However, there are options that will adequately reduce or control adverse effects so that resulting effects are not significant. This includes reviewing assumptions, confirming the appropriateness of the application of the proposed weir discharge coefficient, and sizing the spillway accordingly.

7.3.4 Event Ponds Spillways

The design for the event ponds provided in the proposal does not include emergency spillways. Although emergency discharge of process leach solution from the event ponds is not a desired outcome, without emergency spillways, excess process leach solution could result in failure of the ponds. Failure could result in discharges beyond that which would occur through an emergency spillway. Effects related to unintended discharge and management of process leach solution has been addressed in Section 8. EcoMetrix indicated that an emergency overflow spillway for the event ponds should be provided (EcoMetrix 2012b). The emergency spillway should be able to safely convey the IDF. The IDF for the event ponds should be the same as the IDF for the In-Heap Pond.

The Executive Committee concludes that event ponds without emergency spillways may result in significant adverse effects. However, ensuring event ponds have appropriately sized emergency spillways will adequately reduce or control adverse effects so that resulting effects are not significant.

7.3.5 Heap Leach Facility and Event Ponds Sensitivity Analysis

EcoMetrix has also expressed concerns regarding the ability of the HLF in-heap pond and the event ponds to manage larger snowmelt events (e.g. 25-year or 100-year snowmelt events) with minimal infiltration. They recommend a sensitivity analysis be conducted at the detailed design stage to assess the effect of infiltration percentage on pond volumes.

The Executive Committee concludes that ponds inadequately sized to manage larger snowmelt events may result in significant adverse. However, conducting a sensitivity analysis and sizing the ponds based on results will adequately reduce or control adverse effects so that resulting effects are not significant.

7.3.6 Sediment Control Ponds

Information in the SIR indicated changes to the number of sediment control ponds (SCP). The proposal proposed five SCP while the SIR proposes four as follows:

- Eagle Pup Sediment Control Pond;
- Platinum Gulch Sediment Control Pond;
- Lower Dublin Gulch South Sediment Control Pond; and

- Lower Dublin Gulch North Sediment Control Pond.

YCS has expressed concern with regards to the decrease in the number and ultimately the volume of the SCP (YOR #2010-0267-291-1). YCS recommends larger capacity based on unpredictability of precipitation in Yukon. EcoMetrix indicated that the size of the SCP appears small relative to the upstream drainage areas (EcoMetrix 2012b). This may be because a significant percentage of runoff is assumed, based on water balance modeling, to infiltrate directly into the WRSAs and does not need to be managed in SCP. EcoMetrix recommends a sensitivity analysis be conducted at the detailed design stage to assess the effect of modeling and water balance assumptions on pond volumes.

The design basis for temporary and permanent SCP includes a depth of 1.5 m. The design basis does not include sizing. It is uncertain why a depth of 1.5 m is specified as SCP functionality is dependent on residence time and pond shape. Therefore, it is uncertain whether or not SCP are sized appropriately to reduce sediments in surface water. The release of water with high concentrations of total suspended solids may result if SCP are not sized appropriately.

The Executive Committee concludes that the release of water with high concentrations of total suspended solids due to SCP that are not sized appropriately may result in significant adverse effects. However, sizing ponds appropriately will adequately reduce or control adverse effects so that resulting effects are not significant.

7.3.7 Dublin Gulch Diversion Channel (DGDC)

The DGDC will be constructed to divert surface waters around mine infrastructure including the HLF and embankment, soil stockpile areas, event ponds, and camp area. The primary function of the DGDC will be to convey clean surface water from the Dublin Gulch watershed upstream of the Project. It will be constructed during the initial construction period and is intended to be a permanent diversion structure. Armouring along the DGDC includes turf reinforcement along gentler slope sections and a series of concrete armoured stepped drop structures along steeper slope sections. Typically the channel is about 1.5 to 3 m deep and about 10 to 26 m wide. The permanency of the DGDC is critical to ensure the stability of other permanent infrastructure such as the HLF. If the DGDC is not sized or designed appropriately, it may not be able to handle certain hydrologic events (i.e. high rainfall or snowmelt events). This in turn could lead to damage or degradation over time of permanent infrastructure.

The Proponent has designed the DGDC to have a channel capacity and armouring sized to accommodate a 100-year, 24-hour storm event with adequate freeboard requirements. The DGDC will also be able to convey a 500-year, 24-hour storm event without freeboard. However, armouring will not be sized to accommodate a 500-year, 24-hour storm event. EcoMetrix has indicated that for the most part the design basis appears reasonable and is consistent with industry standards (EcoMetrix 2012b). However, they have noted concerns with regards to the channel armouring where it abuts critical infrastructure such as the HLF and event ponds. NND has also expressed similar concern with the design storm event for the DGDC (YOR #2010-0267-295-1). Areas of the DGDC will be adjacent to and in some cases may be at a higher elevation than the base of the HLF embankment. Although the sizing of the DGDC will accommodate a 500-year, 24 hour storm event, there is no armouring for such an event. As a result, an event larger than a 100-year, 24 hour storm event could lead to erosion and channel failure or erosion of the HLF embankment. Although the likelihood of an event larger than 100-year event may be moderate over the life of the Project, the likelihood increases post-closure. While the risks are lower after post-closure as the HLF will be detoxified, there is still the risk of instability in the HLF embankment and the potential for release of spent ore (i.e. tailings).

The Proponent has indicated that the DGDC, above the armouring for a 100-year, 24 hour storm event, will be stabilized with turf reinforced armouring (geotextile turf reinforcement mat to encourage natural vegetation). Other flatter sections of the DGDC will be armoured with turf as well. Steeper sections will use concrete armoured stepped drop structures. Appendix 4 to the SIR (Heap Leach Facility Feasibility Design – Dublin Gulch Diversion Channel Design) indicates that vegetation will be fully established before the DGDC will be put into use. Turf reinforcement armouring requires proper seeding and the development of vegetation growth for erosion protection, prior to being put into use. Vegetation growth may be difficult to establish under the site conditions and climate.

EcoMetrix has indicated that the long-term reliance of turf reinforced channel armouring is tenuous and that the DGDC is not stable as planned (EcoMetrix 2012b). Due to the risk of erosion and progressive slope failure, channel armouring (with more stability than turf reinforcement) and freeboard should be provided for a 500-year, 24-hour storm event along portions for the DGDC where it abuts critical site infrastructure (i.e. the HLF and event ponds). NND has indicated similar concerns (YOR #2010-0267-295-1).

Both NND and EcoMetrix expressed concern with the concrete block armouring proposed in the steeper portions of the DGDC (YOR #2010-0267-295-1 and EcoMetrix 2012b). Concrete armouring are not natural features and their use in a permanent diversion channel would require ongoing maintenance to ensure stability. Over time, these features may become unstable and eventually fail. The concrete block armouring relies on steel cables for stability. Long-term stability of the concrete structures would rely on the integrity of the steel cabling. More natural step pool features designed to replace the concrete block features may be more stable and self-sustaining in the long-term. EcoMetrix suggests step pool features with slopes in the range of 10 to 20 percent.

In modeling the peak flows, the Proponent used Type II SCS storm distribution to temporarily distribute total rainfall accumulation over a 24-hour period. To emulate average soil saturation conditions, the Proponent used Type II Antecedent Moisture Content (AMC). The U.S. Soil Conservation Service (SCS) has developed three conditions that represent pre-storm event soil moisture conditions. These include dry (Type I), average (Type II), and wet (Type III). The wetter the soil prior to a storm event the greater the volume of runoff and peak flow.

EcoMetrix has noted concerns with regards to using Type II AMC to compute the IDF of the DGDC and suggests using Type III AMC. By using Type II AMC rather than Type III, the design of the DGDC may not account for the maximum volume of water predicted for peak flow. Severe design flood applications typically apply Type III AMC as it is representative of wet (nearly saturated soil or frozen ground) conditions. In the case of the DGDC, EcoMetrix indicates that the Type III AMC should be assumed for the IDF to minimize project risk.

The Executive Committee concludes that the proposed approach to use turf reinforced armouring in areas that abut key mine site infrastructure and the use of concrete block armouring in the steeper sections may result in instability of the DGDC. This instability may result in significant adverse effects. However, there are options that will adequately reduce or control adverse effects so that resulting effects are not significant. This includes additional armouring, using more natural features, and refining the design flood parameters.

7.3.8 Diversion Ditches and Interceptor Ditches

The Proponent has proposed a number of temporary and permanent diversion and interceptor ditches. These ditches will divert water around mine site infrastructure to minimize on-site contact water or reduce surface water run-on. Temporary ditches will be designed for a 10-year 24-hour event, with a minimum depth of 300 mm, and side slopes for unlined ditches of 2H:1V and lined ditches of 1H:1V. Permanent ditches will be designed for a 10-year 24-hour event, with a minimum depth of 600 mm, and side slopes (unlined/lined) of 2H:1V/1H:1V.

EcoMetrix has indicated that in general, the design basis appears reasonable and consistent with industry standards (EcoMetrix 2012b). However, several concerns were identified with regard to depth of temporary ditches and side slopes for temporary and permanent ditches. Ditches on mine sites tend to be constructed with minimal to no grade. This results in the potential for them to fill rapidly with sediment. EcoMetrix recommends temporary ditches have a minimum depth of 600 mm rather than 300 mm to account for this.

Temporary and permanent ditches are proposed to have lined side slopes of 1H:1V. If ditches are rock lined for stability, these side slope angles may not be appropriate. A side slope of 1H:1V for a rock lined ditch is not stable as 1H:1V is steeper than the natural angle of repose for typical rip rap material. To provide a 1H:1V side slope, a ditch would typically have to be lined with concrete or gabions. EcoMetrix recommends that if the ditches are rock lined the side slopes be no steeper than 1.5H:1V and preferably 2H:1V.

NND has expressed concern with using permanent and temporary diversion ditches with a design storm event of a 10-year 24-hour event (YOR #2010-0267-295-1). It is likely that a 10-year 24-hour event will occur during the 20-year mine life. Failures of diversion ditches during events greater than this may result increased sediment loading. The design basis is also inconsistent with the HLF Feasibility Design and HLF water balance. The HLF Feasibility Design (VIT 2012a, Appendix 4) indicates that temporary diversion ditches will be designed with a 100-year 24-hour event. Furthermore, calculations for the HLF water balance are based on a 100-year 24-hour event and appear to assume that the diversion ditches around the HLF would continue to divert run-on water.

If diversion ditches around key infrastructure such as the HLF are sized for a 10-year event rather than a 100-year event, the Proponent may have to deal with excess water at various times. It is likely that a 10-year 24-hour event will be exceeded during the life of the mine.

The Executive Committee concludes that instability of diversion ditches and interceptor ditches may result in significant adverse effects. However, additional measures to ensure the design basis accounts for sedimentation as well as design storm events will adequately reduce or control adverse effects so that resulting effects are not significant.

7.3.9 Groundwater Model

The Proponent provided a groundwater model in their initial submission (VIT 2011a, Appendix 22). As mentioned above, in the evaluation of baseline, the data input to this model covered only a short period of record. The Proponent committed to continuous data collection and to update the model accordingly. An updated model has not been submitted to YESAB to date. The Executive Committee is satisfied with the design of the current model and understands that an updated model will be used for permitting purposes. Government of Yukon expressed concerns with regards to the groundwater model including limited hydraulic property data, period of record for groundwater baseline data, and validation and calibration of the model (YOR #2010-0267-197-1).

Information on the hydraulic properties of the hydrologic units is based primarily on packer tests and slug tests with results from a single pumping test. Although slug and packer tests provide valuable information, they generally characterize a limited area adjacent to the borehole. Limited hydraulic data may lead to uncertainty in the volume of water that may be produced from sources such as pit dewatering and collection beneath the HLF. Additional pumping tests would decrease uncertainties related to hydraulic properties of the hydrologic units and allow for additional calibration and validation of the groundwater model.

The period of record for data included in the groundwater model is short and does not include data for winter months. This leads to uncertainty in the annual groundwater flux and the representativeness of the groundwater model predictions throughout the year.

The groundwater model was calibrated based on the model response to a pumping test conducted in 2010 in the lower Dublin Gulch area. Although results from the pumping test showed a good match to the predictions from the model, the area of influence from the pumping test is less than one percent of the model area. Furthermore, the pumping test conducted is not representative of groundwater below key mine site infrastructure such as the HLF, open pit, or WRSAs. The Proponent has indicated that additional seasonal groundwater data is being collected. This data will be used to further validate and calibrate the model. Government of Yukon has indicated that the current model should be considered a development model and should be refined as more information becomes available (YOR #2010-0267-197-1). They have also indicated that the overall model advancement approach outlined in the groundwater model report (VIT 2011a, Appendix 22) is appropriate to reduce model uncertainties. This approach includes:

- model calibration based using baseline data from on-going monitoring;
- additional evaluation of sustainable well pumping rates through long-term (four to seven days) aquifer pumping tests in the open pit area and the lower Dublin Gulch valley area;
- refining groundwater withdrawal estimates associated with dewatering and depressurization with data collected from proposed installation of additional deep wells in the open pit area and subsequent proposed aquifer pumping tests; and
- using compliance monitoring data and meteorological data during mine construction, mining operation, and closure phases to validate model.

The Executive Committee has determined that uncertainties in the groundwater model may result in significant adverse effects. The Executive Committee notes that the Proponent has committed to update the groundwater model by including new baseline data. The updated model will be provided to the regulators during the regulatory process. Government of Yukon has expressed concern related to uncertainties surrounding groundwater plume migration below the HLF and WRSAs (YOR #2010-0267-337-1). An updated model may provide reliable predictions of potential groundwater contamination and migration. Government of Yukon recommends regular monitoring of groundwater quality in locations down gradient from key infrastructure that will allow early detection and timely intervention of potential groundwater contamination.

7.3.10 Recommended Terms and Conditions

In determining the significance of the effects related to adverse changes to hydrology, the Executive Committee has considered the following non-discretionary legislation:

- *Fisheries Act*
- *Waters Act* and *Waters Regulation*
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- *Canadian Environmental Protection Act*
- *Environment Act*

The Executive Committee has also considered the role of the Yukon Water Board and their authority under the *Waters Act* to issue a Water Use Licence (WUL) for a proposed use of water or deposit of waste into water, or both. Section 12 (4)(a)(i) of the *Waters Act* provides, in part:

> *"Where an application for a licence is made, the Board shall not issue a licence unless the applicant satisfies the Board that… the use of waters or the deposit of waste proposed by the applicant would not adversely affect, in a significant way, the use of waters, whether in or outside the water management area to which the application relates…"*

Section 13 (1)(a)-(e) of the *Waters Act* states:

> *"Subject to this Act and the regulations, the Board may include in a licence any conditions that it considers appropriate, including, without limiting the generality of the foregoing,*
>
> *(a) conditions relating to the manner of use of waters permitted to be used under the licence;*
>
> *(b) conditions relating to the quantity, concentration, and types of waste that may be deposited in any waters by the licensee;*
>
> *(c) conditions under which any such waste may be so deposited;*
>
> *(d) conditions relating to studies to be undertaken, works to be constructed, plans to be submitted, and monitoring programs to be undertaken; and*
>
> *(e) conditions relating to any future closing or abandonment of the appurtenant undertaking."*

The Executive Committee has determined that the Project will result in significant adverse effects. However the effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of the following terms and conditions specified by the Executive Committee:

To reduce uncertainties associated with the water balance model as well as provide sufficient basis for future monitoring:

36. The Proponent shall extend the site water balance model (WBM) sufficiently downstream to support the water quality model. Consideration should be given to extend the model downstream to the confluence of Haggart Creek with Lynx Creek. This information shall be provided to the responsible regulators during the regulatory approval process.
37. The Proponent shall update the site WBM and Heap Leach Facility (HLF) WBM with updated stream flow and climatic input estimates based on additional data collected since the proposal was submitted. This information shall be provided to responsible regulators during the regulatory approval process.
38. The Proponent shall revise the site WBM and the HLF WBM to account for direct precipitation (i.e. rain and snow) and evaporation to model components (e.g. event ponds and HLF) and run scenarios using a shorter time-step (e.g. weekly or daily rather than monthly time-step). The Proponent shall update the water management plan to account for revised predictions.

To ensure stability of the HLF:

39. The Proponent shall ensure the HLF and embankment are designed to the Probable Maximum Flood for long-term stability.
40. The Proponent shall review the assumptions and confirm the appropriateness of the application of the proposed weir discharge coefficient of 3.0 for the HLF embankment spillway. The spillway shall be sized accordingly.

To ensure the HLF in-heap pond and the event ponds are sized appropriately to manage emergency or upset conditions:

41. In conjunction with responsible regulators, the Proponent shall develop an adaptive management plan to compare the actual on-site conditions to predicted conditions. The plan shall outline requirements for:
    a. monitoring (e.g. frequency, documentation, review procedures), defined thresholds, and management responses;
    b. refining the HLF WBM, site WBM, and water management plan based on results from on-site monitoring as well as any changes to the mine plan and site infrastructure during operations;
    c. reviewing the HLF WBM, site WBM, and water management plan prior to (i) the Phase 2 expansion of the HLF and (ii) the Phase 3 expansion of the HLF; and
    d. follow-up monitoring of management responses.

42. The Proponent shall ensure that the area identified for an emergency event pond (i.e. down gradient from the two proposed event ponds and north of the Dublin Gulch Diversion Channel) remains available in case a temporary or permanent event pond is required in the future.

43. The Proponent shall, prior to the regulatory approval process, conduct a sensitivity analysis to assess the effect of infiltration on the HLF in-heap pond and event ponds volumes. Pond volumes and sizes shall be reviewed based on the results of the sensitivity analysis.

To ensure stability of the event ponds:

44. The Proponent shall construct the event ponds with emergency overflow spillways which are able to safely convey the Inflow Design Flood predicted by the water balance model.

To ensure proper function of the sediment control ponds and minimize the potential for release of water with high concentrations of Total Suspended Solids:

45. The Proponent shall ensure that sediment control ponds are sized adequately to meet Total Suspended Solids concentration effluent criteria.

To reduce risks associated with the Dublin Gulch Diversion Channel:

46. Where portions of the Dublin Gulch Diversion Channel and Velocity Reduction Pond abut critical mine site infrastructure, the Proponent shall ensure armouring more durable than turf reinforced armouring is constructed to account for a 500-year, 24-hour storm event.

47. The Proponent shall design and construct the Dublin Gulch Diversion Channel using more natural features such as step pool features rather than concrete block armouring. If the construction of more natural features is not possible, prior to the regulatory approval process the Proponent shall provide responsible regulators with: appropriate rationale for the use of concrete block armouring; a detailed analysis of stability; and a monitoring and maintenance plan.

48. The Proponent shall use Type III Antecedent Moisture Content (AMC), rather than Type II AMC to compute the Inflow Design Flood of the Dublin Gulch Diversion Channel.

To ensure stability of diversion ditches and interceptor ditches:

49. The Proponent shall ensure temporary diversion or interceptor ditches are sized to account for infilling of sediments. This includes increasing the minimum depth from 300 mm where conditions warrant (e.g. ditches constructed with minimal to no grade).

50. The Proponent shall ensure that lined temporary and permanent diversion or interceptor ditches that are lined in a manner that is stable.

51. The Proponent shall ensure that temporary and permanent diversion or interceptor ditches that convey water away from key mine site infrastructure (e.g. the HLF, WRSAs, and event ponds) are sized to accommodate a 100-year, 24-hour design storm event.

To minimize the likelihood of inaccurate water quality model predictions leading to effects on the aquatic ecosystems

52. As proposed, the Proponent shall ensure that a revised groundwater model is submitted to responsible regulators during the regulatory approval process.
53. The Proponent shall, in discussions with responsible regulators, ensure groundwater monitoring occurs at appropriate locations down gradient from potential sources of contamination to enable early detection and timely intervention of potential groundwater contamination.

7.4 Cumulative Effects Assessment

The residual effects of the Project related to hydrology will interact with the residual effects of other projects beyond the Project site. Existing activities in the region consist of placer mines and quartz exploration projects, as well as, several residential dwelling and camps. There are several quartz and placer exploration projects active in the Haggart Creek watershed and additionally there have been several recent projects assessed by YESAB (listed in Appendix E).

Generally speaking, quartz exploration projects and placer exploration may include diversion of surface water, vegetation clearing, excavation of soils, aircraft support, establishment and use of roads and trails, establishment and use of camps, use of heavy equipment, storage and use of petroleum products. The potential residual effects of the existing and proposed projects are similar in nature to those of this Project. However, activities such as the construction of large permanent facilities (e.g. HLF and WRSAs) are not occurring for other projects in close proximity to the Project.

The commitments made by the Proponent, the non-discretionary legislation, and the mitigation measures recommended in this report, are considered adequate to reduce the cumulative effects.

The Executive Committee has determined that the residual effects of the Project, in combination with the residual effects of other projects, and existing and proposed activities, will not result in significant adverse cumulative effects.

7.5 Conclusion of the Hydrology Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects.

8.0 AQUATIC ECOSYSTEMS

This section addresses potential effects of the Project on aquatic ecosystems. An understanding of the environmental and socio-economic setting for aquatic ecosystems is provided, and potential adverse effects are characterized and discussed in the context of the proposal, stakeholder comments, relevant legislation and proposed mitigation strategies. The Executive Committee concludes that compliance with relevant legislation, proposed mitigation strategies and specified terms and conditions will effectively eliminate, reduce or control significant adverse effects on aquatic ecosystems.

8.1 OVERVIEW

The Project will involve excavating approximately 132 million tonnes of waste rock and 92 million tonnes of ore. Waste rock will be disposed of in two permanent WRSAs and ore will be placed in the HLF. During the operations phase process leach solution containing cyanide will be circulated through the HLF to remove gold and other metals.

Water that comes into contact with exposed waste rock and ore will require management throughout the operations, closure, and post-closure phases. The Proponent has predicted that contact water (i.e. precipitation, surface water, or groundwater that comes into contact with mine infrastructure/components) may have elevated concentrations of metals. The Proponent has used water quality guidelines (WQG) as a basis to predict potential effects on aquatic ecosystems. Guidelines used include the Canadian Council of Ministers of the Environment (CCME) WQG for the protection of aquatic life, British Columbia (BC) WQG where there are no CCME WQG, and site specific water quality objectives (SSWQO) based on baseline data collection.

The Proponent has proposed a Water Management Plan as discussed above in Section 7. Part of the plan is to collect all contact water and treat as necessary, using a mine water treatment plant, prior to discharging the water to the environment. Discharge will meet WQG identified by the Proponent and water quality standards ultimately set by regulators during the regulatory approval process.

The Project includes construction of mine site infrastructure that directly overlaps fish habitat. Portions of the WRSAs, HLF, and open pit will infill portions of streams while Dublin Gulch will be re-routed. The Proponent has identified key strategies to deal with the destruction of fish habitat as well as the potential for direct impacts to fish. The main strategy is to construct a fish habitat compensation area to ensure that there is no net loss of habitat.

The Executive Committee has considered the following potential adverse effects to aquatic ecosystems:

- potential increased metal concentration in surface water discharge due to inadequate or inaccurate geochemical characterization and source term predictions;
- adverse changes to water chemistry;
- increased metal concentration in surface water discharge due to ineffective passive treatment systems during post-closure; and
- adverse changes to fish and fish habitat.

Effects of the environment on the Project, such as extreme hydro-meteorological events or earthquakes, are also addressed in this section.

8.2 EVALUATION OF BASELINE INFORMATION

To predict effects on aquatic ecosystems, the Proponent has provided information on existing water quality for surface water at the mine site, expected sources of water contamination from the mine site, models predicting the types and concentrations of these contaminants and the distribution of aquatic life downstream that could be adversely affected by the contaminants.

8.2.1 Geology and Acid Rock Drainage and Metal Leaching

Precipitation and surface water coming in contact with rock mined, or exposed, by the Project is expected to be the single largest source of water contamination and potential effects on aquatic ecosystems. The Proponent provided several reports and documents characterizing the geochemistry of different rock units that will be disturbed at the mine site. This information is outlined in the following appendices to the proposal:

- Appendix 8 – Geochemical Characterization and Water Quality Predictions, April 2011
- Appendix 26 – Interim Report of Metallurgical Test Work, November 2010
- Appendix 27 – Leach Metallurgy and Neutralization Summary, November 2010

The characterization of waste rock and ore included a review of assay data, static and kinetic testing, and data interpretation. Samples were taken from exploration drilling programs and included materials representative of the original open pit design. Table 12 is reproduced from the proposal and represents a summary of the testing program presented by the Proponent.

Results of the geochemical testing program indicate that acid rock drainage (ARD) is not expected at the mine site. Through X-ray Diffraction (XRD)/Refraction, the Proponent found that carbonate materials (neutralizing materials) were generally well in excess of sulphides (acid generating material). The *Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia* (Price 1997) and *Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials* (MEND 2009) indicate that a neutralization potential to acid potential ratio (NP/AP) above four is considered non-acid generating. Acid Base Accounting (ABA) results for the Project indicated that the majority of samples had a NP/AP ratio above four. Kinetic test results indicate that, although there is not expected to be ARD, there is the potential for metal leaching (ML) under neutral drainage conditions.

Table 12 Summary of Testing Program by Material Type

Sample Type	Estimated Tonnage		Number of Samples Tested by Method				
	Waste	Ore	Acid Base Accounting	Whole Rock Analysis	Metals by ICP-MS	XRD/ Petrography	Kinetic Testing
Metasediment	34	30	101	62	77	3	4
Oxidized Granodiorite	9.0	11	57	47	35	2	3
Unaltered Granodiorite	23	18	66	56	51	2	3
Altered Granodiorite	1.0	6.9	69	50	54	3	7[a]
Metallurgical Composite (ore)			1	0	1	1	2[b]

NOTES:

[a] *seven tests were conducted, including three individual samples, and one sample that was tested in quadruplicate with a duplicate standard humidity cell as well as two modified procedures.*

[b] *a standard humidity cell test was completed on the head sample, and a large scale modified kinetic test was completed on the same sample following metallurgical testing and detoxification procedures.*

Water quality predictions were developed using kinetic test data for the WRSA, HLF, and the open pit. As indicated in Section 4.1.4 of the proposal:

> *"The results of the predictions indicate that contact water associated with the waste rock and open pit walls would be near neutral with respect to pH but with somewhat elevated concentrations of sulphate, arsenic, cadmium, manganese, antimony, selenium and uranium, and possibly fluoride, copper, iron, mercury, molybdenum, thallium and zinc."* (VIT 2011a)

On May 11, 2012, the Proponent submitted a Supplementary Information Report (SIR) outlining modifications to the Project. The modifications included increasing the amount of waste rock generated from 66 to 132 million tonnes and ore from 66 to 92 million tonnes. The size and surface area of the WRSAs, HLF, and open pit walls have all increased accordingly. The geochemical characterization presented in Appendix 8 (Geochemical Characterization and Water Quality Predictions) of the original proposal has not been updated to account for the additional tonnage of rock being disturbed. Sample types, locations, and numbers, are based on the original open pit configuration, waste rock volumes, and ore volumes.

8.2.2 Water Quality and Aquatic Biota

The local study area for baseline water quality and aquatic biota includes the Dublin Gulch, Eagle Creek, and Haggart Creek drainage basins. Dublin Gulch and Haggart Creek basins have experienced extensive placer mining over the past century. Historical placer mining activities in the area have affected riparian areas through the removal of vegetation and diversions of drainages. The Proponent collected baseline data on water quality, sediments, periphyton and benthic invertebrates. This information is summarized in the proposal and presented in Appendix 16 to the proposal (Environmental Baseline Report: Water Quality and Aquatic Biota). Additional water quality baseline data as well as fish and fish habitat data was provided by the Proponent (VIT 2011b).

8.2.2.1 Water Quality

Water quality testing recorded pH ranging from 7.5 to 8.3 at the monitoring sites. All sites except Dublin Gulch indicated a high acid buffering capacity. Sites in upper Dublin Gulch tended to have much lower conductivity, lower sulphate and lower total dissolved solids concentrations than other sites. Turbidity tended to be low at all sites. At certain times, turbidity measurements were higher and they corresponded with exceedances of CCME WQG for certain metals including aluminum, arsenic, cadmium, copper, iron, and lead.

Nutrient levels observed tended to be low. In about 80 percent of samples, ammonia was below detection limits. Nitrogen levels were lowest in Dublin Gulch, intermediate in Lynx Creek, Haggart Creek, and lower Dublin Gulch, and highest in Eagle Creek. Phosphorus levels were highest in Stewart Gulch and generally lowest in Haggart Creek. In about 65 percent of samples phosphorus was below detection limits. At all sites other than Ann Gulch, mean dissolved organic carbon levels tended to be low.

Measurements for total and weak acid dissociable cyanide were below detection limits in more than 90 percent of samples analyzed. Several other metals were consistently below detection limits. Several metals including aluminum, cadmium, copper, iron, lead, and zinc occasionally exceeded guidelines. In most samples from Dublin Gulch, Eagle Creek, and Lynx Creek, and some samples from Haggart Creek, total arsenic exceeded guidelines. Dublin Gulch and Eagle Creek mean arsenic levels were approximately an order of magnitude higher than levels in Haggart Creek and Lynx Creek.

Stream sediments were analyzed for metal levels. Arsenic levels in sediments were found to be higher in Dublin Gulch than Haggart Creek while copper levels were lower. Generally, metal concentrations in sediments were higher in Dublin Gulch and Eagle Creek relative to Haggart Creek and Lynx Creek.

8.2.2.2 Periphyton

Periphyton sampling was conducted to provide baseline conditions for primary productivity and community diversity as well as to provide a comparison with future levels in potentially affected streams. Measures of chlorophyll-a indicate oligotrophic (i.e. low nutrient) water conditions. The number of periphyton species per site varied from 10 to 68. Species diversity was higher in Haggart Creek and lower in Eagle Creek and Lynx Creek. Diatoms and blue-green algae were predominant species in Haggart

Creek while blue-green algae was predominant in Dublin Gulch, Eagle Pup, and Stuttle Gulch. In Lynx Creek, one set of survey data indicated diatoms were predominant while another set of data indicated blue-green algae were predominant.

8.2.2.3 Benthic Invertebrates

Benthic invertebrate sampling was conducted to provide baseline conditions of community diversity and abundance. Data generally indicated poor habitat in Eagle Creek and better habitat in Haggart Creek and Dublin Gulch. Data indicated Lynx Creek was intermediate compared to other sites.

8.2.3 Fish and Fish Habitat

The local study area for baseline fish and fish habitat includes the Dublin Gulch, Eagle Creek, and Haggart Creek drainage basins. Dublin Gulch and Haggart Creek basins have experienced extensive placer mining over the past century. Historical placer mining activities in the area have affected riparian areas through the removal of vegetation and diversions of drainages. The Proponent collected baseline data on fish and fish habitat. This information is summarized in the proposal and presented in Appendix 5 to the proposal (Environmental Baseline Report: Fish and Fish Habitat). Additional fish and fish habitat baseline data was provided in the Proponent's response to request for supplementary information (VIT 2012a).

Fish and fish habitat baseline information was collected on biophysical habitat, fish presence and abundance, and characterization of fish populations. Baseline data was collected from streams in the Project area including streams directly affected by the Project and streams that will not be affected by the Project. In total, the Proponent sampled 26 streams in the study area.

The Proponent identified 14 of the 26 streams sampled as fish-bearing or potentially fish-bearing. These include streams located within or immediately downstream of the Project: lower Dublin Gulch, Eagle Creek, and Haggart Creek. Lynx Creek and Iron Rust Creek were also identified as fish-bearing. The remaining nine streams identified as fish-bearing were along the access road.

The Proponent confirmed the presence of 11 fish species in the South McQuesten River watershed including: Chinook salmon (*Oncorhynchus tshawytscha*), Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), longnose sucker (*Catostomus catostomus*), Arctic lamprey (*Lampetra camtschatica*), burbot (*Lota lota*), slimy sculpin (*Cottus cognatus*), round whitefish (*Prosopium cylindraceum*), inconnu (*Stenodus leucichthys*), lake whitefish (*Coregonus clupeaformis*), and rainbow trout (*Oncorhynchus mykiss*). Five fish species are known to inhabit Haggart Creek and Lynx Creek including Chinook salmon, Arctic grayling, round whitefish, burbot, and slimy sculpin. Two fish species, Arctic grayling and slimy sculpin, are known to inhabit Dublin Gulch, Eagle Creek, and Ironrust Creek.

In fish capture programs conducted by the Proponent, five species were captured in ten different streams. The Proponent captured Arctic grayling in nine streams and slimy sculpin in seven streams. Both were captured in streams within the Project footprint. Burbot were captured in the South McQuesten River and Lower Haggart Creek. The Proponent observed but did not capture any Chinook salmon or longnose sucker. Both juvenile and spawning Chinook salmon were observed on different occasions in the South McQuesten River. Previous studies have indicated the presence of Chinook salmon in Haggart Creek and

Lynx Creek. Within the Project site, Arctic grayling and slimy sculpin are present in lower Eagle Creek, lower Dublin Gulch and Haggart Creek. Fish are not present in upper Eagle Creek and upper Dublin Gulch due to barriers to fish passage.

The Proponent has indicated that they believe Arctic grayling overwinter in the South McQuesten River and re-establish populations in Haggart Creek and its tributaries in the summer. It is uncertain when Arctic grayling out-migrate to the South McQuesten River in the autumn. However, the Proponent has indicated that outmigration from Dublin Gulch may not occur until after October. Arctic grayling have been captured in Haggart Creek in April and May suggesting overwintering habitat. As well, the Proponent has identified potential overwintering habitat in Lynx and Haggart Creek. Arctic grayling predominantly spawn during the last two weeks of May in the South McQuesten River. The Proponent also identified potential spawning habitat in Lynx, Haldane, Secret, and Haggart Creeks. Overwintering and spawning habitat within the Project footprint, Dublin Gulch and Eagle Creek, was determined to be poor quality due to residual pool depths (≤0.3 m) and lack of suitable gravel. Based on the information collected by the Proponent, it is believed that Arctic grayling are present in upper Haggart Creek, Dublin Gulch, and Eagle Creek from approximately June to November.

8.2.4 Effluent Discharge Quality and Site Specific Water Quality Objectives

As noted above, the Proponent has used water quality guidelines (WQG) as a basis to predict potential effects on the aquatic ecosystem. Guidelines used include the CCME WQG for the protection of aquatic life, BC WQG where there are no CCME WQG, and SSWQO based on baseline data collection. These WQG are presented in tables R8-1 and R9-1 of the additional proposal information provided in response to an information request (VIT 2011b). These tables are reproduced below in Tables 13 and 14.

In their comments on the DSR, NND expressed concern that there was insufficient rationale for the use of BC WQG in place of CCME WQG (YOR #2010-0267-346-1). NND is concerned that the Proponent is proposing to use the most permissive guideline available.

Table 13 identifies WQG proposed by the Proponent to assess receiving water quality and indicates whether CCME, draft CCME, or BC WQG are being used. Table 14 identifies proposed SSWQO and an overview of rationale used to identify those objectives. The Proponent provided rationale for the WQG proposed (VIT 2011b). For the majority of the parameters where BC WQG or draft CCME WQG were proposed, there were no CCME WQG or the Proponent provided rationale for SSWQO.

For boron, the Proponent has proposed the more prescriptive BC WQG of 1.2 mg/L in place of the draft CCME WQG of 1.5 mg/L. For cyanide, the Proponent has chosen the BC WQG of 0.010 mg/L (WAD cyanide) in place of the CCME WQG of 0.005 mg/L (free cyanide). The Proponent has proposed this approach as free cyanide is challenging to measure accurately (VIT 2012c) and, by definition, WAD cyanide includes both the weak and moderately strong complexes of cyanide and free cyanide. WAD cyanide is more common when the solution is more alkaline (i.e. basic). Baseline water quality data collected by the proponent indicate that surface water in the Project area is circumneutral to basic in pH (VIT 2011a, Appendix 16).

Table 13 Water Quality Guidelines Used to Assess Receiving Water Quality

Parameter	WQG Used to Assess Effects in the Project Proposal[1]	Water Quality Guidelines (mg/L unless stated)[2]	
		Yukon[3]	CCME WQG maximum (and alternatives)
pH, units	6.5 – 9	None provided	6.5 – 9
TSS	Not predicted, dealt with through permit requirements	None provided	Clear flow—maximum increase of 25 mg/L and 5 mg/L above background for short term and long term exposure, respectively High flow—maximum increase of 25 mg/L above background when background is 25 to 250 mg/L; ≤ 10% of background when background is >250 mg/L
Fluoride	0.30 at H>50 No	0.2 at H< 50 0.3 at H>50	No CCME (used BC WQG of 0.30 at H>50)
Sulphate	100	100	No CCME (used BC WQG of 100)
Ammonia-N	CCME WQG, varies with pH, temperature	varies with pH (1.13 for pH 7.5-8.0)	Varies with temperature and pH
Nitrate-N	2.9	40	2.9
Nitrite-N	0.06	0.02 at Cl <2 to 0.1 at Cl 8 to 10	0.06
Phosphorus-P (total)	none	none	none
Cyanide	0.010 WAD	0.005 WAD	0.005 (free CN) (used BC WQG of 0.010 WAD)
Aluminum	0.10 (dissolved)	None	0.10 total, pH≥6.5 (used BC WQG of 0.10 dissolved)
Antimony, total	0.02	0.02	No CCME (used BC WQG of 0.02)

Parameter	WQG Used to Assess Effects in the Project Proposal[1]	Water Quality Guidelines (mg/L unless stated)[2]	
		Yukon[3]	CCME WQG maximum (and alternatives)
Arsenic, total	0.005	0.005	0.005
Boron, total	1.2	5	1.5 (draft CCME 2009b) (used BC WQG of 1.2)
Cadmium, total	0.0003 at H=150	0.00001 at H<30 0.00003 at H 30-90 0.00005 at H 90-150 0.00006 at H 150-210	CCME (1986) is 0.00001 (H=20 mg/L) to 0.00006 (H = 210 mg/L) Used draft CCME of 0.0001 (H=30 mg/L) to 0.00038 (H=210 mg/L)
Chromium, total	0.0089	0.009	0.0089 (Cr III)
Copper, total	0.003 at H=150	0.002 at H<50 0.003 at H 50-75 0.004 at H 75-100 0.005 at H 100-125 0.006 at H 125-150 0.007 at H 150-175 0.008 at H 175-200 0.009 at H >200	0.002 (H <120 mg/L) to 0.004 (H >180 mg/L)
Iron	1.0 (total)	None	CCME is 0.3 total (BC WQG is 1 total and 0.35 dissolved)
Lead, total	0.004 at H=150	0.004 at H<50 0.005 at H 50 to 100 0.006 at H 100-200 0.011 at H 200-300	0.001 to 0.007 (for H=60 to 180 mg/L)

Parameter	WQG Used to Assess Effects in the Project Proposal[1]	Water Quality Guidelines (mg/L unless stated)[2]	
		Yukon[3]	CCME WQG maximum (and alternatives)
Manganese, total	0.05	none	NA (used BC WQG for drinking water of 0.05)
Mercury, total	0.000026	0.0001	0.000026
Molybdenum, total	0.073	1	0.073
Nickel, total	0.110 at H=150	0.025 at H<60 0.065 at H 60-120 0.110 at H 120-180 0.15 at H >180	0.025 (H <60 mg/L) to 0.15 (H >180 mg/L)
Selenium, total	0.002	0.001	0.001 (used BC WQG of 0.002)
Silver, total	0.0001	0.00005 H <100 0.0015 H >100	0.0001
Thallium	0.0008	0.0003	No CCME (used BC WQG of 0.0008)
Uranium, total	0.015	0.3	No original CCME, used draft CCME of 0.015
Zinc, total	0.03 at H=150	0.0075 at H<90 0.015 at H 90-100 0.090 at H <200	0.03

NOTES:

[1] WQG for hardness-dependant parameters were selected based on intermediate hardness (100 to 150 mg/L, representative of Haggart Creek baseline)

[2] Yukon Environment (2011), CCME (2009), BC MOE (2006), BC MOE (2008), Nagpal et al.(2006), Roe et al. (2010)

[3] Yukon standards are not for surface water. They are derived from Yukon Contaminated Sites Regulation water standards times 10, as the standards are designed to be applied to groundwater, and assume 10-fold dilution in surface water, as per directions provided in CSR documents.

Table 14 Updated List of SSWQO for the Eagle Gold Receiving Environment

Parameter	WQG Used to Assess Effects (mg/L)	SSWQO to Further Asses Potential for Significant Adverse Effects	
		SSWQO (mg/L)	Overview of Rationale
Aluminum	0.10 dissolved	0.10 dissolved	To account for baseline exceedances of aluminum during freshet (particulate Al, not the toxic dissolved form). No Project discharges are predicted. The SSWQO is based on BC WQG (BC MOE 2006).
Arsenic, total	0.005	0.014 for Haggart Creek 0.07 for Eagle Creek and Dublin Gulch	Reflects elevated baseline concentrations, and levels predicted to be present in mine contact water (can be treated to 0.010 mg/L in mine water treatment plant). The SSWQO was derived using Background Concentration Procedure.
Cadmium, total	0.0003 at H=150	0.0003	Will be present in mine contact water. The SSWQO is the draft CCME WQG (Roe et al. 2010), derived using species sensitivity distribution approach. 0.0001 to 0.0003 for hardness of 20 to 150 mg/L Baseline hardness: Haggart Creek (W22) – mean 149 mg/L, Dublin Gulch (W70) – mean 61 mg/L.
Iron	1.0 total 0.35 dissolved	1.0 total 0.36 dissolved	To account for baseline exceedances of iron during freshet (particulate Fe, not the toxic dissolved form). The SSWQO is based on BC WQG (BC MOE 2008). No Project discharges are predicted.
Selenium, total	0.002	0.002	Will be present in mine contact water. The SSWQO is the BC WQG, which is based on lotic, rather than lentic, habitat.

Parameter	WQG Used to Assess Effects (mg/L)	SSWQO to Further Asses Potential for Significant Adverse Effects	
		SSWQO (mg/L)	Overview of Rationale
Sulphate	100	644 (during initial draindown at closure only)	Will be present in mine contact water, at levels controlled by gypsum solubility (1620 mg/L). During operations, postclosure, and much of closure, levels in Haggart Creek will meet the BC WQG of 100 mg/L. For four months during the high discharge period of draindown of the HLF, sulphate levels may exceed the BC WQG (up to 225 mg/L), and a short-term SSWQO is requested. The SSWQO is based on Elphick et al. (2011), which describes a hardness-dependent WQG derived using recent toxicity tests on wide range of organisms. The value of 644 is for moderate hardness (species sensitivity distribution approach); although the predicted level will be considerably lower than this.

The Executive Committee has reviewed the WQG proposed by the Proponent and has determined that sufficient rationale has been provided as to why particular guidelines were chosen.

Baseline water quality data collected by the Proponent indicate that several parameters exceed CCME WQG in some samples. SSWQO are proposed for aluminum, total cadmium, iron, and total selenium, based on new draft CCME WQG or BC WQG. For arsenic and sulphate, SSWQG were developed and proposed.

Two SSWQO were developed for arsenic using the Background Concentration Procedure outlined in CCME. They propose 0.014 mg/L arsenic for Haggart Creek and 0.07 mg/L for the DGDC and Eagle Creek. Sulphate will be present in treated effluent from the mine site. During operations, post-closure, and closure, sulphate levels in Haggart Creek are predicted to meet the BC WQG of 100 mg/L. However, during four months at peak draindown of the HLF, the Proponent predicts higher levels of sulphate (up to 225 mg/L). The Proponent is proposing a SSWQO of 644 mg/L for sulphate for a short-term duration (during initial draindown at closure) based on Elphick et al. (2011).

Effluent discharge will meet MMER at the point of discharge. The Proponent predicts that WQG and SSWQO will be met within 100 m of the proposed mixing points (Sites W4 and W29 identified in Figure 7). During operations, the Proponent is proposing this compliance point be located 100 m downstream of where effluent from the mine water treatment plant (MWTP) will enter Haggart Creek (Site W4). During closure, the compliance points will be at three locations: Haggart Creek, downstream from the MWTP (Site W4); DGDC downstream from inputs from the WRSAs (Site W71); and Haggart Creek downstream of all inputs (Site W29).

The Proponent has indicated that additional water quality modeling will be conducted on the mixing patterns at the compliance points in preparation for the Water Use Licence application.

8.2.5 Water Quality Model

The Proponent developed a water quality model and presented it in Appendix 25 to the proposal (Technical Data Report: Water Quality Model). The model was developed to predict the resulting concentrations of metals in receiving waters from the mixing of surface water and contact water from the mine site during construction, operations, closure and reclamation, and post-closure. The sources of water include:

- contact water flowing through and non-contact water diverted around the WRSAs, open pit, and HLF;
- mine water treatment plant (MWTP) effluent; and
- Dublin Gulch, Stewart Creek, Eagle Pup, Ann Gulch, Stuttle Gulch, Platinum Gulch, and Haggart Creek.

The Proponent used a mass balance model to estimate concentrations of water quality parameters. Data used in the model include source terms predicted in the geochemical characterization program, baseline surface water and groundwater quality, predicted surface water flows from the water balance model, and estimates of nitrogen leaching from blast residues. The mass balance method assumes that constituents are not lost due to chemical reactions and that flows are thoroughly mixed a short distance downstream of the confluence. For parameters with predicted concentrations above WQG, the Proponent predicted concentrations of parameters for each month, for all Project phases.

The water quality model was developed based on the activities outlined in the proposal. The water quality model has not been updated to take into account the changes to Project outlined in the SIR (VIT 2012a). The changes that may affect the water quality model include the increased volume of waste rock and ore and the corresponding increases in footprint of the WRSAs and the HLF.

8.3 Effects Related to Geochemical Characterization

Inadequate or inaccurate geochemical characterization could lead to underestimation of mine site effluent quality and a Project that cannot effectively manage or treat contact water. Precipitation and surface water coming in contact with rock mined, or exposed, by the Project is expected to the single largest source of water contamination and potential effects on aquatic ecosystems.

8.3.1 Characterization of Rock Units

Predictions of mine site contact water quality can be made using information on the volumes and types of rock exposed by the Project. Depending on various site factors, this contact water may have elevated concentrations of dissolved metals. Elevated metals or acid in contact water can require management or treatment during operations and closure to avoid adverse effects to downstream aquatic ecosystems. Proper geochemical characterization and predictions of drainage chemistry is critical to ensure appropriate management and mitigation measures are in place prior to mining and the exposure of large volumes of rock to precipitation and surface water.

The Proponent provided geochemical characterization of the original 66 million tonnes of waste rock and 66 million tonnes of ore proposed to be mined by the Project. The Executive Committee was satisfied that the characterization of rock in the original proposal was supported by appropriate data and followed accepted industry standards like those used in BC and by MEND (Price 1997, MEND 2009). This information provided a level of confidence and certainty in the predictions of water quality outlined in the water quality model (WQM).

The SIR provided by the Proponent proposed an increase in the amount of waste rock generated from 66 to 132 million tonnes and ore from 66 to 92 million tonnes. The size and surface area of the WRSAs, HLF, and open pit walls have all increased accordingly. No additional samples were characterized and included in the geochemical predictions for the Project. Therefore, it is not clear whether the original geochemical characterization, including the ARD/ML potential, is representative of the additional ore and waste rock to be mined. Initial geochemical characterization supported the view that ARD generation was unlikely from the ore and waste rock and focus should be on metal leaching in neutral conditions. It is unclear if the additional waste rock and ore have similar geochemistry. This uncertainty has implications for the water quality model predictions, mine water treatment plant (MWTP) sizing and effectiveness and most importantly, water quality management during closure and post-closure. These concerns have also been identified by Environment Canada (YOR #2010-0267-0292-1).

The Proponent has indicated that, while there is exposure of increased volumes of ore and waste rock, they do not expect the exposure of new rock types or lithological units. The Proponent has reviewed updated drillcore assay data and results indicate that the additional waste rock and ore will not be substantively different. Therefore, in their view, the results and implications of the original geochemical characterization program will be representative of the new material being disturbed.

The Proponent has further outlined details on geochemical characterization of additional rock samples that have been collected in the new waste rock and ore. This characterization was initiated in 2012 and is expected to be completed by Q4, 2012. This information will be used verify the original characterization and, if necessary, update the source term predictions and resultant water quality predictions. The Proponent has indicated that the updated geochemical information will be available to support the regulatory review process. The testwork currently underway is outlined in the SRK Memo to the Proponent (Response to Request for Supplementary Information, July 26, 2012, Attachment R5-A). The initial testwork focuses on acid base accounting (ABA) and metal analysis. SRK indicates that kinetic testwork will be completed if ABA results indicate dissimilar geochemistry to previous samples. ABA will provide information on ARD but does not necessarily speak to ML potential. Environment Canada has expressed concerns that if ABA results indicate similar geochemistry, there will be no further kinetic testwork to better predict ML potential (YOR #2010-0267-328-1).

The Proponent provided cross-section and long-section diagrams of the waste rock and ore indicating the location of new samples undergoing geochemical testing. Based on these diagrams, it appears that there are some areas of the expanded open pit that are under-represented. The geochemical characterization of additional waste rock and ore would benefit from an updated accounting of rock types and units, tonnage of each rock type, and samples/tests conducted similar to that presented in the original characterization. If new rock types or lithological units are identified in the expanded open pit, adequate samples (i.e. sufficient samples to be representative) must be characterized to understand if these rock types or lithological units pose significant adverse effects related to ARD/ML.

The Executive Committee agrees with the general approach provided by the Proponent to characterize the new volumes of rock being mined. However, to ensure potential effects related to ARD/ML are not significant and adverse, these results must be available prior to regulatory approval and must be used in the revised source term development to update the site water quality model. There is risk to the Project if additional geochemical characterization varies significantly from the characterization presented in the proposal and considered in this assessment. For example, should additional geochemical characterization and revised source terms require substantial changes to the Project to accommodate new predictions new activities may not be covered under the scope of this assessment.

8.3.2 Derivation of Source Terms for Water Quality Model

Source terms are the predictions of contact water quality from point sources of contaminants (e.g. water quality from the WRSAs and the HLF). The Proponent used source terms and the surface water balance model to predict overall mine site water quality. The Proponent used metal release rates from the humidity cell testing (conducted for the geochemical characterization) to predict source term concentrations in contact water from field scale facilities (e.g. WRSAs and HLF). These source term concentrations were predicted by extrapolating or scaling metal release rates from the lab-based humidity cells.

The Proponent has indicated that for some parameters, concentrations derived from scaling were “unrealistically high in comparison to monitoring data from other geologically similar sites” (VIT 2011a). In these instances, the Proponent evaluated scaled concentrations against theoretical saturation limits and analog data from other selected sites. These analog sites were reported to be climatically and geologically similar. The analog sites used by the Proponent included Fort Knox Mine, True North Mine, Pogo Mine, Brewery Creek Mine, Zortman/Landusky Mine, and Eagle Pup baseline data. Data from analog sites was primarily used by the Proponent for parameters that: were below or near analytical detection limits in the humidity cell leachate; are not constrained by supersaturated species in modeling, and/or; are involved in processes that cannot be reliably modeled. Datasets selected from analog sites included water quality from waste rock seepage and from spent ore heap leach facilities. In some cases where scaled concentrations were unrealistically high, the Proponent limited the upper bound of those source term concentrations to the analog data.

The Proponent has indicated that the selection of analog sites was based on professional judgment. However, there is uncertainty related to how similar the analog sites are to the Project site. As indicated by technical specialists retained by the Executive Committee, it may not be appropriate to use predictions of constituent concentrations based only on analog limits (EcoMetrix 2012b). Differences between the Project and analog sites cannot be determined with confidence due to the lack of short-term leachability tests for Project materials and uncertainty in long-term trends at analog sites. The Executive Committee is of the view that using an analog approach introduces a number of additional uncontrolled variables into the predictions of water quality and decrease the confidence in those predictions.

Risks associated with using analog sites that are not comparable to the Project site include underestimating the source term concentrations for contact water on-site. This may lead to higher concentrations and loadings of metals in contact water than predicted for the operations and closure stages. During operations, the MWTP may not be sized accordingly or may not be appropriately designed to treat contact water to meet discharge criteria. If contact water has higher metal concentrations than predicted during the mine life the effectiveness of post-closure passive treatment options to meet discharge criteria is in question.

Should the MWTP not be designed or sized accordingly, there is increased risk that the Project may have to emergency discharge water that does not meet discharge criteria. The Executive Committee recognizes that several options are available (e.g. event ponds and in-heap storage) to the Proponent for temporary water storage before an emergency discharge would be contemplated.

If contact water has higher metal concentrations than predicted during closure and post-closure, passive treatment options may not improve water quality to meet discharge criteria. Higher metal concentrations could be acutely toxic, but would most likely result in chronic effects to aquatic life downstream. In such a scenario, it is the view of the Executive Committee that the Proponent actively treat water during closure and post-closure until they have demonstrated that the passive technology(ies) applied will consistently result in effluent that meets discharge criteria.

8.3.3 Effects of Metal Leaching from Mine Infrastructure

The majority of waste rock will be disposed of in the WRSAs where seepage will be collected, managed, and reclaimed to limit infiltration of precipitation. However, some waste rock and blast rock fill will be used as construction material for mine site infrastructure including mine site roads and the HLF. This includes a significant amount of waste rock, 2 000 000 m^3, required for the HLF embankment. The use of waste rock as construction material outside of the WRSAs could result in uncontained effluent and as a result become a non-point source of contamination difficult to manage.

As described above, waste rock from the open pit has been characterized and, although it is not expected to be acid generating, has the potential to leach metals under neutral conditions. The Proponent has predicted that any waste rock used for infrastructure construction other than the WRSAs or the HLF, will be minimal. They propose monitoring areas where waste rock was used for construction and if metal leaching is detected, contact water will be collected and treated. Specific measures will also be implemented at the Project closure and reclamation phase to address remediation of these areas. The volume of rock to be used for infrastructure construction is a small proportion of the rock to be stored in the HLF and WRSAs. The Proponent plans to, and should be able to, collect most contact water. However, some contact water from infrastructure such as access roads may infiltrate to ground and will be missed.

Environment Canada noted that monitoring and remedial action is appropriate to deal with potential concerns so long as it is carried out throughout all phases of the Project including construction, operation, and closure and reclamation (YOR #2010-0267-0192-1). Environment Canada further noted that, depending on the nature of contact water and where it reports to, run-off from infrastructure may be subject to the Metal Mining Effluent Regulations (MMER) (YOR #2010-0267-339-1). To meet the requirements under MMER, the Proponent may have to conduct additional monitoring, collection, and reporting.

Government of Yukon, Department of Environment (YOR #2010-0267-337-1) and Environment Canada (YOR #2010-0267-339-1) indicated that using waste rock and monitoring drainage is a reactive strategy and may be difficult to monitor and manage. As such, the Executive Committee is of the opinion that if metal leaching is detected from infrastructure that has used waste rock for construction, it may be difficult to contain depending on the infrastructure and location (e.g. contaminated water may report directly to surface water, infiltrate to groundwater, and/or occur over a large area). Furthermore, it could be difficult to stop or minimize metal leaching once it has begun. Metal leaching from mine infrastructure may be particularly difficult to manage at closure and reclamation.

If contact water from mine infrastructure has high metal concentrations at closure and post-closure, run-off may have to be collected and treated to meet discharge criteria. Higher metal concentrations could be acutely toxic, but would most likely result in chronic effects to aquatic life downstream. It is the view of the Executive Committee that the Proponent should ensure that waste rock used for construction, particularly waste rock exposed to surface run-off, does not lead to metal leaching beyond water quality discharge criteria. The Proponent should use results from the geochemical characterization program to identify waste rock suitable for construction. Further geochemical testing should be done during construction to ensure materials selected will not result in increased metal leaching.

The Executive Committee has determined that uncertainties in the geochemical characterization may lead to significant adverse effects related to metal leaching from waste rock used for construction material. However, further geochemical characterization of the rock units, as proposed by the Proponent, and pre-utilization testing of rock to be used for construction, minimizes the risk of ARD/ML.

8.3.4 Validation Through Field Investigations

Geochemical characterization and prediction uses various assumptions and methods to predict the geochemical behaviour of large quantities of waste rock and ore exposed to the environment. Prediction is a complex process with considerable uncertainty due to knowledge gaps and variability related to materials, their properties and geochemical processes. It is critical to conduct follow-up monitoring and validation of predictions throughout the mine life to understand whether the geochemical predictions are accurate, and to ensure that appropriate management and mitigation measures have been implemented to mitigate any effects. Even in the “modern era”, few predictions of mine water quality based on geochemistry have been accurate (Maest et al. 2006). Follow-up monitoring and validation of predictions will enable the Proponent to confirm, or alter, management and mitigation strategies to deal with on-site conditions.

The Proponent has outlined monitoring and management strategies. In Appendix 25 (Technical Data Report: Water Quality Model), the Proponent indicates that source term predictions for the water quality model will be adjusted during pilot testing and operational monitoring. This testing and monitoring will be used to refine the water quality model inputs.

Contact water from the mine site will be collected and managed during operations, decommissioning and closure. Routine monitoring will be conducted by the Proponent on water prior to discharge to the environment. This monitoring should be used to verify the assumptions used and conclusions arrived at during the prediction modeling. Furthermore, the water monitoring information should be used to inform contact water management, mitigation measures, and options for closure. Water monitoring data should also be used to validate or reject, and update, loading assumptions for COPCs (i.e. source term and water quality predictions). This will allow the Proponent and regulators to evaluate the effectiveness of mitigation measures and management strategies. Given the significant changes to the Project presented by the Proponent in the SIR, initiating follow-up studies early in the Project development would increase confidence in the mitigation measures. The Proponent should begin column tests using site materials prior to operations and follow-up with field test cells during operations. Government of Yukon has stated that field test cells should be initiated as soon as mining operations begin (YOR #2010-0267-337-1).

Source terms were calculated using scale up factors as well as analog site data. Uncertainties exist in the geochemical characterization and use of analog sites for water quality predictions. The Executive Committee concludes that a monitoring program should be implemented including the measurement of regular surface water quality and quantity monitoring from the WRSAs, the open pit, and the HLF. Results should be used to refine the source term predictions and confirm that appropriate scale up factors and analog limits have been used. These programs could include field test plots or large scale field test cells.

The Executive Committee has determined that the Project may result in significant adverse effects to aquatic ecosystems as a result of potential increased metal concentration in surface water discharge due to inadequate or inaccurate geochemical characterization and source term predictions. However the effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee.

8.3.5 Recommended Terms and Conditions

In determining the significance of the effects to aquatic ecosystems related to geochemical characterization and source term predictions, the Executive Committee has considered the following non-discretionary legislation:

- *Fisheries Act*
- *Waters Act* and *Waters Regulation*
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- *Canadian Environmental Protection Act*
- *Environment Act*

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental effects of the Project to aquatic ecosystems:

To decrease variability around geochemical characterization and validate hydrogeochemical predictions:

54. The Proponent shall complete geochemical characterization of the expanded open pit including representative rock units for the total amount of waste rock and ore being mined (132 million tonnes of waste rock and 92 million tonnes of ore). This characterization should include kinetic testing to predict metal leaching potential.

55. The Proponent shall incorporate results of the new geochemical characterization into the overall geochemical characterization of rock units to be excavated by the Project and revise the source term predictions accordingly. The Proponent shall ensure that this information is available prior to the regulatory approval process.

56. The Proponent shall update the water quality model and predictions using the revised geochemical characterization and source term predictions prior to the regulatory approval process.

57. The Proponent shall conduct appropriate testing of on-site materials to compare on-site materials to analog site materials. The Proponent shall consider additional on-site testing results as well as long-term trends at analog sites to provide confidence that the analog site data used to bound upper limits of source term concentrations accurately reflect the characteristics of the Eagle Gold Mine material. The Proponent shall ensure that this information is available prior to the regulatory approval process.

58. The Proponent shall conduct monitoring of water quantity and quality from contact waters during operations, closure and post-closure to characterize contact waters from the different sources, verify assumptions and inform the site closure plan. The monitoring program should specify routine surface water monitoring from waste rock storage areas, the open pit, and the HLF. The data should be reviewed periodically to update loading assumptions for constituents of particular concern in the site water balance and water quality models.

59. To verify the assumptions and conclusions of geochemical predictions and the effectiveness of mitigation measures, the Proponent shall:

    a. establish the relationship between analog characteristics and those of site materials characteristics to verify the use of analogs in the derivation of source terms;

    b. initiate column tests using on-site materials prior to operations and follow up with field test cells during operations to support the site water quality model; and

    c. initiate field test plots or large scale field test cells to confirm that appropriate scale up factors have been applied.

To minimize potential effects due to metal leaching from waste rock used as construction material:

60. The Proponent shall ensure waste rock used to construct on-site infrastructure does not contribute to exceedance of water quality guidelines due to metal leaching. The Proponent shall actively segregate waste rock based on metal leaching potential so that it is used appropriately.

8.4 Effects Related to Adverse Changes to Water Chemistry

Potential effects to the aquatic ecosystem may result due to adverse changes in water chemistry. Changes in water chemistry can result in completely different species composition in a water body. The Project could result in harmful levels of metals (e.g. cadmium and lead), metalloids (e.g. arsenic and antimony) and nutrients (e.g. nitrogen and phosphorous) being added to waterbodies.

The Project may cause adverse changes to water chemistry through various pathways including:

- inappropriate methodology used to calculate SSWQO resulting in discharge of effluent that is not protective of the aquatic ecosystem;
- inappropriate water quality modeling resulting predictions that are not reflective of actual baseline, operating, closure, and reclamation conditions;
- direct discharge of untreated mine effluent as a result of malfunctions or failures of water treatment and water management infrastructure;
- elevated concentrations of metals due to exceeding the design capacity of the water treatment plant; and
- effects of exceeding the dilution ratio of Haggart Creek.

8.4.1 Developing Appropriate Water Quality Standards

Based on water quality modeling, the Proponent predicts that certain parameters will be above WQG and SSWQO. These parameters will require treatment through the cyanide detoxification plant and the MWTP during operations and require additional consideration at post-closure (e.g. caps to reduce infiltration into the WRSAs and HLF and passive treatment systems).

There is the potential for contact water with elevated metal and nutrient concentrations to be discharged into the aquatic ecosystem. The Proponent predicts elevated concentrations, higher than WQG for antimony, arsenic, cadmium, chromium, copper, fluoride, lead, manganese, mercury, molybdenum, nickel, selenium, sulphate, silver, thallium, uranium, and zinc. Other potential contaminants include ammonia, residual chlorine and byproducts, nitrate/nitrite, phosphate, radium 226 and WAD cyanide.

As outlined in the water management plan, discussed above in Section 7, contact water during operations will be contained, managed and treated by the MWTP. The Proponent has proposed that the MWTP will be operational at the start of mining while the cyanide detoxification plant will be operational at year eight of operations. All contact water quality will be monitored and if required, routed to the MWTP prior to discharge to the environment. The Proponent has committed that all effluent discharge from the MWTP will meet MMER requirements and meet WQG and SSWQO downstream of the initial dilution zone.

The CCME WQG for the protection of aquatic life are national standards. The guidelines are:

> *"…intended to provide protection of freshwater and marine life from anthropogenic stressors such as chemical inputs or changes to physical components (e.g., pH, temperature, and debris). Guidelines are numerical limits or narrative statements based on the most current, scientifically defensible toxicological data available for the parameter of interest. Guideline values are meant to*

> *protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term. Ambient water quality guidelines developed for the protection of aquatic life provide the science-based benchmark for a nationally consistent level of protection of aquatic life in Canada" (CCME, 1999).*

These guidelines provide a scientific basis and inform regulatory expectations for Project performance as it is related to maintaining water quality to protect aquatic life across Canada. In many cases, the CCME WQG form the scientific basis upon which further site-specific criteria, guidelines, objectives or standards are developed within the various provincial and territorial jurisdictions.

The CCME acknowledges the diversity of natural conditions across Canada and recognizes that the national standard may not apply to all ecosystems and environmental conditions. Consequently, a process for determining SSWQO is included in the CCME guidance. This process acknowledges that the national guidelines may be over-protective or under-protective at sites with unique environmental conditions. In particular the CCME guidelines may be based on the response of a sensitive species that is not present at the site, that environmental conditions (pH, suspended solids, water temperature) may exist that attenuate or amplify the toxic effects of certain contaminants, or that the natural background concentrations may exceed certain guideline values without apparent effect on biota. Under these circumstances the water quality guidelines may be modified to account for conditions that occur at the site.

The Proponent has provided an argument and water quality data that support the development of SSWQO. The Executive Committee supports the SSWQO approach for the Project, but notes that establishment of SSWQO that are not protective of aquatic life or habitat would be considered a significant adverse effect.

8.4.2 Calculation of Site Specific Water Quality Objectives

The application of inappropriate SSWQO may lead to the discharge of water that will adversely affect the downstream aquatic ecosystem. As discussed above, the Proponent has used CCME WQG, BC WQG, and SSWQO as objectives for water quality in the receiving environment. The SSWQO have been calculated using the Background Concentration Procedure outlined by CCME.

CCME (2003) provides guidance to derive SSWQO including the Background Concentration Procedure. The Proponent has provided rationale as to why this procedure was chosen to calculate SSWQO for arsenic over other procedures outlined by CCME (e.g. Recalculation Procedure or Water Effect Ratio Procedure). The Background Concentration Procedure for driving SSWQO is well-suited for those waterbodies in natural condition rather than waterbodies that have been anthropogenically disturbed. CCME (2003) indicates:

> *"…one of the major difficulties associated with the implementation of the background concentration procedure relates to the variability of water quality over time and space. [It] may be difficult to identify suitable reference sites in areas that have been affected by anthropogenic activities for extended time periods (e.g., in areas affected by mining or urban development). In such cases, it may be necessary to identify nearby reference areas with similar geological,*

> *topographical, physiographical, climatological and ecological features to define background levels of naturally-occurring substances."*

CCME guidance recommends that if appropriate data are not available to determine background concentrations of contaminants in water, an appropriate reference site should be identified and data collected to determine background concentrations. The water quality datasets used by the Proponent include data affected by anthropogenic activities. These activates include both historic activities and current/existing activities.

The Proponent has indicated that the upper reaches of Haggart Creek and the Dublin Gulch watershed have been heavily impacted by historic placer mining activities. Since 1895, placer mining activities have affected the area from small operations to larger scale mechanized operations. Historic placer mining has resulted in the complete removal of vegetation and overturning of riparian area as well as the diversion of Eagle Pup and Stuttle Gulch drainages. Historic placer mining wastes (i.e. cobble and boulder tailings, settling ponds with fine sediments etc.) are prominent features in the Haggart Creek and Dublin Gulch watersheds. These wastes contribute to the water quality in the area.

In addition to historic placer mining activities, there has been active placer mining during periods when water quality data was being collected. The dataset used to calculate the original SSWQO include data from the 1990s during which active placer mining was occurring in tributaries to Haggart Creek upstream from the sampling locations. The Proponent has indicated that this data had higher concentrations of TSS, aluminum, arsenic, copper, iron, and lead at Haggart Creek sites compared to data from 2007-2010. The Proponent has shown that, by excluding data from the 1990s, the SSWQO for arsenic would drop to 0.014 mg/L, from 0.02 mg/L. Environment Canada (YOR #2010-0267-192-1), Government of Yukon (YOR #2010-0267-197-1), NND (YOR #2010-0267-200-1), YCS (YOR #2010-0267-201-1) expressed concern with using background data that appears to be influenced by anthropogenic disturbances. Technical consultants (EcoMetrix) retained by the Executive Committee reviewed the methods for deriving SSWQO and concluded that data influenced by anthropogenic sources should not be considered in deriving SSWQO for the Project. EcoMetrix states:

> *"…a background water concentration for arsenic derived from an appropriate reference location, such as Lynx Creek which has not been affected by placer mining, appears to be a more appropriate SSWQO for the Eagle Gold Project. This option does not appear to have been examined by Victoria Gold in the information available for this review. Victoria Gold should consider the reference data for Lynx Creek in the derivation of the arsenic SSWQO for the Project."* (EcoMetrix 2012b)

It is the view of the Executive Committee that anthropogenically affected water quality data from years where activities were occurring upstream should not be used to derive the SSWQO, as it may lead to the discharge of water quality that is not protective of aquatic ecosystems. The level of historic placer mining activity in the area suggests that Background Concentration procedure for deriving SSWQO may not be appropriate. The Executive Committee believes that consideration should be given to using an appropriate reference site such as Lynx Creek to derive SSWQO.

8.4.3 Constituents of Potential Concern

Constituents of potential concern (COPC) are water quality parameters that may be modified as a result of Project activities and may cause consequences or effects to aquatic resources. These are parameters that are expected to exceed CCME guidelines in waters that are released to the receiving environment and therefore may adversely affect aquatic ecosystems. Arsenic, cadmium, lead and zinc have been identified as COPC for this Project. The Proponent has indicated that water will be collected and treated during operations to meet MMER, WQG, and SSWQO.

For long-term closure scenarios, the water quality model in the proposal predicts that a number of constituents of potential concern (COPC) would likely exceed SSWQO at one or more of the proposed compliance points. Generally the timing of predicted exceedances was similar at the three locations (DGDC at Site W71 and Haggart Creek at Sites W4 and W29) however the extent of exceedances varied.

The predicted concentrations and extent of exceedances are summarized below in Table 15. These predictions assume that the HLF and the WRSAs have a cap that reduces infiltration of precipitation to 10 percent and no treatment, active or passive, of mine site contact water.

In Haggart Creek, exceedances are predicted for: aluminum, mercury, and selenium during freshet; manganese during freshet and winter months (December to May); and arsenic during most months of the year. In Dublin Gulch, exceedances are predicted for: aluminum, antimony, and selenium during freshet; cadmium, copper, and uranium during June; and arsenic during the full year.

Of the COPCs, arsenic was predicted to show the greatest exceedances of CCME WQG for the protection of aquatic life. The CCME WQG for arsenic is 0.005 mg/L while the proposed SSWQO is 0.014 mg/L. In Haggart Creek, SSWQO will be exceeded by 1.5 times at Site W4 and 2 times at Site W29, while the CCME WQO will be exceeded by 5.8 times at Site W4 and 7.6 times at Site W29. In Dublin Gulch at Site W71, the SSWQO will be exceeded by 1.3 times and the CCME WQG will be exceeded by 18 times. Arsenic is further discussed below in section 8.4.4.

Results of water quality modeling downstream of the Project in Haggart Creek indicate that a number of COPC would likely exceed WQG for long-term closure scenarios. The potential effects of COPC on the aquatic ecosystem are summarized below. Although cyanide has not been predicted to exceed WQG after closure, it has been included in this list because the Proponent has indicated the cyanide detoxification plant will not be operational until year eight of the Project.

Aluminum

Aluminum is abundant in the natural environment and is relatively insoluble at pH 6 to 8 although solubility increases under more acidic and more alkaline conditions. Most of the bio-reactive aluminum is likely to be in the dissolved fraction. Aluminum toxicity to aquatic organisms tends to vary with ambient conditions including, but not limited to pH, hardness, organic carbon, and the presence of other metals. Generally, aluminum is most toxic in acidic water and is substantially less toxic at higher pH (US EPA 2009) therefore water quality guidelines for aluminum are often based on pH.

Generally fish are more sensitive to aluminum than benthic organisms. Aluminum is a gill toxicant to adult fish due to iono-regulatory actions, respiratory actions, or both. The iono-regulatory effects predominate at lower pH whereas the respiratory effects are more prevalent as pH increases to moderately acidic levels. Calcium, dissolved organic matter and fluoride have been shown to protect fish against the physiological and toxicological effects of aluminum. Aluminum does not appear to bioaccumulate in benthic organisms or biomagnify in aquatic systems.

Antimony

Antimony is naturally occurring in ore deposits often associated with other elements. Anthropogenic sources include emissions from fuel combustion, metal mine and smelting, and waste incineration. In the aquatic environment, antimony tends to adhere to sediments. Antimony dissolves in water and can transform into a variety of different species. The different species are dependent on pH and oxygen levels in the water. It does not readily biomagnify in the aquatic ecosystem. Antimony is persistent in the environment. It is moderately toxic to aquatic organisms.

Arsenic

The largest natural source of arsenic entering surface waters is from weathered rocks and soils. Approximately two thirds of total arsenic in rivers is dissolved, while one third is adsorbed to suspended solids. Arsenic adsorption to organic and inorganic solids increases as pH decreases while desorption is favoured as the pH values become alkaline. Arsenic may be removed from fresh water by biotic uptake, adsorption to iron and clay particles, or, less frequently, by precipitation or co-precipitation. Biotic uptake is reduced when phosphorous is available. There is no indication that arsenic biomagnifies in freshwater foodchains.

Cadmium

Cadmium is a metal found in natural ore deposits often associated with other elements such as zinc and copper and can enter the aquatic system through leaching. Cadmium may be present in natural waters in dissolved ionic form or associated with sediments, suspended solids and colloidal particles. The fate of cadmium in the aquatic system is related to pH, hardness, redox potential and the presence of materials with negatively charged surfaces. Most cadmium entering surface water tends to settle to the bottom sediments.

Cadmium may bioaccumulate in aquatic biota but it has not been found to biomagnify in aquatic food chains. At chronic levels, cadmium reduces growth and inhibits photosynthesis in freshwater algae and macrophytes and impairs reproduction in aquatic invertebrates. Salmonids appear to be the most sensitive fish; growth and survival of juveniles are affected by acute and chronic exposure.

Cyanide

Potential effects related to cyanide are dealt with in section 6 of this report. In summary, cyanide is acutely toxic to aquatic organisms. Cyanide is not persistent in the environment, as it quickly oxidizes in the presence of oxygen and sunlight to less toxic forms. Cyanide does not bioaccumulate as low doses in animals and humans are detoxified and excreted.

Copper

In the aquatic environment the concentration of copper and its bioavailability depend on many factors such as water hardness and alkalinity, ionic strength, pH and redox potential, complexing ligands, suspended particulate matter and organic matter, and the interaction between sediments and water. Copper may bioaccumulate in organisms although adsorption of copper to particles and complexation by organic matter can greatly limit bioavailability. Tolerance to copper has been demonstrated in aquatic systems for phytoplankton, aquatic invertebrates, and fish.

Copper has been shown to exert adverse reproductive, biochemical, physiological and behavioural effects on a variety of aquatic organisms at very low levels. Copper has been shown to adversely affect olfaction (sense of smell) in fish. Fish rely on their sense of smell to find food, avoid predators and migrate. Detection of odours occurs when dissolved odorant molecules bind with olfactory receptor molecules. Copper may compete for binding sites affecting activation or signal transmission therefore interfering with behaviours, such as homing, appetite and food intake, and detection of predators. The presence of dissolved organic carbon may diminish these effects of copper on fish.

Manganese

In the aquatic environment manganese exists in two main forms, Mn(II) and Mn(IV), the proportion of which depends on pH and redox conditions. Mn(II) is bioavailable and can be readily taken up by benthic fauna and fish. It can be significantly bioaccumulated at lower trophic levels and can affect the composition of freshwater microflora populations by causing blooms of certain algae.

In aquatic environments, manganese toxicity is slight to moderate and is influenced by several factors such as water hardness, salinity, pH, and the presence of other contaminants. Little is known about the aquatic toxicity of manganese in colloidal, particulate, and complex forms. In general, however, toxicities of metals bound into these forms are assumed to be less than those of the aqueous ionic forms.

Water hardness affects manganese toxicity to fish with toxicity decreasing as hardness increases. At chronic exposure levels manganese has been shown to cause anemia in fish and increased mortality.

Mercury

Mercury is a natural occurring element. Mercury may be released from anthropogenic sources such as metal mining and smelting, coal fired power plants, and combustion of waste containing mercury.

Mercury volatilizes and may be transported over large distances. Mercury will also diffuse through water and settle into sediments or absorb into soil particles on land. Mercury in water, sediments, or on soils may re-volatilize to air to be deposited in another location. This process is known as biogochemical cycling. Mercury is persistent in the environment as it can change form but cannot be destroyed.

Mercury is easily absorbed by organisms and concentrates in muscle and tissue. It is known to bioaccumulate in the food chain. Mercury is toxic to aquatic life. Due to bioaccumulation, low concentrations in streams may still lead to toxic effects to fish species or humans and/or wildlife that consume fish from those streams.

Selenium

Selenium is often found as a trace element in natural sulphide bearing ores. Traces of selenium are found in most water and soils. Selenium may be released from anthropogenic sources such as metal mining and smelting. It is highly mobile and biologically active in alkaline soils and its oxidized form.

Selenium in water is affected by pH. It is more toxic to vertebrate species than invertebrates and plants. Selenium is known to cause congential deformation and death in fish and birds. In wildlife, selenium may cause starvation and wasting, deformities, and reproductive failure. Selenium may interact with mercury to become more toxic. Selenium is persistent in the environment and has been known to biomagnify in aquatic organisms.

Sulphate

Sulphate is a non-metallic element that occurs naturally in a number of minerals. Atmospheric deposition and decomposition of organic matter provide natural sources of sulphate in fresh water systems. Anthropogenic sources may include wastes from industries that use sulphates and sulphuric acid, leaching of iron pyrite from exposed rock surfaces and mining activities such as blasting and deposition of waste rock.

Sulphate may be present in surface water as a dissolved salt (SO_4^{-2}). It may be reduced to sulphide, volatilized to the air as hydrogen sulphide, precipitated as insoluble salt or incorporated into living organisms. Although sulphur is an essential element for aquatic life it has been found to affect growth and survival of aquatic plants (particularly aquatic moss) and animals (zooplankton and fish larvae). Sulphate toxicity tends to decrease with increasing water hardness. There is some evidence that elevated sulphate can stimulate the growth of sulphur metabolizing bacteria in creek beds leading to changes in the natural macroinvertebrate community.

Uranium

Uranium is a naturally occurring element and exists as a component of other minerals. The most abundant anthropogenic source is uranium mining. However, it can also be released to the environment through metal mining if uranium is a component within the deposit. The speciation and bioavailability of uranium is dependent on conditions such as pH, temperature, and hardness. In the aquatic ecosystem it tends to partition into sediments. In fish, uranium tends to accumulate in bones and scales, and to a lesser extent, the liver. Uranium can bioaccumulate in the aquatic environment. It can be toxic and affect reproduction and lead to death.

8.4.4 Arsenic

Of particular concern is the release of contact water containing arsenic concentrations that are above the natural background conditions, leading to potential effects on the aquatic ecosystem downstream. The Executive Committee notes that during operations, the proposed water treatment process is designed to release effluent containing <0.010 mg/L of arsenic (twice the CCME WQG and lower than the proposed SSWQO). This provides some confidence that harmful levels of arsenic will not be discharged by the Project during operations. Arsenic concentrations in contact water during closure and post-closure are an important issue.

Arsenic occurs in a variety of forms in fresh water as it undergoes chemical and microbiological oxidation, reduction, and methylation (CCME 2001). In rivers, approximately two thirds of the total arsenic is soluble and bio-available and one third is adsorbed to suspended solids (CCME 2001). Arsenic availability depends on organic content, pH, phosphorus, and mineral content of the water. There is no indication that arsenic biomagnifies up freshwater food chains.

Arsenic can be acutely toxic to freshwater fish, invertebrates, and aquatic plants. At low concentrations, arsenic can slow growth and have chronic toxic effects (CCME 2001). The most sensitive freshwater fish seem to be equally as sensitive as some invertebrates (zooplankton). Some aquatic plants, however, are an order of magnitude more sensitive than freshwater fish and invertebrates. Concentrations of arsenic between 2 and 46 mg/L can inhibit the growth of freshwater algae. The LC_{50} value (50 percent of individuals die within 48 hours) for the zooplankton *Daphnia magna* is 7.4 mg/L, and for the American oyster it is 7.5 mg/L. The chronic toxicity effects of arsenic have been observed with the LC_{50} of 0.5 mg/L for *Daphnia magna* over three weeks.

Arctic grayling has been shown to be most sensitive to arsenic exposure during early life stages (Buhl and Hamilton, 1990). The Proponent has indicated that Arctic grayling spawn in the South McQuesten River in early May and that fish of all life stages use Haggart Creek and its tributaries in the following months. Therefore, juvenile Arctic grayling may be present in the Project area receiving environment during its most sensitive life stage relative to arsenic.

The Proponent proposes a 0.014 mg/L limit for arsenic in Haggart Creek and 0.07 mg/L for the DGDC and Eagle Creek which represent the 95^{th} percentile of two water quality datasets Eagle Creek at site W27 for the period of record from 2007 to 2010 and Haggart Creek at Site W4 for two periods of record from 1993 to 1996 and 2007 to 2010. The Proponent has indicated that the 95^{th} percentile was selected to incorporate the greatest amount of verified data and to recognize natural variability.

In contrast, both the generic CCME WQG for arsenic and the BC Ambient Water Quality Guidelines for arsenic are 0.005 mg/L. In deriving that guideline, data was reviewed that indicated fish were equally as sensitive to arsenic exposure as aquatic invertebrates (CCME 2001). CCME and BC Environment Protection Division considered uncertainty around the actual toxicity of arsenic in the environment (versus in laboratory trials) and applied the precautionary principle when arriving at the 0.005 mg/L guideline.

Based on information provided in the proposal the Executive Committee is concerned with several water quality parameters that may be discharged at levels exceeding generally accepted guidelines. While the Executive Committee recognizes that local surface waters around the Project may be naturally high in some of these parameters, releasing effluent that would be acutely or chronically toxic to downstream aquatic organisms is considered a significant adverse effect. The Executive Committee is confident that with a properly designed and sized MWTP, discharge water quality standards can be met for COPC during operations. During operations, the Proponent should validate predictions of mine water quality and identify those COPC that would exceed discharge criteria without treatment. This information will be critical to effectively design closure and post-closure water management options to meet discharge criteria and minimize significant adverse effects to aquatic ecosystems.

Table 15 Summary of Predicted Exceedances of Site Specific Water Quality Objectives before Treatment Post Closure

Constituent of Potential Concern	Units	SSWQO		Maximum Predicted Concentration			Predicted Occurrence of SSWQO Exceedances After Closure
		Total	Dissolved	Haggart Creek W4 [1]	Haggart Creek W29 [2]	Dublin Gulch W71 [3]	
Aluminum [4]	mg/L	–	0.1	**0.27**	**0.41**	**1.33**	Freshet
Antimony	mg/L	0.04	–	0.01	0.01	**0.07**	Freshet
Arsenic	mg/L	0.014 - Haggart Creek		**0.03**	**0.04**	–	Year round
		0.07 - Dublin Gulch, Eagle Creek		–	–	**0.089**	
Cadmium	mg/L	0.0003	–	0.00004	0.0001	**0.0003**	June
Copper	mg/L	0.003	–	0.002	0.003	**0.004**	June
Manganese	mg/L	0.05	–	**0.13**	**0.12**	0.04	December through May
Mercury	mg/L	0.00003	–	**0.00003**	**0.00003**	0.00002	Freshet
Selenium	mg/L	0.002	–	**0.0023**	**0.0022**	**0.0028**	Freshet
Uranium	mg/L	0.015	–	0.004	0.005	**0.022**	June

NOTES:

Bold indicates exceedance of the SSWQO

[1] *Water Quality Model Report (YOR #2010-0267-158-1) Table 28*

[2] *Water Quality Model Report (YOR #2010-0267-158-1) Table 34*

[3] *Water Quality Model Report (YOR #2010-0267-158-1) Table 32*

[4] *Predicted values are total aluminum*

8.4.5 Water Quality Model

A robust water quality model is required to reasonably predict Project-related effects to water quality and aquatic ecosystems. The Proponent provided a water quality model with the proposal. The model was developed to predict concentrations of metals resulting from the mixing of surface water and contact water from the mine site during construction, operations, closure, and post-closure. In developing the model, the Proponent used source terms predicted in the geochemical characterization program, baseline surface water and groundwater quality, predicted surface water flows from the water balance model, and estimates of nitrogen leaching from blast residues. The water quality model was developed based on the activities outlined in the proposal.

Government of Yukon indicated that the surface water balance model, groundwater quality model, and water quality model presented in the original proposal were detailed and sufficient (YOR #2010-0267-197-1). They further indicated that additional monitoring data (e.g. water quantity and water quality) can be collected during the years after the submission of the proposal. They recommend this data be used to make the models more robust.

In May 2012 the Proponent provided additional proposal information in the SIR outlining changes to the Project. The changes in activities that may affect the water quality model include the increased volume of waste rock and ore and the corresponding increases in footprint of the WRSAs and the HLF. The water quality model has not been updated to take into account the changes to Project outlined in the SIR (VIT 2012a). However the Proponent indicated that an updated water quality model is being developed to take into account the changes to the Project including the updated input data. This model will be available and submitted as part of the Type A Water Use Licence application (VIT 2012a, Appendix 10).

The Proponent provided an updated water balance model (discussed above in Section 7) but has not provided an updated water quality model. Environment Canada expressed concern that the water balance model and the water quality model have not been linked (YOR #2010-0267-292-1). They indicated that the water balance model must be linked to the water quality model to predict a range of expected water quality conditions, especially contaminant loadings, for the various phases of the Project. This will further allow the Water Board to set achievable SSWQO based on predicted water flows and water quality.

The initial water quality model was used as the basis for the effects characterization. Based on changes to the Project which are described in the SIR, the magnitude and spatial extent of Project effects on water quality may be greater than those initially predicted. The Proponent has provided information to indicate that the MWTP is capable of handling the updated contact water flows. Furthermore, they committed to operating the MWTP during the operations and draindown phases of the Project to ensure that discharge criteria are met. Areas where there is increased uncertainty and where potential adverse effects on the aquatic ecosystem could result are generally related to the decommissioning and post-closure phases of the Project.

The Executive Committee retained EcoMetrix to review specific aspects of the water quality model and how it relates to the information provided in SIR (VIT 2012a). The following is based on work presented in EcoMetrix (2012b).

Based on the revised Project presented in the SIR, with respect to potential effects to Haggart Creek downstream of Platinum Gulch, the Proponent states:

> *"During closure and post-closure, the Project Proposal concluded that residual environmental effects of Project discharges on water quality and aquatic biota are considered not significant, given that, with mitigation measures, the effluent discharges and resulting water quality in the streams will meet regulatory requirements (MMER effluent criteria, Yukon Water Board permits, WQG or SSWQO). There will be no unauthorized release of a deleterious substance (as defined under the Fisheries Act) into waters frequented by fish and no impairment of the streams to sustain aquatic life. These conclusions are equally applicable upon evaluation of the updated project refinements."* (VIT 2012a, p105-106)

> *"There is no reasonable expectation that the Project's contribution to cumulative effects has the potential to measurably change the health or sustainability of water quality and aquatic biota. For the Project, the predicted residual effects on water quality will be to meet WQG or SS WQG in Haggart Creek, and no further interactions with other projects are anticipated for Haggart Creek. Arsenic will meet a SSWQO that would be developed recognizing baseline levels."* (VIT 2012a, p106)

The analysis of water quality in the receiving environment for all Project stages is based on the projected loadings described in the initial proposal. The proposal predicts arsenic will consistently exceed the CCME WQG of 0.005 mg/L (CCME 2001) and often exceed the selected SSWQO of 0.014 mg/L (YOR #2010-0267-287-1) during post-closure in Haggart Creek (at Station W29) below Eagle Creek (YOR #2010-0267-158-1 p167, Figure 22). The greatest arsenic concentrations at Station W29 were predicted to occur during spring (0.38 mg/L in April) based on using a 10 percent infiltration cap on the HLF and the Eagle Pup WRSA with no additional passive treatment of contact waters.

The initial water quality assessment for the downstream receiving environment in Haggart Creek was based on the original proposal. Water quality predictions were provided for three proposed compliance points, Haggart Creek downstream of the treatment plant effluent discharge (site W4), the DGDC downstream of inputs from the reclaimed Eagle Pup WRSA (vicinity of W71, before it becomes fish habitat in Eagle Creek), and Haggart Creek downstream of all inputs of contact water (vicinity of site W29), but not further downstream. No new assessment has been provided for this review.

The Proponent stated that water chemistry may not change for the revised Project if the assumed water chemistry remains representative of the new open pit and anticipated WRSAs (see section 8.3 above), but has not adequately addressed the increase in loadings of COPC that is to be expected. The revised Project includes a substantial increase to the proposed waste rock volume and to surface areas affected by the tailings and waste rock storage. The loadings of arsenic and other COPC, which have been predicted to exceed water quality objectives in the receiving environment after closure, will be substantially greater than those used to support the original predictions. As reported by SRK (VIT 2012a, Appendix), source term concentrations are calculated from the metal leach mass. An increase in rock mass results in a directly proportional increase in constituent mass, or loading, potentially added to contact water over a given period of time.

The constituent concentrations may not change substantially, but the mass loading is expected to change because the contact water flow from the waste rock will be considerably greater. The total surface runoff from the site may not change because the overall footprint is the same but the proportion of runoff that comes in contact with waste rock will increase.

The expected increase in constituent loadings does not appear to be properly discussed in the proposal although this issue was raised in Appendix 10 to the SIR (VIT 2012a):

> *"It should be recognized that while we would not expect concentrations to change markedly, the evaluation of how loadings may change from the facility will need to be assessed in the context of the site-wide water and load balance. Specifically, the effect of changing footprints may have an influence on predicted water qualities within the hydrological basins of interest and should be considered in this evaluation."*

The issue of increased loadings to the receiving environment is of particular interest during post-closure when contact water is not proposed to be actively managed or treated. The information made available through the screening has not adequately demonstrated that the Proponent can mitigate this potential issue through the proposed treatment measures. As discussed below in section 8.5, EcoMetrix has concerns that passive treatment systems are not proven technologies for northern climates and therefore alternative systems, which may include perpetual active treatment systems, should be developed in parallel with passive treatments systems to ensure that long term WQO can be met at closure.

Government of Yukon expressed concern with regards to cyanide predictions in the water quality model (YOR #2010-0267-337-1). The water quality model presented in Appendix 25 to the proposal (Technical Data Report: Water Quality Model) outlines contact water input predictions to and effluent discharge predictions from the MWTP. It appears that contact water input parameters for Cyanide include weak acid dissociable (WAD) Cyanide, total Cyanide, and cyanate. However, the water quality output parameter, or effluent discharge criteria from the MWTP, is free Cyanide. Furthermore, Government of Yukon has indicated that leachate quality from column tests conducted for the HLF were not used as input to the water quality model. The Department of Environment recommended additional studies be conducted using detoxified leachate from column tests as well as additional humidity cells with detoxified ore. YCS expressed concerns that all cyanide species should be taken into account (YOR #2010-0267-341-1).

The Executive Committee requested additional information from the Proponent based on this concern. The Proponent indicated that the revised water quality model will include data from bench scale testwork of the MWTP effluent. HLF column metallurgical and detoxification/rinsing testwork provided the feed water for this bench scale testwork. Total Cyanide, WAD Cyanide, thiocyanate, and cyanate will be directly measured in influent and effluent. This will allow a comparison of total Cyanide to receiving water quality criteria.

The Proponent has neither provided an updated water quality assessment for the revised Project at this time nor a complete assessment of potential risks to aquatic resources in Haggart Creek during post-closure. As a result, uncertainty remains about predictions of long-term, post-closure water quality in the creeks downstream of the Project.

There are significant uncertainties surrounding the accuracy of the water quality model given the changes in the Project activities described in the SIR. The Project changes affect water model inputs (e.g. water balance model, baseline data collection, and source term predictions) and potential for increased loadings. These uncertainties may lead to potential discharge of water that does not meet WQO and are not protective of the aquatic ecosystem. The Executive Committee determined that an updated water quality model must be developed prior to submitting an application for a Type A Water Use Licence as indicated by the Proponent. To ensure that discharge criteria and SSWQO are set to protect the aquatic ecosystem, as discussed above, the model must include updated baseline water quality data, an updated water balance model, and updated source term predictions. Additional monitoring during operations is required to verify the accuracy of predictions arising out of the water quality model.

There is risk to the Project if the updated water quality model varies significantly from the model presented in the proposal and used in this assessment. For example, should the updated model predict water quality that requires substantial changes to the Project to ensure discharge criteria meet WQO, new activities may not be covered under the scope of this assessment. As a worst case scenario, the updated water quality model and water quality predictions may result in water quality that cannot be mitigated to an extent that is protective of the aquatic ecosystem.

In a response to a request for additional information, the Proponent provided additional information on the development of their updated water quality model (VIT 2012c). The Proponent has been developing a revised water quality model since May 2012 which will be submitted to regulators during the regulatory process. The revised model will be similar to the existing model in that it is a conservative mass-mixing model. However, there are some key revisions which take into account the changes to the Project outlined in the SIR, updated baseline water quality data, and recommendations made by the Executive Committee in the DSR. Furthermore, the revised water quality model is being integrated on the same GoldSim model platform as the updated site WBM. Key changes as described by the Proponent include (VIT 2012c):

- *"the use of GoldSim, rather than the Excel-based spreadsheet platform,*
- *the incorporation of updated project information (from the May 2012 SIR) associated with the larger footprints,*
- *the simulation of various water management strategies that optimize the flow of water to the minewater treatment plant, while meeting water quality compliance objectives,*
- *an extension of the model boundaries to below the confluence of Haggart and Lynx Creeks (i.e., to monitoring station W23),*
- *the use of updated baseline water quality data (through October 2012), and the consideration and review of potential changes from background conditions using suitable SSWQOs,*
- *the use of updated geochemical source terms, and*
- *results that indicate the location where downstream water quality complies with water quality guidelines and/or SSWQOs:*
    - *without active or passive treatment,*

- *with active and passive treatment options for the expected performance, and*
- *with active or passive treatment at MMER release limits."*

8.4.6 Mine Water Treatment Plant, Cyanide Detoxification Plant, and Solution Conveyance Infrastructure

The MWTP is described in Appendix 20 to the proposal (Mine Water Treatment Technical Memorandum). Updated information was provided in the SIR and Appendix 10 to the SIR (Technical Memorandum – Water Quality Predictions). The conceptual design outlines a water treatment process that will treat contaminated surface water and detoxified process solution (influent into the MWTP) to enable discharge (effluent from the MWTP) to meet MMER, CCME/BC WQO, and proposed SSWQO. The process has been designed using influent water quality predictions from the water quality model.

As discussed above, there are uncertainties with regards to the source term predictions, the water quality model, and the methods used to derive SSWQO. Given these uncertainties, the conceptual MWTP process may not be capable of producing effluent that does not have adverse effects on downstream aquatic ecosystems. Environment Canada has noted similar concerns (YOR #2010-0267-192-1).

Assumptions, predictions and uncertainties remain in the models that feed into the MWTP. Refined models (taking into account updated baseline data), pilot scale testing, and operational monitoring will allow for a detailed MWTP process that will ensure effluent is capable of meeting discharge criteria. Environment Canada notes that effluent quality predicted from the MWTP is only assumed at this time as discharge criteria will be defined during the Water Use Licence and permitting stage. They also recommend further effluent modeling and/or effluent simulations be conducted by the Proponent prior to the water licensing stage (YOR #2010-0267-192-1).

The cyanide detoxification process proposed by the Proponent uses a proven and effective two step cyanide removal process, followed by air stripping. The first step includes oxidizing cyanide to a less toxic cyanate form. The second step includes hydrolyzing the cyanate to ammonia. The ammonia generated in this process will be removed by air stripping. Ammonia is both a water-enriching nutrient and toxin at high enough concentrations and will require careful management. Once process leach solution has been detoxified, it is mixed with other mine site contact water and directed through the MWTP prior to discharge to Haggart Creek.

Chlorine will be used in the MWTP process to oxidize some metals as well as any residual cyanide from the cyanide detoxification process. The effluent can be de-chlorinated prior to discharge. However, Environment Canada has expressed concern over residual chlorine and chlorine by-products remaining in the effluent (YOR #2010-0267-192-1). De-chlorination is an important step in the water treatment process as chlorine has a high acute toxicity to aquatic organisms.

The Proponent indicated that there will be an optional de-chlorination step in the treatment process that will be used when necessary to ensure that the treated water will not be harmful to aquatic life and will pass discharge criteria set under the MMER. However, Environment Canada recommends that further effluent modeling and/or effluent simulations are conducted prior to prior to the water licensing stage to predict the potential for residual chlorine or by-products. The Executive Committee is confident that the technologies exist to treat contact water and excess process solution to meet criteria and allow discharge without significantly affecting downstream aquatic ecosystems. These treatment systems must be properly designed to treat the COPC in the influent stream.

8.4.6.1 Effects of failure or malfunction of the Mine Water Treatment Plant, Cyanide Detoxification Plant and Solution Conveyance Infrastructure

As discussed above, the water quality model predicts that concentrations of COPC will exceed CCME WQG, BC WQG, and SSWQO. Failure or malfunction of the MWTP, the cyanide detoxification plant, or solution conveyance infrastructure during operations or post-closure could result in the release of water with elevated concentrations of metals and cyanide to the environment. Discharge of untreated effluent containing levels of contaminants above discharge criteria is considered significant and adverse.

Failure or malfunction of the water treatment processes and/or solution conveyance infrastructure could result from various factors including:

- insufficient water storage capacity or MWTP flow-through capacity to deal with extreme precipitation events;
- mechanical breakdown of equipment or operator error;
- power failure; and
- effects of the environment on the MWTP, cyanide detoxification plant and solution conveyance infrastructure such as forest fire, debris flows etc. (effects of the environment on mine site infrastructure have been dealt with below in section 9).

The Proponent provided a site WBM and water management plan (VIT 2012a, Appendix 8 and Appendix 9) outlining how contact and non-contact water will be managed on-site. Further details are provided in the proposal and the SIR (VIT 2011a and 2012a). Additional information on the site WBM and the HLF WBM were provided in response to information requests issued by the Executive Committee (VIT 2012c and 2012d). These are discussed previously in section 7. The Proponent has provided details on how contact water can be managed during extreme precipitation events to ensure that they do not exceed the MWTP capacity of 600 m^3/h (or 14 400 m^3/day). Management tools and options for extreme precipitation events include:

- operational solution storage and management infrastructure including the HLF in-heap pond and two event ponds with a total combined system operation capacity of 642 000 m^3; and
- process solution transfer pumps located in the in-heap pond capable of pumping 2 770 m^3/h and a back-up solution transfer pump capable of pumping 693 m^3/h.

The Proponent included redundancies in pumping capabilities as well as excess storage capacities to deal with excess process leach solution and ensure that the MWTP capacity will not be exceeded. For example, as stated by the Proponent in the SIR, *“the combined pumping rate of treatment and solution recycling (i.e., 80 900 m^3/day) is more than twice the total daily volume that is estimated to drain to the Events Ponds during a 1:100 year 24 hour storm during freshet (i.e., 33 000 m^3).”*

Furthermore, the operational volume maintained in the in-heap pond will be approximately 13 to 42 percent of its total capacity. Water from the event ponds will be used as makeup water and re-circulated to the HLF.

The Proponent has indicated additional management options for process leach solution in the unlikely event that the in-heap pond and both event ponds reach full capacity, including:

- treatment of contact water through the MWTP at a rate of 600 m^3/h (14 400 m^3/day);
- modification of the barren solution pipeline to pump excess process solution as a spray on the HLF. This spray would form snow during cold weather or encourage evaporation during warm weather;
- use of back-up transfer pump to double solution recycling and use unsaturated portion of HLF for storage; and
- use of the open pit as temporary storage for an additional capacity of 50 000 to 275 000 m^3.

The Proponent demonstrated that the HLF solution management system is flexible and allows different management options to respond to extreme precipitation events. The proposal indicated that the MWTP and the cyanide detoxification plant would be constructed and functional prior to operations. However, the SIR has indicated that the cyanide detoxification plant will not be required until year eight of operations.

The WBM presented in the original proposal and the SIR indicated that the HLF would operate with a negative water balance and during operations all process leach solution will be recycled in the leaching circuit. In other words, process leach solution would not be required to be detoxified and discharged during operations. However, the HLF WBM revision 3 indicates that while years one through three will operate with a negative water balance, starting in year four, the Project will operate with a positive water balance and will require treatment and discharge of excess water (VIT 2012c). Furthermore, it may not be possible to operate the HLF as a zero discharge facility from years one through three due to reasons including higher than projected run-on/infiltration, lower than projected available solution storage capacity, and circumstances that temporarily or permanently reduce storage capacity. In addition, accidents or malfunctions during operations to the process leach solution circuit may require temporary detoxification of process leach solution to allow for discharge. There may be other unforeseen events that require process leach solution detoxification such as temporary shutdown or unplanned closure of the Project.

Discharge of untreated process leach solution containing cyanide would have significant adverse effects to the downstream aquatic ecosystem. As indicated by recent information, the cyanide detoxification plant must be constructed and functional by year four. However, the Executive Committee believes that the risk of discharge during years one through three would be greatly reduced if the cyanide detoxification plant was constructed and functional prior to operations. This would ensure the Project has additional flexibility and options in the event of unforeseen problems or events.

The Proponent has also demonstrated that there will be redundancy in the power supply for the pumping and water/solution conveyance systems on-site. Electricity will be supplied to the Project by

Yukon Energy Corp. through the electrical grid. The Proponent has indicated that they will conduct regular monitoring and maintenance of the proposed transmission and distribution lines. Furthermore, three emergency diesel generators will be located on-site to provide back-up power. In the event of a long-term power failure, the Proponent will store sufficient diesel on-site to power the emergency generators for approximately two weeks.

The Proponent has indicated that the emergency diesel generators will supply power to the pregnant and barren solution pumps, carbon stripping circuit, camp and buildings, fire and freshwater distribution systems, and fire, alarm and security systems. The Executive Committee agrees with the Proponent that, in the event of power failure, the Proponent should be able to supply sufficient power to the MWTP and the cyanide detoxification plant to ensure that water can be treated for discharge. This avoids the potentially significant effects of untreated discharge due to a loss of power for key mine infrastructure.

Process leach solution will be pumped between various site infrastructure during normal operations as well as during upset conditions. For example, under normal operating conditions, solution will be pumped between the HLF and the process plant at a rate of approximately 2 770 m^3/h in either direction. Pumping of process leach solution will also occur between other infrastructure including HLF in-heap pond, top of HLF, event ponds, MWTP, etc. Damage to pipelines at various stages could result in significant amounts of process leach solution to be discharged to the environment. In certain areas (e.g. in close proximity to the DGDC) a discharge of solution may be very difficult to contain. Discharge of untreated process leach solution containing cyanide would have significant adverse impacts to the downstream aquatic ecosystem.

The Proponent has indicated that there will be double containment in cyanide storage areas. However, they have not indicated whether or not there will be any secondary or double containment of solution transfer pipelines. Although the likelihood of process leach solution discharge from damage to pipelines may be low, the magnitude and extent of potential effects may be high. The Executive Committee has determined that means must be in place to capture and contain process leach solution in the event of uncontrolled discharge from solution transfer pipelines.

The Executive Committee has determined that the Project may result in significant adverse effects to aquatic ecosystems as a result of failure or malfunction of the MWTP, cyanide detoxification plant, and/or solution conveyance infrastructure. However the effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitgative measures specified by the Executive Committee.

8.4.7 Recommended Terms and Conditions

In determining the significance of the effects related to adverse changes to water chemistry, the Executive Committee has considered the following non-discretionary legislation:

- *Fisheries Act*
- *Waters Act* and *Waters Regulation*
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*

- *Canadian Environmental Protection Act*
- *Environment Act*

The Executive Committee has also considered the role of the Yukon Water Board and their authority under the *Waters Act* to issue a Water Use Licence (WUL) for a proposed use of water or deposit of waste into water, or both. Section 12 (4)(a)(i) of the *Waters Act* provides, in part:

> *"Where an application for a licence is made, the Board shall not issue a licence unless the applicant satisfies the Board that… the use of waters or the deposit of waste proposed by the applicant would not adversely affect, in a significant way, the use of waters, whether in or outside the water management area to which the application relates."*

Section 13 (1)(a)-(e) of the *Waters Act* states:

> *"Subject to this Act and the regulations, the Board may include in a licence any conditions that it considers appropriate, including, without limiting the generality of the foregoing,*
>
> *(a) conditions relating to the manner of use of waters permitted to be used under the licence;*
>
> *(b) conditions relating to the quantity, concentration, and types of waste that may be deposited in any waters by the licensee;*
>
> *(c) conditions under which any such waste may be so deposited;*
>
> *(d) conditions relating to studies to be undertaken, works to be constructed, plans to be submitted, and monitoring programs to be undertaken; and*
>
> *(e) conditions relating to any future closing or abandonment of the appurtenant undertaking."*

The Executive Committee has determined that the Project will result in significant adverse effects to aquatic ecosystems by adverse changes to water chemistry. However the effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental effects of the Project to aquatic ecosystems due to adverse changes to water chemistry:

To inform the establishment of site-specific water quality objectives (SSWQO) during the regulatory review process:

61. As part of their Water Licence Application, the Proponent shall provide further analysis on the surface water quality dataset used to propose SSWQO, including:
    a. consideration and use of additional water quality baseline data collected since the proposal was submitted;
    b. consideration for the use or exclusion of data points associated with high Total Suspended Solids (i.e. data points collected during spring freshet); and

c. determination whether pre-2007 data is within the natural variation of water quality and identify and quantify the influence of anthropogenically affected water quality data.

62. The Proponent shall consider and submit into the regulatory review process the results of alternative methods for deriving SSWQO using water quality data less likely to be anthropogenically affected. Specifically, the use of background conditions inferred from the review of water quality data for other nearby and un-affected watersheds (e.g. Lynx Creek) identified as a suitable reference.

63. The Proponent shall provide information on the derivation of a background water concentration for arsenic derived from an appropriate reference location, such as Lynx Creek, and provide information on a SSWQO for arsenic within Haggart Creek based on the results. This information shall be provided to responsible regulators to allow appropriate effluent discharge criteria to be set for arsenic to ensure the protection of downstream aquatic life.

To minimize the likelihood of effluent containing cyanide being released to the environment:

64. The Proponent shall ensure the cyanide detoxification plant is constructed and operational prior to start-up of the HLF operation so that it is readily available to treat excess cyanide contaminated water should the need arise.

65. The Proponent shall ensure that process leach solution transfer pipelines are constructed in a manner that ensures capture and containment of process leach solution in the event of uncontrolled discharge (e.g. double piping or lined trenches).

To minimize the likelihood of inaccurate water quality model predictions leading to effects on the aquatic ecosystems:

66. The Proponent shall ensure that the proposed water treatment systems are designed taking into account the uncertainty associated with the water quality predictions in advance of their Water Licence Application, including:

    a. confirmation that the water treatment system performance is adequate for the range of possible water quality model predictions; and

    b. water treatment approaches that are readily adaptable should the quality of effluent be different from that predicted.

67. As proposed, the Proponent shall ensure that a revised water quality model is submitted to responsible regulators during the regulatory review process. The revised water quality model shall include:

    a. consideration and use of additional water quality baseline data collected since the proposal was submitted;

    b. predictions for various cyanide species including total cyanide, weak acid dissociable cyanide, thiocyanate and cyanate;

    c. consideration for revised source term predictions;

d. consideration and review of potential change from background conditions using suitable SSWQO. For example, if sufficient data are available, the SSWQO for arsenic should be derived from the review of the available water quality data for other nearby and un-impacted watersheds identified as suitable references;

e. consideration for the updated water balance model, including review of potential contaminant loadings due to increases in ore and waste rock volumes; and

f. support for the assumption that proposed water quality objectives for the receiving environment will be achievable with passive treatment during post-closure through the review of applicable technologies and a planned development program for the site.

68. The Proponent shall conduct monitoring of water quantity and quality from contact waters (e.g. waste rock storage areas) and non-contact waters (e.g. reference locations) during operations, closure and post-closure to verify assumptions and inform the site closure plan.

8.5 EFFECTS RELATED TO CLOSURE AND RECLAMATION

8.5.1 Passive Water Treatment during Post-closure

The post-closure stage of the Project will start when all mine operations have finished and mine site facilities have been decommissioned and active closure activities have ceased. The Proponent has indicated that during post-closure, passive treatment systems (PTS) may be required for long term water quality management of contact water from the WRSAs, HLF, and open pit.

PTS are proposed to manage water quality after active treatment has ceased. The Proponent indicated that performance of passive treatment systems will be dependent on a number of factors including influent water (facility seepage) chemistry, the effectiveness of the covers to reduce infiltration, inflow (facility seepage) rates, and treatment cell size and residence times, and effluent water quality criteria and discharge rates (VIT 2011b).

There is the potential for the Project to release effluent that does not meet discharge criteria during post-closure if the PTS do not function as proposed by the Proponent. Environment Canada (YOR# 2010-0267-192-1), Government of Yukon (YOR #2010-0267-197-1) and NND (YOR #2010-0267-295-1) expressed concerns regarding the function of PTS to treat effluent during post-closure. The Executive Committee retained EcoMetrix to review aspects of the Project related to the use of the PTS.

The Proponent provided a discussion on PTS in Appendix 28 to the proposal (Passive Techniques for the Treatment of Mine Effluent) and has provided further information to support the discussion with some case histories for cold climates including Yukon, northern Quebec and Norway.

The Proponent also provided a summary of recorded reductions in selected constituent concentrations and a conceptual design. The conceptual PTS design combines anaerobic (biochemical reactor) and aerobic processes to treat the constituents that are predicted to exceed water quality objectives at post-closure. These constituents are discussed above in section 8.4.3 and include aluminum, antimony, arsenic, cadmium, copper, manganese, selenium, silver, and uranium.

EcoMetrix (2011) identified certain key issues concerning the proposed closure plan for the Project and the implications for long-term water treatment. Major limitations identified included the:

- uncertainty associated with the duration of active water treatment requirements during closure;
- likelihood that runoff and seepage from the waste rock piles will require perpetual active treatment;
- proven effectiveness of the proposed passive treatment technologies for treating mine-water; and
- likelihood that the proposed cover systems will meet the infiltration reduction objectives assumed by the Proponent.

EcoMetrix also stated concerns with regard to characterization of inflow (i.e. constituent loadings, concentrations, and flows) and the ability of the PTS to meet treatment objectives based on those inflow characteristics. After reviewing additional proposal information and the SIR, EcoMetrix (2012b) has indicated that these concerns still remain.

The Executive Committee notes that the Proponent and regulators will have almost a decade of Project operations to collect information on actual Project water quality, validate water quality predictions and refine closure PTS options. Mitigations that improve the confidence in the effectiveness of the proposed PTS decrease the likelihood of effluent discharges above criteria during post-closure, which decreases the significance of the effects of these discharge on aquatic ecosystems. Clearly defined water chemistry of influent, nominal flow rates, seasonal variations, and target effluent levels will allow appropriate development of PTS. Furthermore, early on in the design of the PTS the Proponent must identify and evaluate candidate substrate materials for the biochemical reactor. The Proponent has indicated that laboratory, bench, pilot, and full scale testing will be conducted in developing the PTS.

Environment Canada (YOR #2010-0267-192-1), Government of Yukon (YOR #2010-0267-197-1) and EcoMetrix (2012b) expressed the need for the above noted testing to occur. The development schedule for the PTS should begin early in the Project development to allow for review and acceptance of detailed PTS plans prior to decommissioning. Furthermore, monitoring and follow-up plans must be included to evaluate the performance and predicted long-term effectiveness of the PTS. A maintenance plan should also be included to deal with issues identified in the monitoring and follow-up plan. EcoMetrix, in their review of the SIR, have indicated that there are few, if any, good examples of PTS in northern climates. While PTS may prove to be effective, there remains considerable uncertainty surrounding the implementation of PTS for this Project.

The Mining and Petroleum Environmental Research Group conducted a review of the applicability and potential effectiveness of PTS for Yukon mine drainage applications (Laberge 2010). The review indentified PTS, such as bioreactors designed for site specific conditions, as potentially viable options for long-term treatment of mine drainage in Yukon. However, the review also indicated that drawbacks to bioreactors include short-circuiting, plugging, compacting, overloading, and exhausting of carbon available to sulphate reducing bacteria. Furthermore, long-term performance has not been proven as case studies used in Yukon review were limited to pilot and field scale studies. NND has also questioned the performance of PTS in northern conditions (YOR #2010-0267-200-1). Referencing the Alexco, Draft Closure Options Report for Keno Hill, NND indicated that PTS trials showed some metal removal during warmer months but little or no metal removal during colder months.

Based on uncertainties and the lack of information on the performance and longevity of the proposed PTS to achieve required treatment levels, there is the potential that PTS are shown to be ineffective for treating contact water post-closure. If PTS are ineffective for the Project and contact water has elevated concentrations of COPC, alternative treatment systems must be in place. This may include the requirement for longer-term active treatment at the site post-closure.

8.5.2 Recommended Terms and Conditions

In determining the significance of the effects on aquatic ecosystems if passive treatment systems are ineffective at closure, the Executive Committee has considered the following non-discretionary legislation:

- *Fisheries Act*
- *Waters Act* and *Waters Regulation*
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- *Canadian Environmental Protection Act*
- *Environment Act*

As noted previously, the Executive Committee has also considered the role of the Yukon Water Board and their authority under the *Waters Act* to issue a Water Use Licence (WUL) for a proposed use of water or deposit of waste into water, or both.

The Executive Committee recognizes the Proponent commitments set out in Appendix A and B will help to reduce, control or avoid adverse effects related to ineffective passive treatment systems at closure on aquatic ecosystems. However, we recommend additional mitigative measures to ensure that passive treatment systems are effective and adequately reduce significant adverse effects to aquatic ecosystems during post-closure.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental effects of the Project to aquatic ecosystems.

To ensure the effectiveness of passive treatment systems for the protection of aquatic ecosystems during post-closure

69. The Proponent shall provide responsible regulators with updated long-term, post-closure water quality predictions based on updated water quality modeling, water balance modeling, and groundwater modeling.

70. The Proponent shall provide responsible regulators with rationale for the assumption that proposed water quality objectives for the receiving environment will be achievable with passive treatment during post-closure through the review of applicable technologies and a planned development program for the site.
71. The Proponent shall ensure that the proposed approach for developing the passive treatment follow a phased approach that includes laboratory scale, bench scale, pilot scale, and full scale testing.
72. The Proponent shall ensure that the passive treatment system development and testing begins early enough in the Project development to ensure that detailed plans are submitted, reviewed and accepted by responsible regulators prior to decommissioning.
73. The Proponent shall ensure that the passive treatment system development includes a monitoring plan with follow-up on the performance and predicted longevity of the systems and a maintenance plan in the case that the performance and/or longevity of the systems are somehow compromised.

To ensure that contact water discharged during post-closure will not adversely affect aquatic ecosystems:

74. The Proponent shall ensure that contact water discharged by the Project during post-closure meets discharge criteria established by the responsible regulators.
75. The Proponent shall maintain active mine water treatment until contact water meets discharge criteria established by the responsible regulators or alternative treatment methods such as passive treatment systems are proven to be effective.
76. The Proponent shall ensure that means for active water treatment remain in place for a length of time, determined by the responsible regulators, as a contingency in the event of failure of the passive treatment systems.
77. The Proponent shall demonstrate of the potential benefits of the proposed water treatment system for the post-closure phase of the revised Project by providing quantitative modelling results and determining at what point further downstream water quality complies with water quality guidelines and/or site specific water quality objectives:
    a. without active or passive treatment;
    b. with active or passive treatment for the expected performance; and
    c. with active or passive treatment at regulatory release limits.

8.6 EFFECTS RELATED TO FISH AND FISH HABITAT

The Project includes various activities that may affect fish habitat. These activities include construction of mine site infrastructure, access road upgrades, and transmission line construction, as well as activities such as water usage and discharge and site water management. The Project may cause adverse changes to fish habitat through various pathways including:

- removal and alteration of riparian areas during construction;
- construction of mine site infrastructure within stream and riparian areas (e.g., watercourse infilling for WRSAs, HLF and embankment, DGDC construction, and open pit development);
- water usage and discharge during construction and operations; and
- diversion of watercourses and site runoff.

Appendix 23 to the proposal (Preliminary Fish Habitat Compensation Plan) estimates a permanent loss of 17 929 m² of in-stream fish habitat (9 799 m² of fish-bearing and 8 130 m² of non-fish-bearing habitat). The Fish Habitat Compensation Plan (FHCP) further estimates a loss of 191 550 m² of associated riparian habitat (92 400 m² of fish-bearing and 99 150 m² of non-fish-bearing habitat). There will also be a loss of wetted usable area for fish in Haggart Creek due to a reduction in baseline flows. Through the DGDC, Dublin Gulch will be diverted from Haggart Creek into Eagle Creek. As well, flows from Eagle Pup and Stuttle Gulch will be re-routed from Eagle Creek, through the MWTP, and discharged to Haggart Creek. This reduction of wetted usable area (1.8 km section of Haggart creek between the Dublin Gulch confluence and the Eagle Creek confluence) is estimated to be -380 m² (-2.4%) during an average year, -497 m² (-3.2%) during a wet year, and 169 m² (-1.1%) during a dry year.

Authorization under the *Fisheries Act* for the harmful alteration disruption or destruction of fish habitat as a result of the Project will be required. This has been noted by DFO (YOR #2010-0267-191-1). The Proponent has indicated that the FHCP will result in a no net loss of fish habitat and will meet the requirements under the *Fisheries Act*. DFO has indicated that the preliminary FHCP is consistent with DFO policy and that the appropriate information has been submitted. However, *“DFO will not make conclusions with regard to the acceptability of the plan until it has completed the review of the entire project proposal, has received a recommendation from the Executive Committee, and has consulted with the potentially affected First Nation.”* (YOR #2010-0267-191-1).

The Proponent has shown that Project changes as proposed in the SIR will not significantly affect the amount of fish habitat being disturbed or the reduction in base water flows in Haggart Creek. Therefore, the preliminary FHCP has not been updated. The Proponent has further indicated that a detailed FHCP with detailed engineering design will be submitted to DFO for authorization under the *Fisheries Act*.

The flow changes in Haggart Creek have been estimated but have not been included in the water balance model as noted above in section 8. The preliminary FHCP should be reviewed and updated based on a hydrological assessment of the receiving environment considering modifications made to the Project described in the SIR and any resulting changes to potential impacts on fish habitat.

The focus of the preliminary FHCP is maintaining habitat for Arctic grayling, a sport fish species present within the affected streams. The baseline fish studies conducted by the Proponent also identified slimy sculpin present in the affected streams. Slimy sculpin are a forage fish and are a preferred sentinel species for monitoring. Young-of-the-year and juvenile slimy sculpin are also likely a food source for Arctic grayling. Monitoring of slimy sculpin populations should be included in monitoring following the installation of the FHCP.

Although the Proponent did not capture any Chinook salmon at Haggart Creek sites during field sampling programs, historic data indicate Chinook have been observed in Haggart Creek in close proximity to the Project. Furthermore, Chinook salmon were observed during field sampling programs at the South McQuesten River bridge. Upper reaches of Haggart Creek near the Project have been heavily influenced by historic placer mining activity and are less likely to be suitable salmon habitat.

There are several activities along the access road that may affect fish and fish habitat including the development of borrow sources, stream crossings and culvert replacements, construction of the parking area at the South McQuesten River bridge, and the construction of a staging area near the South McQuesten River. DFO has expressed concern with regard to these activities in close proximity to the South McQuesten River (YOR #2010-0267-191-1). They recommend that the parking and staging areas are constructed in a manner to avoid impacts to fish and fish habitat.

The Project includes the construction of a 44 km, 69 kV transmission line with a cleared right-of-way of 30 m. The transmission line will generally follow the South McQuesten and Haggart Creek access roads. The route would cross many fish bearing streams and include activities that may result in potential effects to fish and fish habitat such as clearing vegetation, installation of power poles, stringing of power lines, and access to the right-of-way. The Proponent has indicated that they will follow DFO's Operational Statement for Overhead Line Construction. However, DFO has indicated that this operational statement is intended for transmission lines with a right-of-way of 10 m or less (YOR #2010-0267-0191-1). They provide further recommendations in addition to the operational statement to reduce effects to fish and fish habitat.

The Project includes activities that may lead to erosion and sedimentation. An increase in sediment load may result in an increase in the total suspended solids in a watercourse thereby altering the chemistry of the water body. In general, the deposition of fine sediment in aquatic ecosystems is detrimental to aquatic organisms. The effects of increased sediment loads and increased turbidity levels may over time affect flow and water quality to the point where fish food sources are diminished and fish habitat rendered unsuitable to support fish and fish reproduction.

Activities associated with construction such as clearing vegetation, construction of mine-site infrastructure, construction and upgrading of roads, may lead to erosion and sedimentation. During operations, activities such as blasting, crushing, road maintenance may further lead to the deposition of fine particulate and sediments into nearby water bodies. The Proponent has proposed mitigative measures to ensure that activities will not result in the release of sediments into nearby aquatic ecosystems.

The Executive Committee recognizes that there will be changes to fish habitat as a result of the Project. The magnitude of incremental change, due to Project activities in watercourses around the mine site already affected by anthropogenic activities is considered relatively small. Furthermore, although impacts to fish habitat are permanent and not likely reversible (e.g. infilling of watercourses) the effects are not considered significant based on the proposed creation of new fish habitat to offset any habitat loss. Power line construction may result in significant adverse effects to riparian areas, in particular at areas of stream crossings. However, these effects can be mitigated.

8.6.1 Recommended Terms and Conditions

In determining the significance of adverse Project effects on fish and fish habitat, the Executive Committee has considered the following non-discretionary legislation:

- *Fisheries Act*
- *Waters Act* and *Waters Regulations*
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- *Canadian Environmental Protection Act*
- *Environment Act*

The Executive Committee has concluded that the Proponent commitments as outlined in Appendix A of this report and compliance with relevant legislation will help to reduce, control or avoid adverse effects to fish and fish habitat in aquatic ecosystems. However, we recommend additional mitigative measures to adequately reduce the effects to aquatic ecosystems with regard to fish and fish habitat.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental effects of the Project to fish and fish habitat in aquatic ecosystems.

To mitigate significant adverse effects to fish and fish habitat:

78. The Proponent shall review and update the preliminary Fish Habitat Compensation Plan taking into account changes in the Project identified in the SIR and the effect of those changes on potential effects on fish habitat.
79. The Proponent shall construct the parking and staging areas along the access road in a manner that:
    a. where possible, avoids impacts to riparian vegetation within 30 m of the high water mark;
    b. where possible, avoids impacts to stream channels; and
    c. avoids the introduction of sediments into surface waters.
80. The overhead transmission line shall be constructed in a manner that:
    a. applies the mitigation measures described in the Fisheries and Oceans Canada Operational Statement for Overhead Line Construction;
    b. to the extent possible, ensures watercourse crossings to occur as close to the road crossing as possible to minimize the amount of riparian area clearing;

c. to the extent possible, ensures short riparian shrubs and grasses are left undisturbed;

d. ensures riparian trees and tall shrubs are topped as opposed to completely removed;

e. ensures a qualified environmental professional (QEP) is on-site at the time of final pole location selection, and while the clearing is taking place for Haldane Creek, North Star Creek, South McQuesten River, Bighorn Creek, Secret Creek and Haggart Creek; and

f. ensures the QEP is tasked with ensuring minimal disturbance of riparian vegetation and avoiding a harmful alteration, disruption or destruction to fish habitat as a result of the clearing.

8.7 CUMULATIVE EFFECTS ASSESSMENT

The residual effects of the Project on aquatic ecosystems will interact with the residual effects of other projects in the Haggart Creek watershed. Cumulative effects on aquatic ecosystems through adverse changes to water quality and fish and fish habitat are considered in this section. Existing activities in the Haggart Creek watershed that would have residual effects on aquatic ecosystems include several active and proposed placer mines. Quartz exploration projects in the watershed are not expected to have residual effects on aquatic ecosystems of significant magnitude.

In addition to existing and recent projects (Appendix E), the upper reaches of Haggart Creek and the Dublin Gulch watershed have been heavily impacted by historic placer mining activities. Since 1895, small operations to larger scale mechanized operations have been undertaken in the watershed. Historic placer mining has resulted in the complete removal of vegetation and overturning of riparian area as well as the diversion of Dublin Gulch, Eagle Pup and Stuttle Gulch drainages. Historic placer mining wastes (e.g. cobble and boulder tailings and settling ponds with fine sediments) are prominent features in the Haggart Creek and Dublin Gulch watersheds. These wastes likely contribute to the overall water quality in the area.

Placer mining activities may result in residual effects to aquatic ecosystems including introduction of sediment to surface water, water use, vegetation clearing, excavation of soils, construction and use of roads and culverts and accidental release of deleterious substances into watercourses. The Proponent presents surface water quality data from 2007 that show an increase in total suspended solids and associated metals compared to other years. The Proponent provides evidence that the decreased water quality observed is due to upstream placer mining activities that year.

Water quality has been affected in the Dublin Gulch and Haggart Creek drainages due to past placer mining activity. Exposed placer mining wastes and settling ponds may have contributed to increased concentrations of metals in surface waters. Clearing of vegetation, removal of riparian areas, and diversion of streams may lead to increased erosion and sedimentation. There is no baseline water quality data from these drainages prior to disturbance. Therefore, it is likely that the current level of residual effects for erosion and sedimentation from historic projects are low to moderate as vegetation has begun to re-establish and stream channels have stabilized. However, there may be residual effects of increased metal concentrations in surface water due to exposed wastes. For example, metal concentrations in Dublin Gulch and Haggart Creek may be currently elevated above their natural baseline.

The magnitude of the residual effects of the Project on water quality is related to exceedances of their SSWQO for water quality parameters. Discharge of effluent within the SSWQO should not adversely affect aquatic life. The Proponent has proposed to ensure that discharge water quality will meet MMER, CCME WQG, BC WQG, and SSWQO. SSWQO were proposed for arsenic and sulphate. For the majority of contaminants of concern, MMER, CCME WQG, BC WQG will be met. The Executive Committee is confident that water treatment technologies and processes exist to treat effluent during operations to meet SSWQO. The Executive Committee is of the view that if the SSWQO/WQG are met, there is a low likelihood that residual effects will interact with residual effects from other projects and activities in the watershed, resulting in significant adverse cumulative effects to the water quality of the aquatic ecosystems.

Active placer mining in the Haggart Creek watershed may lead to increased erosion and sedimentation in surface waters near the Project. This may lead to alteration of water chemistry such as increased total suspended solids and concentrations of metals. The Proponent has proposed to ensure that discharge water quality will meet WQG that are protective of the aquatic life. However, if there is active placer mining that is discharging water at the same time as the Project, residual effects may result in cumulative water quality that does not meet CCME WQG or BC WQG. This may result in potential significant adverse cumulative effects. The Proponent has proposed, and the Executive Committee expects, downstream monitoring of water quality parameters. If the levels of these parameters increase unacceptably as a result of Project inputs, regulators are in a position to modify the discharge limits in licences.

Specific mitigative measures recommended by the Executive Committee to decrease the likelihood of ineffective passive treatment systems for arsenic during post-closure are expected to reduce the magnitude of the residual effects of the Project related to significant long-term arsenic discharge.

Construction of the mine site, access road improvements and power line construction are all expected to have residual effects on fish and fish habitat in the Haggart Creek watershed. Historic placer mining has altered fish habitat along Haggart Creek and some tributaries. Upper Haggart Creek has limited fish populations and fish species diversity. The Proponent suggests that a reason for the low diversity is the lack of suitable over-wintering habitat.

The Proponent proposes to mitigate the residual effects of the mine site on fish and fish habitat through their Fish Habitat Compensation Plan. The FHCP proposes to create habitat that may prove suitable for fish over-wintering. This would increase the year-round fish habitat and fish habitat quality in upper Haggart Creek. It is unclear how reversible the significant past changes to fish habitat in Haggart Creek are. If the residual effects to fish and fish habitat as a result of the Project are of low magnitude or arguably positive in the longer term, then the cumulative effects on fish and fish habitat are not significant.

The mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and the mitigative measures recommended in this report, are considered by the Executive Committee as adequate to address potential cumulative effects to aquatic ecosystems. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects on aquatic ecosystems.

8.8 Conclusion of the Aquatic Ecosystems Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to aquatic ecosystems.

9.0 ENVIRONMENTAL QUALITY

This section addresses potential effects of the Project on environmental quality of the Project area. An understanding of the environmental setting for environmental quality is provided. Potential adverse effects are characterized and discussed in the context of the proposal, comments received during the screening, relevant legislation and mitigation measures proposed by the Proponent.

This section considers the management of terrain stability, permafrost, waste rock storage, natural hazards (e.g. earthquakes, floods and mass movements) and deleterious substances. This includes consideration of accidents and malfunctions during construction, operation, reclamation and closure, and post closure of the proposed facilities and infrastructure.

9.1 OVERVIEW

The Project will involve the development of an open pit and the construction of major infrastructure with heavy static loads (e.g. HLF and WRSAs) as well as buildings and equipment with vibratory loads (i.e. series of three conventional crushing facilities).

Engineering challenges for construction of the proposed earthworks include supply of high quality borrow materials, foundation and cut slope design, construction on ice-rich permafrost, bedrock “rippability”, and the potential risk of slope failure and changes in terrain stability. These issues are addressed in this section.

The geotechnical characteristics of the mine site are affected by a complex geological history. More specifically, the local bedrock is variably folded, faulted, and metamorphosed. Dublin Gulch remained ice-free during the most recent continental glaciations. As a result, the rock mass has been left in place for at least 200 000 years and has developed a thick weathered profile. Rock mass quality in weathered rocks is typically low. Surface sediments and bedrock are further modified by ongoing periglacial and colluvial processes, and excess ice is commonly encountered in widely distributed, discontinuous permafrost. Permafrost occurs typically on north-facing and east-facing slopes at higher elevations and within poorly drained valley bottoms. The permafrost is relatively warm, with measured ground temperatures typically ranging between 0 and -1°C. Valley bottom sediments have been reworked by a century of human activity.

There is a general absence of durable rock for use in high quality engineering applications, such as concrete aggregate, large block riprap, drain rock, structural fill or durable rock fill. The typically poor quality rock mass has important implications for the design of foundations, particularly those with heavy static or vibratory loads, and where foundations will need to be placed on sloping ground in rugged terrain. The pervasive foliation and associated joints and faults in the rock also present challenges for the design of engineered cut slopes. For example, the orientation of foliation follows natural slope surfaces in much of the area south of Dublin Gulch, forming potential planes of weakness that are of concern for engineered cut slopes.

Construction challenges will be most significant where warm permafrost that is also ice-rich is disturbed and exposed to thawing during the summer, since ice-rich permafrost can suffer significant loss of strength and stiffness upon thawing.

The Executive Committee has considered the following potential adverse effects to environmental quality:

- changes in terrain and infrastructure stability; and
- air quality.

Effects of the environment on the Project (e.g. extreme hydro-meteorological events, earthquakes, climate change) are addressed in this section.

9.2 Evaluation of Baseline

The proposal and supplementary information provide an understanding of baseline conditions related to environmental quality. The information provided is sourced from scientific publications, industry standards publications as well as studies done by the Proponent in support of the Project. The baseline information considered in this evaluation is addressed in two sections: the natural environment and the geotechnical design base for mine site infrastructure.

9.2.1 Geotechnical Investigations of Soil and Bedrock

Surficial geology, bedrock, terrain hazard and terrain stability mapping as well as soil classification were conducted by various consulting companies on behalf of the Proponent for the footprint of the mine, including the access road.

During soil classification, soil map units were developed based on field data and terrain conditions reflective of dominant surficial material characteristics. The largest influence on soil development in the area of the Project is climate and the resulting permafrost which is present in substantial portions of the area. Within the Project area, permafrost is present in the eastern plateau and in the lower valley bottoms adjacent to Haggart Creek and Dublin Gulch.

The proposal provides terrain hazard and stability mapping which includes detailed terrain classification for the area. This mapping provides details on terrain stability, potential for soil erosion, slope angle, drainage capacity and geomorphologic processes. The objectives of the terrain hazard assessment is to support Project engineering design so that natural geoprocesses are not accelerated or exacerbated beyond the natural conditions, and to reduce risks to Project infrastructure. Terrain hazards identified for the study areas include slow mass movements (i.e. surficial slump, slide, soil creep and tension cracks), rapid mass movements (i.e. debris flows, rock falls and slides), bedrock slumps, seepage, flooding, gullies, watercourses, and permafrost. The dominant terrain hazard in the Project area is a consequence of accelerated permafrost thawing.

An assessment on the availability of borrow materials and their characterization was presented in the proposal. The earthworks construction materials required for construction of the HLF can be grouped into three main sizes: cobble/boulder, sand/gravel, and silt/clay.

Because the Project is an open pit mine, volumes of potentially suitable non-soil material (i.e. overburden) will be stripped during mining, and available for reclamation. The Proponent undertook the soil reclamation suitability mapping and collection of information on overburden properties with the goal to identify all materials suitable for reclamation that supports the Soil Materials and Handling Plan.

9.2.2 Characterization and Extent of Permafrost

The Project is located in a zone classified as having extensive discontinuous permafrost. This classification means that 50 to 90 percent of land is underlain by permafrost (Heginbottom 1984). The mine site is in an unusual geological setting in a Canadian context, in that it sits in a small part of the country that has not been recently glaciated. The valley bottoms were glaciated during the Reid glaciation at least 200 000 years ago, and the uplands earlier than that, potentially 800 000 to 1 000 000 years before present, in pre-Reid glaciations (Bond 1997). Permafrost is primarily concentrated in three locations in the Project area, south of the confluence of Dublin Gulch and Haggart Creek, the plateau at the east end of the LSA, and a small area at the headwaters of Ann Gulch. Permafrost occurrence has been documented through geomorphological and surficial geology observations as well as through drill cores. The temperature of permafrost at the site, where confirmed with multi-year observations of borehole thermistors, tends to be relatively warm at about ranging between 0 and -1°C. Additionally, excess ice is relatively common, observed either as visible ice, or inferred from excess water developing upon thawing of frozen samples.

A number of subsurface site investigations were conducted by the Proponent as well as predecessor companies. The most recent investigations were conducted in the summer and early fall of 2012. In total, 463 test holes and observations have been drilled within the Project footprint including 122 in the HLF area. The Proponent predicts a total of approximately 770 000 m^3 of ice-rich soils and permafrost is present throughout the Project area and will require some type of management (VIT 2012c).

9.2.3 Climate

The climate baseline report in the proposal describes local and regional climate conditions and provides details of the study area, methods of analysis, and data sets for temperature, rainfall, wind direction, wind speed, relative humidity, and solar radiation. Regional climatic data are available from several stations in the area which provide a long-term database. Historical climatic information of the Project site was available from 1993 to 1996. Climate data collection was renewed in August 2007 at the Potato Hills Station site (1 420 m asl), an historic data collection site, and a second climate station ("Camp Station") was installed in August 2009 at the old climate station site near the existing camp (823 m asl).

Historical regional climate data recorded from Environment Canada weather stations at Mayo and Dawson (Environment Canada 2010) provide information on the nature of extreme precipitation events that have been reported in the region of the Project. Rainfall recorded at the Project site is within ten percent of the estimated median rainfall for the region.

Between 2007 and 2009, no rain events at the site exceeded the 1:100-year 24-hour event intensities or accumulations in the Mayo records. The maximum 24-hour accumulation at the Potato Hills data station was 35.4 mm on September 16, 2007 which represented a five-year event for Potato Hills based on regression analysis. The extreme 24-hour rainfall recorded for Mayo is 31.8 mm (August 27, 1932) and the predicted 24-hour 100-year accumulation on record for Mayo is 35 mm. Extreme rainfall events 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 water storage and conveyance infrastructure on the Project site. Surface runoff during extreme precipitation events could also lead to slope instability.

The Proponent proposes mitigation measures to minimize potential effects to the Project during extreme precipitation events, like designing the HLF and WRSAs using defined synthetic modeled peak flow assumptions.

All infrastructure design specifications for the Project have taken into account the potential for extreme events and effects of the environment, including climate change. The Water Management Plan provides a detailed description of design criteria for the Project's water management facilities with respect to extreme precipitation events. Water management is addressed in section 7.0.

9.2.4 Earthquakes

The Project is located within an area of moderate seismic hazard (Natural Resources Canada 2005). Seismic events have the potential to cause terrain instability and damage to Project facilities. Site-specific seismic hazard information was obtained from Natural Resources Canada (VIT 2011a). The most appropriate standard to be applied to design of non-building Project facilities have been determined during feasibility-level design studies. Design and construction of the HLF embankment has considered the Canadian Dam Association's Dam Safety Guidelines (2007). The HLF will be designed to withstand seismic ground motions from the maximum credible earthquake (MCE). The design for high hazard facilities such as the HLF embankment will be for a peak ground acceleration of 0.27 g and MCE of moment magnitude 7.0.

9.2.5 Air Quality

Little is known of the existing air quality regime in the Project area. The closest air quality monitoring station is the Environment Canada National Air Pollution Surveillance Network station in Whitehorse, Yukon. The Proposal presents an air contaminants baseline study, divided into two categories, Criteria Air Contaminants (CACs) and greenhouse gases (GHGs). CACs include fine particulate matter ($PM_{2.5}$), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO).

There are no other large scale industrial activities in the Project area impacting on air quality. Due to the remote location and minimal sources of air pollution, gaseous air-contaminants should be low. There may be fine particulate matter in the air surrounding the Project. The Proponent has indicated that, based on previous mining experience, they expect ambient $PM_{2.5}$ concentrations to range from 2 to 3 µg/m³ during summer months.

9.3 Effects Related to Changes in Terrain or Infrastructure Stability

Permafrost and ice-rich soils are present in various areas of the mine site including the HLF, WRSAs, and DGDC. Degradation of or construction on these soils may lead to instability of infrastructure, which may directly affect various VESECs. In assessing effects related to changes in terrain or infrastructure stability, the Executive Committee considered degradation of permafrost, HLF stability, WRSA stability, and management of excavated ice-rich soils and permafrost.

9.3.1 Degradation of Permafrost

Construction of major mine infrastructure on or adjacent to areas of ice-rich soils and permafrost may result in decreased stability. Clearing of vegetation, removal of topsoil and overburden, and surficial material disturbances increase permafrost degradation. Thawing permafrost results in an increased water content in unconsolidated materials which then increases the risks of mass wasting (i.e. slumping and debris flows). Mass wasting due to permafrost thaw may directly affect various VESECs including environmental quality, aquatic ecosystem, wildlife and wildlife habitat, health and safety. Mass wasting may also indirectly affect these VESECs by leading to instability of mine site infrastructure. Infrastructure such as the HLF, HLF embankment, WRSAs and DGDC may become unstable if they are constructed overtop of permafrost. If the construction leads to degradation of permafrost below the infrastructure foundations, they may become unstable and ultimately fail.

Failure of the HLF and HLF embankment may lead to release of crushed ore/tailings and process leach solution containing cyanide and metals into the environment. Failure of the DGDC may lead to instability of the diversion itself as well as instability of the HLF embankment. This may result in increased erosion and sedimentation as well as the failure of portions of the HLF embankment. Failure of the WRSAs may lead to volumes of waste rock sliding down into lower reaches of Eagle Pup, Platinum Gulch and potentially Dublin Gulch and Haggart Creek leading to increased metals loadings and instability of other site infrastructure. Permafrost degradation at the periphery of infrastructure may lead to small scale mass wasting events. This could lead to localized instability of small portions of infrastructure.

Various participants expressed concerns related to construction of the HLF and WRSAs in areas of discontinuous permafrost (YOR #2010-0267-201-1, YOR #2010-0267-200-1 and YOR #2010-0267-295-1).

Permafrost and frozen soils are present in several areas of the mine site (VIT 2012a, Appendix 2 and VIT 2012c) including the HLF, WRSAs, DGDC, Truck Shop, Laydown area, and conveyor/crusher areas. The Proponent predicts a total of approximately 770 000 m^3 of ice rich soils/permafrost has been delineated. The Proponent expects that: up to 489 000 m^3 will be managed in the first year of construction; 115 000 m^3 will be managed in the second year of construction; and 165 000 m^3 will be managed in subsequent years. Management of ice rich soils/permafrost will be sequenced throughout different stages of construction. Based on the character of materials, the Proponent has indicated they will be managed through the following options:

- stripping of insulating layers to encourage thawing and drainage in areas with relatively thin zones of ice rich soils/permafrost;
- excavation, removal and deposition of ice rich soils/permafrost in isolated or closed basins (e.g. existing borrow sites in placer tailings); and
- excavation, removal and deposition of ice rich soils/permafrost in engineered facilities.

Outside of the infrastructure footprints, the Proponent outlines further mitigation measures to ensure stability of permafrost in the Permafrost Monitoring and Mitigation Plan (VIT 2011a, Appendix 30, Conceptual Environmental Management Plan).

The original proposal indicated there was approximately 47.2 ha of permafrost area within the 128 ha area that will be cleared. The Supplementary Information Report indicated that the total area to be cleared has increased by 23 ha due to expansion of the open pit, HLF, and WRSAs. Although not stated in the Supplementary Information Report, the Executive Committee considers it likely that there will be some increase in the area of permafrost to be cleared.

Several appendices to the SIR identified key concerns and recommended mitigations to deal with permafrost below key infrastructure. These include:

- Appendix 1 – 2011 Mine Site Infrastructure Foundation Report (BGC Engineering);
- Appendix 2 – 2011 Mine Site Infrastructure Geotechnical Investigations (BGC Engineering);
- Appendix 4 – Heap Leach Facility Feasibility Design (Tetra Tech); and
- Appendix 7 – Geotechnical Assessment and Design of the Waste Rock Storage Areas (BGC Engineering).

These reports recommend that the Proponent conduct additional subsurface investigations to further delineate permafrost and massive ice prior to construction. Mitigation measures recommended in these appendices include excavation and replacement of permafrost rich overburden with rockfill or constructing a fill blanket to insulate the area. The Executive Committee has concluded that the use of a fill blanket to insulate areas may not be appropriate mitigation in areas of permanent site infrastructure such as the HLF, HLF embankment, and the WRSAs. It may not be possible to determine the effectiveness of this mitigation strategy until those facilities are constructed, at which time it may be very difficult or impossible to remediate. If the insulation is not sufficient and it is not possible to remediate the issue, permafrost degradation may lead to infrastructure failure. This concern has also been reflected in comments provided by NND (YOR #2010-0267-295-1).

Permafrost and ice rich soils that are excavated must be contained and allowed to thaw prior to reuse either as building material or reclamation material. As this material thaws, it will be unconsolidated and will release water. If uncontained, this may lead to erosion and sedimentation of the surrounding environment. The Proponent estimates that 770 000 m^3 of permafrost will require management from the Project area. In Appendix 1 to the SIR, BGC has indicated the need for temporary containment of excavated permafrost.

To inform the screening by the Executive Committee, EcoMetrix reviewed the geotechnical stability of mine infrastructure related to permafrost (EcoMetrix 2012b). In their review, EcoMetrix agreed with the recommendations by the geotechnical consultant retained by the Proponent (BGC Engineering) that further delineation is required to properly manage permafrost-rich soils.

The Executive Committee concludes that degradation or inadequate storage of excavated permafrost and ice rich soils may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to detail subsurface investigations and ensure sufficient storage is available will adequately reduce or control adverse effects so that resulting effects are not significant.

9.3.2 Heap Leach Facility Stability

The Proponent proposes to construct a valley fill HLF to remove gold from ore using cyanide leaching technology. The HLF will be used during operations as part of the process for extracting gold from ore. However, the HLF is also a permanent waste disposal structure. It will remain in place after closure and function as a containment structure for waste tailings.

The HLF will extend from the Dublin Gulch valley up the Ann Gulch valley. The entire HLF will cover an area of approximately 106 ha and contain approximately 92 million tonnes (dry weight) of ore at final capacity. The HLF will be held behind a confining embankment. The embankment will provide HLF stability and containment of process leach solution in the in-heap pond. It will be approximately 400 m in length with a 10 m crest and 2.5H:1V upstream and downstream slopes. The in-heap pond volume is created within the pore space of the ore within the HLF. The in-heap pond will have an operational volume between 60 000 and 194 000 m^3 and a total volume of approximately 459 000 m^3 (approximately 507 000 m^3 including freeboard).

9.3.2.1 Geotechnical Stability

The HLF and embankment have been designed and are proposed to be constructed, operated, maintained, and monitored according to the Canadian Dam Association's Dam Safety Guidelines (CDA Guidelines) (2007). The CDA Guidelines indicate that one metre of freeboard is required to ensure a safety margin is maintained to prevent overtopping.

Environment Canada (YOR #2010-0267-339-1) and Yukon Government (YOR #2010-0267-337-1) expressed concern with the suitability of one metre of freeboard for the HLF in-heap pond. The nature of the HLF is such that the pore space of the ore within the HLF constitutes the volume of the in-heap pond. In response to information request, the Proponent clarified that the proposed design for the HLF in-heap pond includes two metres of freeboard and exceeds the CDA Guidelines (VIT 2012c). Furthermore, the spillway is designed to convey the probable maximum flood flow rate of 27 m^3/s.

HLF and embankment stability is critical to ensure that process leach solution and ore are not released to the surrounding environment. Failure of the HLF or embankment could result in potential effects to various VESECs such as wildlife and wildlife habitat, vegetation, aquatic resources, and health and safety through:

- release of process leach solution containing high concentrations of cyanide, ammonia, nitrate, and metals;
- elevated concentrations of suspended solids in surface water; and
- blockage or damage to the DGDC.

Partial failure could result in damage to the remaining HLF components (e.g. subsurface drainage, liner system and heap cap).

Instability and failure of the HLF or the embankment could result from several factors, improper design, improper construction methods and/or inappropriate construction materials used. Additional environmental factors that may affect HLF stability include extreme precipitation and seismic activity.

To assist the Executive Committee in its assessment, EcoMetrix reviewed the geotechnical stability of the HLF and embankment and concluded that the likelihood of failure of the earth fill/rock fill embankment structures is generally considered to be low (EcoMetrix 2012b). A factor of safety is often calculated to describe the stability of a slope using a ratio of available ground shear strength to gravitational force (i.e. forces resisting movement to the forces driving movement). EcoMetrix indicated that the factors of safety for the HLF and embankment are adequate for the Project site.

The Proponent has conducted considerable slope stability analysis on the HLF with the use of various embankment materials. Their analysis shows that the HLF and embankment are adequately safe against deep-seated and shallow surface slope failure under all conditions (i.e. static and seismic loading). The Proponent has also proposed measures to ensure that failure does not occur due to liquefaction. Existing loose tailings beneath the embankment footprint will be excavated to full depths of 10 to 12 m and abutment soils will be excavated to a depth of approximately 6 m to protect against liquefaction. EcoMetrix agreed with the recommendations by the geotechnical consultant retained by the Proponent (BGC Engineering) that monitoring the HLF and embankment stability is necessary by installing geotechnical instrumentation within and below the HLF.

The Executive Committee concludes that instability of HLF may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to ensure appropriate design basis as well as excavate and manage permafrost and ice rich soils will adequately reduce or control adverse effects so that resulting effects are not significant.

9.3.2.2 Ore Properties and Ore Behaviour

The final HLF height in certain areas, including above the in-heap pond, will be approximately 150 m. Ore properties and ore behaviour in the HLF may affect the overall stability of the HLF as well as the permeability. Consistent solution flow through the HLF allows the Proponent to predictably manage in-heap solution volumes as well as to ensure that rinsing and detoxification of the HLF at closure occur as proposed.

On behalf of the Proponent, Tetra Tech (VIT 2012a, Appendix 6) conducted ore agglomeration test work simulating various stages of the Project and examining the permeability of different ore composites under varying conditions. Test variables included crush type, crush size, cement levels, and percolation rates at different simulated heap heights. Composite crush sizes ranged from 2 to 12.5 mm crushed by high pressure grinding rolls (HPGR) or conventional cone crushing methods. Most of the tests were conducted on composites crushed by HPGR as this was the original proposed method of crushing. Tests also simulated an HLF height ranging from 30 to 150 m.

In general, conventional crushers create material with less fines and more consistent grain size than HPGR crushers. Based on this assumption, the Proponent has indicated that the agglomeration test work conducted to date on HPGR crushed samples are considered conservatively low. At a simulated HLF height up to 150 m and low or no cement addition, test results indicate that most HPGR crushed composites and all conventionally crushed composites show high percolation rates (>100 L/h/m²) and minimal settling.

HPGR crushing is no longer being proposed for the Project. Rather, conventional crushing will be used. Tetra Tech (VIT 2012a, Appendix 6) recommends that 2.5 to 3 kg/t of Portland Type II or equivalent cement be added to the first few lifts of ore in the HLF. This will ensure that there are no permeability issues in the base of the HLF, particularly when leaching upper lifts. Furthermore, lime (approximately 1.04 kg/t) must be added to lifts that are not agglomerated with cement to ensure the HLF remains alkaline. Alkalinity is necessary to ensure that NaCN does not volatilize to HCN gas.

Tetra Tech has stated "*Based on available data, Eagle Gold ore crushed to 5 millimeters or larger has no permeability issues at heap heights up to 150 meters, if irrigated at a 10 L/hr/m² rate and properly agglomerated with 2.5 to 3 kg/t cement. Cement addition will also add to heap stability.*" (VIT 2012a, Appendix 6, p. 6). However, additional agglomeration testing is planned. Testing will be conducted to confirm past results and simulate optimized HLF design parameters including crush size, composite type, cement addition rate, and ultimate HLF height.

The Proponent originally proposed to use HPGR crushers in the tertiary crushing stage. Based on information in the SIR, the Proponent proposes to use conventional cone crushers rather than HPGR crushers to achieve the final crush size. Although the Proponent has indicated that some tests have been completed on samples prepared with conventional crushers, the majority have not. Furthermore, the samples on conventionally crushed materials used an estimated P_{80} (passing 80 percent) crush size of 7 and 12.5 mm while the final proposed crush size is approximately 6.4 mm.

Natural Resources Canada has expressed concern regarding long-term agglomeration testing and the migration of fines through the HLF (YOR #2010-0267-294-1). Ore that is stacked in the in-heap pond portion of HLF will remain submerged for an extended period of time. Saturation over long periods of time may cause stability issues and should be addressed by the Proponent. As well, over long periods of time, fine particles may migrate through the HLF and deposit in the in-heap pond area. This may lead to lower permeability and reduced capacity of the HLF in-heap solution storage.

Natural Resources Canada has also questioned the requirement to aerate the HLF during leaching (YOR #2010-0267-294-1 and #2010-0267-342-1). Based on sulphide content of ore under leaching, aeration may be required to ensure leaching is effective. Natural Resources Canada has indicated that, although sulphide content in the ore is low, the Proponent has not provided sufficient rationale for not requiring aeration. The need for aeration will be based on the economics of the HLF and will not have potential adverse effects to VESECs. Therefore, while aeration may be beneficial to the economics of the Project, it was not considered further by the Executive Committee.

The Executive Committee concludes that instability of HLF may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to complete additional agglomeration and long-term column tests will adequately reduce or control adverse effects so that resulting effects are not significant.

9.3.2.3 Maximum Credible Earthquake

The HLF will be designed to withstand seismic ground motions from the maximum credible earthquake (MCE). The design for high hazard facilities such as the HLF embankment will be for a peak ground acceleration of 0.27 g and MCE of moment magnitude 7.0.

While the HLF embankment will be designed to withstand seismic ground motions from the MCE, Environment Canada has expressed concern that all infrastructure associated with the stability of the HLF should be designed to this basis (YOR #2010-0267-339-1). They reference the Environmental Code of Practice for Metal Mines (Environmental Code) which recommends that tailings management facilities and associated structures should be designed to withstand seismic ground motions from the MCE for long-term stability (Environment Canada 2009). While the Environmental Code doesn't speak specifically to heap leach facilities, Environment Canada considers the HLF "to be analogous to a tailings impoundment facility, suggesting an equivalent design standard" given that, at closure, they contain spent ore materials (YOR #2010-0267-339-1). It is uncertain whether or not the entire HLF as well as associated structures (e.g. event ponds and DGDC) have been designed to the MCE.

The Executive Committee concludes that instability of HLF may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to ensure the HLF and associated infrastructure are constructed to withstand seismic ground motions from the MCE will adequately reduce or control adverse effects so that resulting effects are not significant.

9.3.3 Waste Rock Storage Area Stability

The Proponent proposes to construct two WRSAs to dispose of waste rock generated in the development and mining of the open pit. The WRSAs are permanent waste disposal structures and will remain in place after closure. The Platinum Gulch WRSA will be located on the south side of the open pit and will contain approximately 13.7 million tonnes of waste rock over an area of approximately 41 ha. The Eagle Pup WRSA will be located on the north side of the open pit and will contain approximately 116.8 million tonnes over an area of 103 ha. The maximum vertical thickness of the Eagle Pup WRSA will be approximately 140 m while the Platinum Gulch WRSA will be approximately 40 m. Final slope inclinations will be around 2.4/2.5H:1V.

WRSA stability is critical to ensure proper disposal of waste rock. Failure of the WRSAs could result in potential effects to various VESECs such as wildlife and wildlife habitat, vegetation, aquatic resources, and health and safety through:

- exposure of waste rock and release of elevated concentrations of metals;
- elevated concentrations of suspended solids in surface water;
- blockage or damage to the DGDC and other streams; and
- partial failure could result in damage to the remaining WRSA components (i.e. subsurface drainage and WRSA cap).

Movement or failure of the WRSA could result from several factors including improper design and inappropriate construction methods. Environmental factors that may affect stability include extreme precipitation and seismic activity.

Appendix 7 of the SIR outlines the Geotechnical Assessment and Design of the WRSAs (assessment conducted by BGC Engineering for the Proponent). Permafrost was encountered within the footprints of the WRSAs and may be disturbed during placement of waste rock. BGC indicated that foundations built on areas with permafrost may lead to excess pore pressure. This could result in a reduction of the shear strength of the foundation soils. BGC's results and analysis indicated that if excess pore pressures are generated, the WRSAs could become unstable. More specifically, the Eagle Pup WRSA could develop instability in the lowest fill lift if excess pore water pressure is generated in the foundation soils. The Platinum Gulch WRSA could develop instability in the lowest fill lift regardless of excess pore water pressure being generated in foundation soils. In the upper lifts, the Platinum Gulch WRSA could develop instability if excess pore water pressure is generated.

As a result, BGC recommends additional delineation and characterization of permafrost at the toes of the WRSAs and implementation of mitigative measures such as re-grading the face of lifts, buttressing areas with waste rock, excavating and removal of permafrost, or preloading permafrost areas to initiate thawing and drainage of water prior to construction. BGC further indicates a need to ensure that rock drains below the WRSAs maintain their flow capacity and do not degrade over time. If unsuitable rock is used, the drains may degrade over time and lose their capacity to convey water out of the WRSAs. This will lead to increased pore pressure within the WRSAs and decreased stability. They recommend that rock drains are constructed out of durable intrusive waste rock. However, BGC indicates that based on waste rock production schedules, suitable rock may not be available for the rock drains. They recommend that alternative rock types be evaluated to ensure they are suitable for rock drain construction.

To inform the screening by the Executive Committee, EcoMetrix reviewed the geotechnical stability of the WRSAs and concluded that the likelihood of failure of the WRSAs is generally considered to be low (EcoMetrix 2012b). In their review, EcoMetrix has indicated that the Proponent has conducted considerable slope stability analysis on WRSAs. The analysis shows that the WRSAs are adequately safe against deep-seated and shallow surface slope failure for most short term and long-term conditions.

EcoMetrix has indicated that preloading permafrost areas will not likely be feasible due to the potential lengthy period that may be required to thaw permafrost and dissipate excess pore water pressure. NND has expressed the same concern that, based on the timeline for construction, there is likely insufficient time to allow for preloading and drainage of permafrost areas prior to construction. The Executive Committee agrees that potential permafrost-related WRSA instability is an important construction issue.

WRSA instability related to permafrost-rich foundation soils and decreased long-term performance of rock drains were identified. EcoMetrix agrees with the BGC Engineering reports and recommends that further testing of susceptibility of mechanical degradation is required to assess the less durable rock. Furthermore, EcoMetrix recommends that consideration be given to including subdrains in addition to rock drains to further protect against reduced flow due to rock degradation.

The importance of foundation stability depends on the particular infrastructure. Slumping of a mine access road due to permafrost degradation would result in relatively insignificant environmental and socio-economic effects that are easily reversible. Movement or catastrophic failure of the HLF, while unlikely, would result in irreversible, high magnitude effects to both personnel and the surrounding environment. Failure of the HLF would introduce cyanide into the downgradient terrestrial and aquatic ecosystems. Failure or movement of the WRSAs could introduce waste rock into watercourses; preclude, disturb or destroy covers and re-establishing vegetation that would lead to increased metal loadings in contact water. Modifications to the Project as outlined in the SIR, resulted in more ore on the heap, a higher heap and more waste rock on larger and higher WRSAs. Failure of larger and higher structures increase the magnitude of the effects and the significance of that failure.

The Executive Committee concludes that instability of HLF may result in significant adverse effects. However, measures proposed by the Proponent as well as additional measures to ensure appropriate design basis, excavate and manage permafrost and ice rich soils, and further investigation of rock drains will adequately reduce or control adverse effects so that resulting effects are not significant.

9.3.4 Management of Excavated Ice Rich Soils and Permafrost

In the DSR, the Executive Committee stated that additional mitigations were required to mitigate significant adverse effects related to terrain and infrastructure instability. In particular, recommendations were made to conduct additional subsurface investigations to delineate and characterize ice-rich soils/permafrost.

NND (YOR #2010-0267-346-1) and YCS (YOR #2010-0267-341-1) agreed that these recommendations are necessary. However, in their comments on the DSR, NND and YCS expressed concern regarding the outcome of these recommended additional subsurface investigations and excavation of ice rich soils/permafrost. They indicated that there are concerns and uncertainties related to the outcome of those investigations. Results of additional subsurface investigations may lead to unanticipated outcomes. For example, increased volumes of ice rich soils/permafrost may be delineated and will need to be managed accordingly. Subsurface investigations may also result in required changes to mine-site infrastructure to account for unanticipated outcomes. Based on these concerns, the Executive Committee requested additional information from the Proponent (YOR #2010-0267-349-1).

The Proponent responded to the request for additional information and provided information on the delineation and characterization of permafrost (VIT 2012c). Additional subsurface investigations were conducted during the summer and fall of 2012. Based on additional subsurface investigations, as well as past subsurface investigations, the Proponent predicts a total of approximately 770 000 m^3 of ice rich soils/permafrost has been delineated. The Proponent expects that up to 489 000 m^3 will be managed in the first year of construction; 115 000 m^3 will be managed in the second year of construction; and 165 000 m^3 will be managed in subsequent years. Management of ice rich soils/permafrost will be sequenced throughout different stages of construction. Based on the character of materials, the Proponent has indicated they will be managed through the following options:

- stripping of insulating layers to encourage thawing and drainage in areas with relatively thin zones of ice rich soils/permafrost;

- excavation, removal and deposition of ice rich soils/permafrost in isolated or closed basins (e.g. existing borrow sites in placer tailings); and
- excavation, removal and deposition of ice rich soils/permafrost in engineered facilities.

It is noted that new estimates of ice rich soils/permafrost volume (770 000 m^3) is increased from volumes identified in Appendix 1 to the SIR (2011 Mine Site Infrastructure Foundation Report). Appendix 1 to the SIR identified approximately 40 000 m^3 to be excavated in the HLF area with unknown quantities excavated from other locations. However, the Proponent has indicated that, based on additional delineation they have a high degree of confidence in the predicted volumes of ice rich soils/permafrost in the Project area. Furthermore, they have provided management strategies to properly deal with this material. The Proponent has determined that some minor design modifications to the DGDC are required based on the new estimates and can be reasonably implemented. No design modifications are required for the HLF, embankment and event ponds based on new information.

The Proponent has committed to submitting the consolidated results from its subsurface investigations as well as a detailed overburden and waste rock management plan (which includes an ice-rich soils management plan subsection) in conjunction with their applications for a Quartz Mining License and Type A Water Use Licence.

The Executive Committee has reviewed additional information provided by the Proponent in their response to our information request and are satisfied that the Project will not require major modifications. The Executive Committee is also satisfied that the Proponent has appropriate measures to manage ice rich soils and permafrost.

9.3.5 Recommended Terms and Conditions

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- The *Quartz Mining Act* and *Quartz Mining Land Use Regulations*

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects related to terrain and infrastructure instability on environmental quality.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental effects of the Project to environmental quality:

To mitigate significant adverse effects related to permafrost degradation on environmental quality:

81. As proposed, the Proponent shall submit the consolidated results from its subsurface investigations in conjunction with their applications for a Quartz Mining License and Type A Water Use Licence.
82. The Proponent shall ensure sufficient storage is available for temporary containment, management, and thawing of excavated ice rich soils/permafrost.

To mitigate significant adverse effects related to terrain and HLF instability on environmental quality:

83. The Proponent shall implement the mitigations outlined in Section 6.0 of Appendix 4 to the Supplementary Information Report (VIT 2012a including additional information on Appendix 4 in VIT 2012b) regarding the stability of the HLF and embankment including:
    a. removal of loose or unsuitable materials from the HLF area;
    b. excavation of foundation to bedrock in area of HLF confining embankment and the diversion embankment; and
    c. installation of geotechnical instrumentation within and below the HLF to monitor and verify the that the facility components are performing as expected and to provide sufficient warning in the event of problematic conditions.
84. The Proponent shall identify and excavate ice rich soils/permafrost beneath the footprint of the HLF rather than use other methods to manage ice rich soils/permafrost (e.g. fill blankets as insulation).
85. The Proponent shall ensure that additional agglomeration test work is completed on sample ore representative of final crushing/processing output prior to loading the HLF.
86. The Proponent shall ensure long-term column tests are initiated to study the effects to stability and permeability of the HLF. Consideration should be given to the migration of fines and the behaviour of saturated of ore in the in-heap pond.
87. The Proponent shall ensure the HLF and permanent structures associated with the HLF are designed to withstand seismic ground motions from the maximum credible earthquake for long-term stability.

To mitigate significant adverse effects related to terrain and WRSA instability on environmental quality:

88. The Proponent shall use methods, other than fill blankets as insulation or preloading and draining permafrost areas, to manage areas of ice rich soils/permafrost below the WRSAs.
89. The Proponent shall implement the mitigations outlined in Section 7.0 of Appendix 7 to the Supplementary Information Report (VIT 2012a) regarding the stability of the WRSAs including:
    a. conducting additional investigations to determine the liquefaction potential; and
    b. buttressing the ice-rich lobe on Eagle Pup WRSA at an early stage in the work.
90. The Proponent shall conduct further investigations on less durable rock considered for use in the rock drains beneath the WRSAs. Should this rock be incapable of maintaining long-term drainage due to mechanical degradation, the Proponent shall ensure additional measures are implemented, such as construction of subdrains in addition to rock drains or using alternative durable rock, to protect against reduced flow volumes and increased pore water pressure in the WRSAs.

9.4 EFFECTS RELATED TO AIR QUALITY

During the construction and operations stages of the Project, the main contributors to atmospheric emissions will be:

- emissions from fossil fuel combustion (i.e. burning diesel and gasoline in vehicles, equipment, and generators);
- fugitive dust emissions (i.e. surface soil disruption, clearing, leveling/grading, road construction, quarry and borrow sources, traffic along roads, blasting);
- disposal of cleared vegetation by burning; and
- point source emissions from the adsorption, desorption, recovery (ADR) facility.

As indicated by the Proponent, Criteria Air Contaminants (CAC) that may be emitted include total suspended particulates (TSP), respirable particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), carbon monoxide (CO), and sulphur dioxide (SO_2). These types of emissions were included in the air quality model as measureable parameters. Air quality and CACs were predicted in a 30 × 30 km area using dispersion modeling. Although there will be emissions (i.e. use of heavy machinery and movement of soils/materials) during the reclamation stage, the Proponent did not use the model to predict air quality for that stage. The Proponent indicated in their December 2011 response that the reclamation stage will have far less disturbance and emissions than the construction or operations stages (YOR #2010-0267-207-1).

TSP is particulate matter that ranges from 0.001 µm to 500 µm. $PM_{2.5}$ is particulate matter that is 2.5 µm or less. Generally, depending of particulate properties and environmental conditions (i.e. wind and topography), larger particles settle close to their source while smaller particles disperse over greater areas. Particulate matter is unique among atmospheric constituents in that it is not defined on the basis of its chemical composition. Therefore, it may include a broad range of chemical species. The air quality standards for particulate matter are based on studies demonstrating adverse effects on cardio-respiratory health from inhalation. An increase in particulate matter that is 2.5 µm or less has the potential to impact human and wildlife health in regards to breathing and lungs, with smaller particulate travelling deeper into the lungs. Impacts to lungs can lead to a variety of health concerns ranging from minor irritation to permanent lung disease. As such, changes in airborne particulate must be considered as potentially adverse. Particulate matter that is 2.5 µm or less that settle out over soil, vegetation, and water may lead to increased metal concentrations in the environment. This may in turn affect VESECs including human health and safety, vegetation, wildlife, and aquatic resources.

Emissions from internal combustion engines include nitrogen monoxide (NO), NO_2, CO, and SO_2. Concentrations of NO and NO_2 in the presence of hydrocarbons and sunlight are important factors in the formation of ground-level ozone as well as other oxidants. NO_2 is a gas that, at high levels, can be corrosive and irritating. If the fuel consumed by equipment and vehicles contains sulphur compounds, then there will be small quantities of SO_2 emitted. Both SO_2 and NO_2 can become constituents of acid rain (sulphuric acid and nitric acid respectively).

In May 2012, the Proponent provided additional information outlining changes to the Project. Changes which may affect air quality include:

- increased emissions of $PM_{2.5}$ due to more area cleared during construction, increased blasting and crushing of ore due to higher production during operations;
- decreased emissions of CACs due to less fuel being burned in the diesel generators during construction; and
- increased emissions of CACs due to more vehicle traffic during construction and operation.

There will also be an increase in the duration of air emissions being released due to the increased length of time during which construction and operations will occur. The proposal indicates these changes are anticipated to result in modest increases in PM and CACs, and will be within regulatory parameters.

The Proponent has predicted that 24-hour TSP and $PM_{2.5}$ concentrations will exceed regulatory objectives at the south perimeter of the mine site. All other CACs are predicted to be below regulatory objectives. The Proponent has outlined mitigation measures in the fugitive dust control plan and the combustion source control plan (VIT 2011a, Appendix 30, Conceptual Environmental Management Plans). In their December 2011 response, the Proponent also provided details to be included in an ambient air quality monitoring plan (YOR #2010-0267-207-1). The Proponent proposed to monitor ambient particulate monitoring of TSP and $PM_{2.5}$ and employ additional mitigations measures depending on the outcome of mine-site dust fall measurements. However, Government of Yukon, Department of Environment has indicated that there are no Yukon dust fall standards (YOR #2010-0267-337-1). As such, they will require ambient particulate monitoring of TSP and $PM_{2.5}$ regardless of dust fall measuring results.

The Executive Committee concurs that air quality monitoring should be conducted in accordance with Government of Yukon policy and standards.

9.4.1 Wet Deposition

The Proponent did not include wet deposition in the air quality model. Wet deposition is the natural process of rain or snow removing PM from the atmosphere and depositing it on the ground. The Proponent indicated in their December 2011 response (YOR #2010-0267-207-1) that they did not include wet deposition because it would result in lower concentrations of CACs away from the mine site. NND has expressed concern that by not including wet deposition, there is an underestimate of metal concentrations associated with dust fall within and near the mine site (YOR #2010-0267-200-1).

Although wet deposition has not been considered in the air quality model, the Executive Committee has determined that mitigations, as detailed below, will ensure CACs are monitored and managed near the mine site. These mitigations include monitoring and managing soil and vegetation uptake of metals, detailed in section 10.3.4, and implementation of an Air Quality Monitoring Plan.

9.4.2 Gold Recovery Emissions

The Proponent conducted dispersion modeling to predict effects related to emissions from the Project (VIT 2011a, Appendix 9). The modeling predicted TSP, $PM_{2.5}$, NO_2, CO and SO_2 short-term emission rates as well as Greenhouse Gas (GHG) emissions. Environment Canada (YOR #2010-0267-069-1) and Government of Yukon, Department of Environment (YOR #2010-0267-0337-1) have expressed concerns that emissions from the gold recovery process have not been addressed by the Proponent.

Emissions from the gold recovery process (i.e. electrowinning and on-site smelting to gold doré) may result in the release of SO_2, PM, and metals such as arsenic, cadmium, chromium, mercury, and lead. These metals are considered toxic under the *Canadian Environmental Protection Act*. PM emissions from the gold recovery process that settle out over local soil, vegetation, and water may lead to increased metal concentrations in the environment. This may in turn affect various VESECs including human health and safety, wildlife, and aquatic resources.

The Executive Committee is of the opinion that to ensure accurate air quality predictions, emissions from the gold recovery process should be included in the dispersion modeling.

9.4.3 Solid Waste Incineration

The Proponent indicated that no decision has been made regarding the use of an incinerator on-site. The burning of waste and the resulting release of toxic air emissions may affect human health, wildlife, and general environmental quality in the area. Waste burned under marginal conditions such as at low temperature ranges and while exposed to precipitation and moisture often results in an incomplete burning of materials. Incomplete burning of mixed garbage results in the emission of several toxic compounds. Contaminants that may be released due burning waste include particulate matter polychlorinated dibenzo-pdioxins (dioxins), polychlorinated dibenzo-furans (furans), sulphur oxides, carbon monoxide, volatile organic compounds, nitrogen oxides, polynuclear hydrocarbons, and aldehydes. Environmental effects may include land and water contamination, vegetation damage, contribution to greenhouse gasses, decreased ozone levels, and acid rain.

The operations of solid waste incinerators are regulated by the Government of Yukon, Department of Environment. The Executive Committee is aware of current research and testing of solid waste incinerators in Yukon by the Government of Yukon. The Executive Committee is of the view that emission levels from waste incinerators are set so as to be protective of human health and the environment. The Executive Committee is of the opinion that compliance with the *Solid Waste Regulation* and the *Special Waste Regulation* will not result any significant adverse effects.

9.4.4 Environmental Standards

Environment Canada expressed concern with the lack of consideration for the emission of mercury (YOR #2010-0267-292-1). They have indicated that CCME has established standards, of which Yukon is a signatory, for managing air quality issues and emissions (YOR #2010-0267-198-1 and YOR #2010-0267-292-1). Environment Canada has indicated that these standards should be followed by the Proponent.

Government of Yukon expressed concern with the application of federal, CCME, and/or British Columbia environmental standards and guidelines where there are Yukon guidelines in place (YOR #2010-0267-070-1 and YOR #210-0267-197-1). Under the *Environment Act*, Government of Yukon has developed standards and guidelines that apply throughout Yukon. These include air quality guidelines and standards for various contaminants in soil and water. Government of Yukon has expressed concern that, although these standards have been referenced in the text in the proposal they have not been reflected in tables. Furthermore, these guidelines and standards should be applied and followed prior to using those of other jurisdictions.

The Yukon Ambient Air Quality Standards (YAAQS) apply to sulphur dioxide, ground level ozone, carbon monoxide and nitrogen dioxide gases as well as total suspended and fine particulate matter. The Proponent has established Ambient Air Quality Objectives based on CCME and National Ambient Air Quality Standards regulatory standards. These standards measure NO_2, CO, and SO_2 in $\mu g/m^3$. YAAQS measure NO_2, and SO_2 in parts per billion by volume (ppbv) and measure CO in parts per million (ppm). Results from measuring ambient air quality using $\mu g/m^3$ may not be comparable to results from measurements using ppbv or ppm. Further, the Proponent has not indicated that they will monitor ground level ozone.

Inadequate monitoring or the application of inappropriate air quality standards may result in significant adverse effects in Yukon. The Executive Committee recognizes that air quality monitoring guidelines and standards are available for Yukon. These standards should be applied to avoid significant adverse environmental and socio-economic effects.

9.4.5 Recommended Terms and Conditions

Construction and mining activities can generate significant air emissions. Exhaust from heavy equipment and dust from blasting and ore conveyance can be harmful to humans and can carry metals beyond the mine-site. Solid waste incineration and activities at the ADR plant can result in complex, toxic compounds released to the air. The Executive Committee notes that air emissions, and their effects on both personnel and environment, are regulated through the following legislation:

- The *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- The *Environment Act* and the *Special Waste Regulations*, *Spills Regulations*, *Storage Tank Regulations*, *Air Emissions Regulations*, *Solid Waste Regulations*, and *Contaminated Sites Regulation*.
- *Occupational Health and Safety Act* and *Regulations*
- *Canadian Environmental Protection Act*

The Executive Committee acknowledges commitments made by the Proponent to minimize dust by covering much of the ore conveyance infrastructure. The effects of dust outside the mine footprint are likely smaller magnitude, highly likely, broader in spatial scale and difficult to reverse, the combination of which makes them significant. The Executive Committee is of the view that it is difficult to minimize the creation of dust at a mine site, but measures exist to limit its distribution and monitor potential effects to ensure that the magnitude of adverse effects are not significant beyond the mine footprint.

The amount of equipment and number of on-site personnel (approximately 400) will generate a significant waste stream. If the Proponent decides to incinerate solid waste there are potential significant adverse air emissions. However, compliance with non-discretionary legislation will decrease and control these emissions and the Executive Committee has concluded that the adverse effects would not be significant.

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to environmental quality with regards to air quality.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse environmental and socio-economic effects of the Project to environmental quality.

To reduce uncertainties associated with the air quality model, as well as provide sufficient basis for future monitoring:

91. The Proponent shall update the air quality model to include emissions related to the gold recovery process (e.g. electrowinning and on-site smelting to gold doré). This includes emissions such as SO_2, PM, and metals such as arsenic, cadmium, chromium, mercury, and lead. This information shall be provided to responsible regulators during the regulatory approval process.

To mitigate significant adverse effects to air quality:

92. To minimize wind entrainment of contaminants as a result of build-up of deposits on the adsorption, desorption and recovery facility stack, the Proponent shall conduct regular inspections of the plant stack and take remedial action to remove deposits where necessary.
93. As proposed, the Proponent shall cover ore conveyance equipment.
94. The Proponent shall cover equipment where ore is loaded or discharged onto conveyors and other equipment. This is referenced in the Executive Summary to the proposal but not itemized in the Fugitive Dust Control Plan.
95. The Proponent shall implement an Ambient Air Quality Monitoring Plan developed with responsible regulators. The plan shall:
    a. consist of ambient monitoring and/or modeling for TSP, $PM_{2.5}$, metals (including arsenic, cadmium, chromium, mercury and lead) and other contaminants of potential concern (including ammonia and/or ammonia degradation products);
    b. identify all additional mitigation measures to be undertaken (e.g. enclosure of appropriate infrastructure, the construction of wind breaks, and watering);
    c. include all proposed triggers for the implementation of additional mitigation measures; and
    d. meet Yukon air quality guidelines and standards.

9.5 Cumulative Effects Assessment – Environmental Quality

The residual effects of the Project on environmental quality will interact with the residual effects of other projects beyond the Project site. Existing activities in the region consist of placer mines and quartz exploration projects, as well as, several residential dwelling and camps. There are several quartz and placer exploration projects active in the Haggart Creek watershed and additionally there have been several recent projects assessed by YESAB.

Quartz exploration and placer exploration projects involve some activities that are similar to the proposed Project. Activities may include vegetation clearing, excavation of soils, establishment and use of roads and trails, establishment and use of camps, use of heavy equipment, storage and use of petroleum products, management of wastes.

The mitigative measures related to terrain and infrastructure stability should reduce residual effects of the Project. Residual effects related to geotechnical instability (e.g. HLF failure) of the Project are extremely low frequency and likelihood though potentially of a very large magnitude and practically irreversible. Any residual effects due to these infrastructure failures are independent of any residual effects of activities of other present or future projects.

The potential residual effects of the existing and proposed projects, resulting from heavy equipment emissions and dust creation, are similar to the proposed Project, though at much smaller magnitudes. Many of the existing and future projects in the direct vicinity of the Project contribute emissions and dust during summer only. The extent to which these residual effects spatially overlap will be informed by the pre-construction ambient air quality monitoring to be conducted by the Proponent. The Executive Committee has concluded that the residual effects of the Project on air quality, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects.

The mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and the mitigative measures recommended in this report, are considered by the Executive Committee as adequate to address potential cumulative effects to environmental quality. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects on environmental quality.

9.6 Conclusion of the Environmental Quality Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to environmental quality.

10.0 VEGETATION

This section addresses potential effects of the Project on vegetation. Potential effects of loss of vegetation, changes in the structure or composition of vegetation communities, and the accumulation of toxins in vegetation and soils are considered. The Executive Committee has determined that the Project will result in significant adverse effects to vegetation; however, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee. The following sections provide a rationale for this determination.

10.1 OVERVIEW

Vegetation is an important part of surrounding ecosystems. It plays a key role in water, energy and nutrient cycling. It also stabilizes soils and landforms from erosion and mass wasting. It provides habitat and is a food source to many species of wildlife. It is also important as a socio-economic value. Certain plants species such as berries are an important source of food for people.

The Project area is characterized by a combination of northern boreal forest and subalpine ridges and plateaus above the tree line. The proposal focuses on rare plants, wetland ecosystems, riparian ecosystems, old forest, and traditional use plant species as indicators representing the various ecosystems affected by the Project. Since the Project area was not glaciated during the last Ice Age, there may be locally rare Beringian species present.

Project activities, including clearing/grubbing of land, will result in the removal and alteration of vegetation and may alter underlying soils. Vegetation is also linked with the following VESECs:

- water quality, as vegetation influences hydrological processes and plays a major role in wetlands (Section 8);
- environmental quality, as vegetation contributes to soils processes, stabilizes soils and prevents erosion (Section 9);
- wildlife, as vegetation provides wildlife habitat (Section 11); and
- fish and fish habitat, due to the importance of riparian areas (Section 8).

10.2 BASELINE INFORMATION

The proposal presents information from scientific publications as well as studies done by the Proponent in support of the Project. These studies include terrestrial ecosystem mapping, collection and analysis of vegetation samples to determine baseline trace metals content and a rare plant survey in areas with the greatest potential for rare plants (e.g. wetlands, subalpine areas, and rock outcrops). The vegetation field programs were undertaken in August 2009 and July 2010. Vegetation information was collected to support the mapping of wildlife habitats, ecosystems and First Nations' interests. Vegetation samples were also collected for metals analysis. Terrestrial ecosystem mapping was completed to describe the spatial distribution of terrestrial ecosystems within the study areas. A separate summer rare plant survey was completed to identify rare vegetation elements.

The Proponent (through FMA Heritage/Stantec) collaborated with NND Heritage Department to design and complete a Traditional Knowledge and Use (TKU) Study Report. The report includes information from meetings and interviews with NND citizens between 2009 and 2010. At the request of NND, the report was not made available. However, the proposal refers to the report and discusses traditional plant use in the Project area.

The RSA contains two ecological zones the subalpine zone and the forested (boreal) zone. Altitude largely determines the distribution of these ecological zones over the RSA.

The subalpine zone (1 502 ha of the RSA) occurs on the ridge tops and high plateaus above approximately 1 225 m asl. There is little tree cover at this elevation and the vegetation is dominated by dwarf birch, willows, shrubs, herbs, mosses, and lichens.

The valley bottoms and areas below the tree line make up the forested zone (11 450 ha of the RSA). The elevation range of this zone in the study areas is from 600 m asl up to the subalpine zone. Vegetation in the forested zone include white and black spruce, subalpine fir, trembling aspen dwarf and Alaska birch, willows, shrubs, herbs, mosses, and lichens.

More detailed ecosystem units were mapped within the ecological zones for the RSA and LSA. Twenty-one different ecosystem units were identified. Tables 4.1-8 and 6.8-2 of the proposal provide “Ecosystem Category Summaries”, but the numerical values are not consistent. From Table 4.1-8 of the proposal: conifer forest ecosystems predominate over the LSA (45 percent) and RSA (67 percent) followed by dwarf birch dominated ecosystems (LSA – 29 percent, RSA – 14 percent) and riparian areas (LSA – 7 percent, RSA – 7 percent).

Only one rare plant, island purslane (*Koenigia islandica L.*), was identified within the LSA (across Bawn Boy Gulch). The plant location is outside of the Project footprint and is not anticipated to be disturbed by Project activities.

Five estimated forest productivity classes were mapped by the Proponent over the RSA and LSA. Sixty-four percent of the LSA has ‘Low’ or ‘Nil’ estimated forest productivity. Two percent of the LSA and RSA are classed as high productivity.

Samples from nine locations were collected by the Proponent and analyzed for a full suite of metals to characterize baseline levels of trace metal concentrations in vegetation. The Proponent compared the results to dietary tolerances for cattle, as the tolerances for wild ungulates are generally not known. All samples analyzed in 2009 contained metal concentrations below levels considered toxic for cattle.

10.3 EFFECTS RELATED TO VEGETATION

This section describes project and cumulative effects on vegetation. The effects assessment uses the local study area (LSA) and regional study area (RSA), as defined in the proposal. The LSA includes the mine site and access roads, and the RSA includes a broader area around these features.

10.3.1 Loss of Vegetation

Project activities will remove vegetation over the life of the mine and may have longer term effects on the types and distribution of vegetation found over the LSA. Site clearing and grubbing, access road upgrades, and clearing of the transmission line RoW are the major activities expected to result in vegetation loss. The proposal estimates the total Project footprint that will be cleared to be 608 ha.

Construction will result in the removal of all vegetation and active soil layers for the majority of the mine site and for specific locations along the access road. Some areas at the margins of the mine facilities will be cleared of trees while shrubs, forbs, and the active soil layer will be left intact.

The Proponent has indicated that clearing of the transmission line RoW will result in the removal of trees and some tall shrubs but that lower vegetation (e.g. shrubs, forbs, and mosses) and the active soil layer will remain largely. Soil disturbance while clearing vegetation will be minimized by completing this clearing when the ground is frozen. Once clearing and grubbing is complete, subsequent construction and maintenance activities will not lead to significant additional loss of vegetation.

Construction of the mine site and road upgrade will result in the disturbance or loss of about 20 ha of riparian area. The greatest proportion of this loss would be directly under the mine footprint as much of the existing Haggart Creek Road (HCR) is constructed immediately adjacent to Haggart Creek (see Figure 8). Widening and improvements to the HCR to meet the needs of the Project will remove riparian vegetation. Increased traffic use and maintenance of the HCR, including winter use, will result in increased dust on downslope riparian vegetation. The Proponent has estimated that construction of riparian areas during closure and reclamation is predicted to result in a net gain of about nine ha in the RSA when the Project is complete.

Figure 8 Haggart Creek Road (km 30, HCR)

The proposal indicates that no specific berry harvesting areas were identified within the mine site area. NND participants in the study indicated that the mine site "is already so disturbed by past mining activities that they cannot use it for berry picking" (VIT 2011a, p.6-287). The proposal indicates that in the RSA, the higher quality berry picking areas are found in the valley bottoms adjacent to Haggart Creek and the South McQuesten River. Furthermore, less than one percent of potential berry picking area will be lost due to the Project.

NND raised concerns regarding the loss of wetlands due to the Project (YOR #2012-0267-200-1). The Executive Committee recognizes that wetlands are important habitat, however wetlands cover less than one percent of the LSA and the proposal indicates a maximum Project disturbance on wetlands of 0.01 ha. This relatively small amount of wetland loss is not considered by the Executive Committee to be a significant adverse effect.

In relation to loss of vegetation other than wetlands, the Executive Committee concludes that progressive reclamation, as committed to by the Proponent, is an effective re-vegetation strategy and if properly implemented, the Project will not result in significant adverse effects due to loss of vegetation. Experience gained from other northern and Yukon mine sites (e.g. Brewery Creek) should help the Proponent meet their re-vegetation goals and minimize any long-term vegetation loss.

10.3.2 Changes in the Structure or Composition of Vegetation Communities

Vegetation clearing over the mine site and transmission line RoW will cause changes in tree stand structure and composition over the lifetime of the Project and may result in longer-term changes in structure or composition of vegetation communities.

Mine site construction and operations activities will remove vegetation and either remove or affect the underlying soil. Reduced soil capability, deteriorated soil structure, higher erosion potential and modified surface water flow pathways are conditions that favour re-vegetation by invasive or habitat-generalist vegetation species. Re-vegetation of a disturbed area by these species can often impede the re-establishment of ecologically appropriate plant species.

Invasive plant species are known to spread more easily along cleared edges such as roads and transmission line RoW. Construction equipment and regular traffic may facilitate the spread of invasive species if they are contaminated with seeds, pollen, etc. Once established, these species can compete with native plant species and change long-term plant communities in an area.

Construction of the transmission line will result in the removal of woody vegetation (i.e. trees and shrubs) along the RoW. Until the line is decommissioned, ongoing maintenance is expected to remove trees and tall shrubs from the vegetation community along the RoW. This effect on the vegetation community in the RoW is expected to be reversible when maintenance ceases at decommissioning.

The Executive Committee notes that the Proponent has committed to an Invasive Plant Management Plan to minimize the introduction of invasive plant species and to use native plant species where possible for re-vegetation. The Executive Committee concludes that successful implementation of this plan will adequately reduce or control adverse effects of invasive plant species so that resulting effects are not significant.

10.3.3 Accumulation of Toxins (Metals and Others) in Vegetation

Dust will be generated at the mine site during open pit mining activities (i.e. blasting, ore and waste hauling), ore processing (i.e. crushing and conveyance) and vehicle travel on roads. The dust generated by the Project will be higher in both volumes and metal concentrations than background conditions. The Proponent predicts 85 percent of the dust produced will be retained within the mine site by implementing a Fugitive Dust Control Plan. The Proponent modeled the dispersion of 18 metals beyond the mine site and concluded that arsenic was the only metal of concern. As indicated in the proposal, potential effects on plants outside of the mine site as a result of dust deposition include:

- accumulation of dust on the surface of plants may alter bio-chemical or physical processes (e.g. gas exchange and light penetration); and
- increased metal concentrations in plant tissue as a result of increased uptake of metals from soils.

The migration of arsenic-rich dust beyond the boundaries of the mine site, and beyond practical control or mitigation measures, is of particular concern. The proposal predicts that dust dispersion will result in increases of soil arsenic concentrations of 10 percent or more over an area of 72 ha surrounding the mine (103 ha total area). Though soils around the mine contain naturally high concentrations of arsenic, the levels of arsenic measured in the plant samples that were analyzed for metal concentrations did not exceed best available thresholds (e.g. for toxicity to cattle). This suggests that in the area around the mine site there is not a direct relationship between soil metal concentrations and plant metal concentrations. The Executive Committee agrees with the Proponent's conclusion that some increase in metal loadings in plants growing in soil affected by dust generated by the Project should be expected.

The Proponent has predicted that about three ha of land with moderate traditional berry use potential in the LSA will be affected by increased arsenic concentrations in the soil. The Proponent has incorporated a discussion of this potential effect in their Qualitative Human and Ecological Health Assessment. The spatial extent of this effect is small but the understanding of arsenic loading in plants and its significance is not clear.

NND raised concerns regarding the concentration of arsenic in vegetation and the potential accumulation of metals and other toxins in vegetation following closure due to the Project (YOR #2012-0267-200-1). The Executive Committee notes that dust generation can also be a longer-term problem (i.e. during closure and post-closure phases of the Project) in areas of the mine site where re-vegetation is unsuccessful. However, successful re-vegetation over the mine site is expected to control dust generation in post closure.

The WRSAs and HLF are proposed to be covered and re-vegetated. If the roots of this vegetation penetrate the cover and growth medium they would come in contact with rock and water containing higher metal concentrations. NND questioned if 50 cm of soil cover on waste rock would be sufficient to prevent uptake of metals or toxins into vegetation and suggested ongoing monitoring (YOR #2012-0267-200-1). The Executive Committee notes the progressive reclamation for the WRSAs as proposed by the Proponent will allow monitoring of root penetration and potential metals uptake by vegetation used to stabilize the cover and will inform the likelihood of vegetation absorbing metals from rock in the WRSA and HLF.

The mine water treatment plant (MWTP) will produce caustic sludge at a rate of approximately 237 tonnes per year during operations and 77 to 3 870 tonnes per year during closure. After closure, the caustic sludge will be transferred to the HLF for permanent disposal. Some sludge will be incorporated directly into the heap while caustic sludge from years 17 to 23 will be incorporated into the closure cap for the heap (VIT 2012a).

The final closure cap for the HLF is designed to reduce infiltration of precipitation and will function as a store and release cover system. The store and release cover relies on surface material and vegetation to store precipitation and release water back to the atmosphere through evaporation from soils and evapotranspiration of plants.

Caustic sludge will contain high concentrations of contaminants of concern. NND indicated that by including caustic sludge in the cover material and design, vegetation on the HLF may become a contaminant source to the surrounding environment (YOR #2010-0267-3461). Vegetation required for the cover may uptake contaminants from the caustic sludge.

The Executive Committee recognizes that elevated metal concentrations in vegetation as a result of dustfall or through uptake from soils can have several effects. Elevated metals can impede plant growth and reproductively as well as introduce metals into the food chain where they can bioaccumulate and biomagnify. As a result, the Executive Committee concludes that if vegetation on or surrounding the mine site uptake metals it would be considered a significant adverse effect.

10.3.4 Recommended Terms and Conditions

To eliminate, reduce or control significant adverse effects from the Project on vegetation, the following mitigative measures are required:

96. The Proponent shall develop and implement a plan for the monitoring of plant metal uptake and toxicity. The sampling locations should take into account prevailing winds and water flows. During closure and post-closure, sampling locations should include sites on the re-vegetated HLF and WRSAs.
97. As proposed, the Proponent shall implement a soil metal monitoring program in areas around the mine site. Should this program measure more than a ten percent increase in arsenic in soils around the mine site, the Proponent shall undertake additional studies to measure the arsenic uptake in plants growing in the soils with elevated arsenic and shall implement measures to decrease airborne transportation of arsenic off the mine site.
98. The Proponent shall ensure that caustic sludge is incorporated into the HLF and final closure cap in a manner to avoid or minimize vegetation uptake of contaminants.

10.4 CUMULATIVE EFFECTS ASSESSMENT

Much of the Project area has been previously explored and mined but the Project will result in short-term vegetation loss and longer-term residual effects to vegetation communities. Activities on other active quartz claims and a few placer claims occurring in the area (Appendix E) have also cleared and altered vegetation and excavated soils. The greatest residual effects on vegetation in the RSA are the result of historic placer projects on Haggart Creek and its tributaries. Figure 9 below, is a photograph of the Haggart Creek valley from the height-of-land east of Haggart Creek. The light brown band extending across the middle of both photographs is un-reclaimed placer tails along Haggart Creek. The tailings are largely un-vegetated though there is some natural re-colonization of these tailings, particularly by disturbance tolerant vegetation immediately adjacent to the streams.

Figure 9 Historic Placer Mining Tailings Along Haggart Creek (SW from Platinum Gulch)

The residual effects of the Project and past projects are the loss of vegetation and changes to the structures and composition of vegetation communities, in particular riparian vegetation. The removal of riparian vegetation results in a loss of wildlife habitat and often results in increases in water temperature and sediment load, both detrimental to fish habitat quality. The Project will be removing wetland and riparian vegetation on the Project site but the Proponent is predicting a net increase in riparian habitat after Project closure. This increase is largely due to the Proponent’s commitment to rework and reclaim some of the placer tailings immediately west of the Project site into a fish habitat compensation area.

The mitigation measures proposed by the Proponent and the mitigative measures recommended in this report are considered by the Executive Committee as adequate to address potential cumulative effects to vegetation. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects on vegetation.

10.5 Conclusion of the Vegetation Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to vegetation.

11.0 WILDLIFE

This section addresses potential effects of the Project on wildlife and wildlife habitat. The assessment uses the local study area (LSA) and regional study area (RSA), as defined in the proposal. The LSA includes the mine site and access roads and the RSA includes a broader area around these features Figure 10 has been reproduced from the proposal and wildlife LSA and RSA.

The Executive Committee considered effects to wildlife and wildlife habitat due to:

- habitat loss and alteration;
- disturbance and disruption; and
- direct injury and/or mortality.

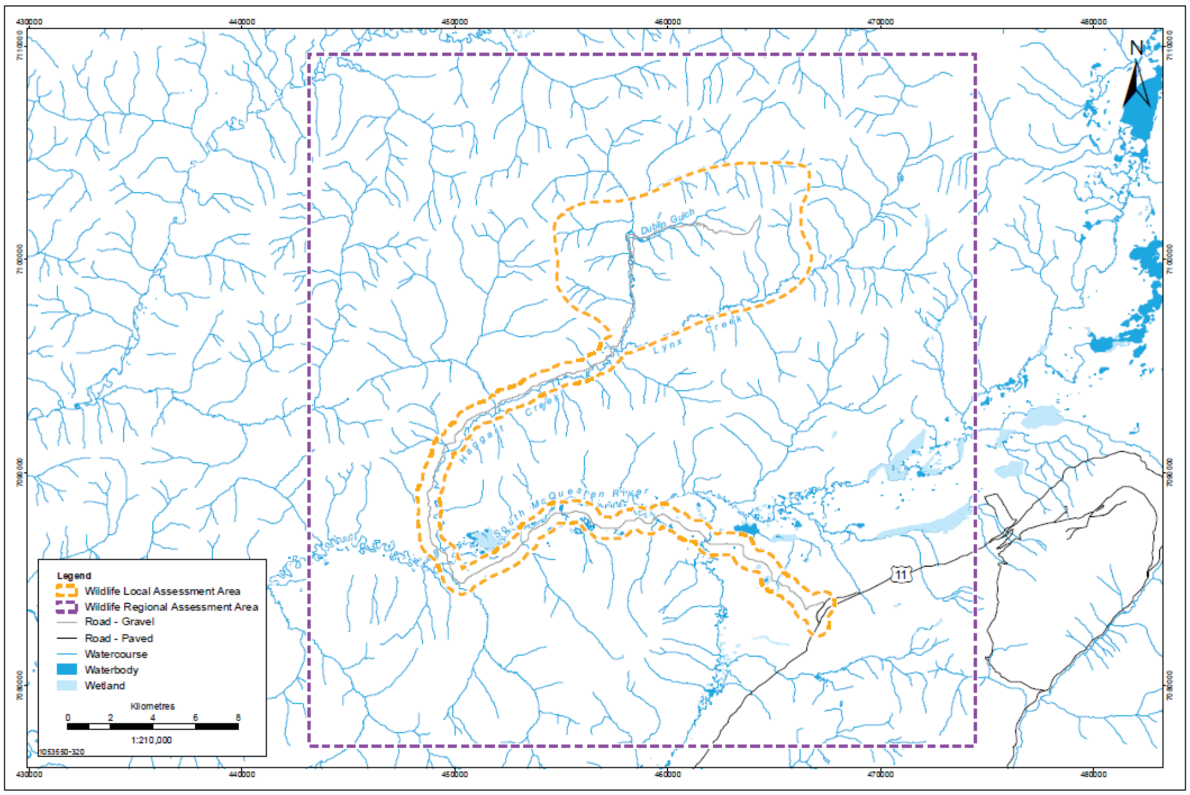

Figure 10 Wildlife Local and Regional Study Areas

11.1 OVERVIEW

Wildlife is valued for its role in local and regional ecosystems, cultural importance, significance to subsistence harvesters, as well as its part in the local traditional economy. Some species of wildlife have particularly high conservation value because their local populations are in decline or they are relatively rare either regionally or nationally. Different habitat types can be more or less important for different species in different seasons or life history stages. Habitat types can also be more or less common across the landscape. Habitat types that are less common tend to be more important and valuable.

The Project location does not overlap with any Wildlife Key Areas identified by Government of Yukon, Department of Environment. However, ungulates, in particular moose, are one of the most important wildlife species potentially affected by the Project. Moose are known to use the lowland and riparian areas along the South McQuesten River extensively. In addition to the lowland habitat, moose move up into the hills of the RSA in the fall. Caribou may be observed occasionally near the mine site.

Other wildlife in the Project area includes grizzly and black bears, wolves, marten, other small mammals, raptors and other birds. The Project overlaps with habitat of wildlife species that are of conservation concern, including the rusty blackbird and olive-sided flycatcher.

Wildlife habitat is characterized by its productivity, prevalence, and/or contribution to key requirements of certain wildlife species. As indicated by the Proponent, based on the wildlife occurring in the Project area, wetlands, riparian areas and old forest are considered as the three most important habitat types in the Project area.

All stages of the Project include activities that may adversely affect wildlife and wildlife habitat. During construction, the clearing and grubbing of vegetation over the mine site is the single largest direct removal of wildlife habitat related to the Project. Clearing of the transmission line RoW and the maintenance of the RoW by regularly removing woody vegetation changes the vegetation community structure and wildlife habitat quality on, and adjacent to, the RoW. During construction and operations the level of human activity combined with noise from explosives, heavy equipment, crushers and other equipment will result in wildlife avoidance of the mine site and a further effective loss of habitat. During construction and operations, use of the SMR and HCR by project vehicles can lead to vehicle-wildlife collisions and wildlife mortality.

11.2 Baseline Information

The proposal includes baseline information related to wildlife and wildlife habitat. In response to information requests, the Proponent submitted additional information including a report on the moose survey completed in March 2011, and a report on the June 2011 breeding bird survey.

The Executive Committee notes that the wildlife-related studies conducted by the Proponent, previous owners of the Eagle Gold/Dublin Gulch property and governments contribute to a relatively good understanding of wildlife use of the RSA. The Proponent completed late-winter aerial surveys, late-winter track surveys, summer aerial surveys, and summer ground-based surveys of wildlife.

11.3 Effects Related to Wildlife and Wildlife Habitat

This section addresses effects of the Project on wildlife and wildlife habitat with particular emphasis on moose, caribou, grizzly and black bears and migratory birds. Several comments submitted during the assessment expressed concerns regarding the potential effects of the project on wildlife and wildlife habitat. NND identified that Project activities have the potential to affect wildlife populations that naturally range in other parts of the NND traditional territory (YOR #2010-0267-200-1).

The Project involves the clearing of vegetation, primarily within the Project site, and along the transmission line, which parallels the existing access road. Clearing of land and associated earthworks may result in the disturbance to vegetation, removal of riparian area ecosystems, and degradation or damage to habitat. Habitat can be lost or quality decreased, resulting in wildlife avoiding of the area. Clearing activities can degrade limited topsoil resources, damage root and seed stock and change surface and subsurface hydrology decreasing the ability of the area to regenerate to pre-project conditions and affecting the long-term habitat productivity of the area. Wildlife may also avoid the area as a result of noise disturbances from various sources (e.g. blasting, the use of heavy equipment, increased traffic and ore processing).

Wildlife may change behaviour and migration/movement to avoid the access road as traffic increases. Increased traffic on the access road results in increased likelihood of vehicle-wildlife collisions. The access road will also be maintained (e.g. plowed) during the winter extending these potential effects into the winter months. Improvements to the access road and year-round maintenance will improve access for hunters and may result in increased wildlife mortality.

Wildlife mortality may also result from clearing of vegetation (e.g. for breeding birds), control of problem wildlife, or potential exposure of wildlife to cyanide and other hazardous materials (section 6).

Adverse Project effects to wildlife and wildlife habitat vary according to the species of wildlife. The following sections address Project and cumulative effects on moose, caribou, grizzly and black bears and migratory birds.

11.3.1 Moose

Moose are the most important large ungulate in the area and are recognized as an important species for harvest by the NND. As indicated in the proposal, moose densities in the Mayo area are close to 200 animals for every 1 000 km^2, which is above the Yukon average (Government of Yukon 2003). In baseline studies conducted by the Proponent, moose were the most commonly detected species and accounted for 33 percent of all wildlife species observations.

The first 20 km of the SMR follows a portion of the South McQuesten River valley that is known as excellent calving, summer, rutting and late winter habitat (See Figure 11). In late fall, moose move from these lowlands to Potato Hills in the Project area. The wetlands along Lynx and Haggart creeks are preferred feeding habitat for moose. The riparian areas are often used as travel corridors by moose and together with low elevation forests they are an equally attractive habitat as they provide food and cover, especially in winter.

In March 2011, the Proponent completed a 1 130 km^2 moose survey in the RSA for the area surrounding the mine site and the South McQuesten and Haggart Creek roads. The survey area was defined using a ten kilometre buffer around these features. Moose were observed throughout the survey area with the majority of animals observed at mid to lower elevations east and south-east of the mine site between Lynx Creek and the South McQuesten River.

Figure 11 Excellent Moose Habitat in the South McQuesten River Valley (km 21.5, SMR)

The Project will remove moose habitat through vegetation clearing and site preparation. Project noise can lead to moose avoiding potentially suitable habitat (i.e. habitat alienation). Creation and use of roads, trails or other linear structures created during the Project may result in wildlife disturbance and habitat disruption. Moose movements could be affected by the activities along the access road and at the mine site. The Executive Committee agrees with the Proponent that moose generally do not perceive roads as barriers although traffic can lead to increased avoidance and result in moose mortality.

Wildlife trails connecting alpine or sub-alpine habitats and lower elevation valley bottoms exist in the Project area and appear to have long term use by moose The Proponent committed to provide crossing and escape points for wildlife along the access road to maintain travel corridors. The Project disturbance effects associated with increased traffic along the access road and transmission line RoW maintenance are anticipated to decrease at closure.

During the winter months, the Proponent has committed to creating breaks in the snow banks along the access road created by snow plowing. This will allow moose, and other wildlife, egress off the road to avoid vehicle-wildlife collisions.

The Proponent has committed to a moose monitoring program including a yearly late-winter moose survey in cooperation with the Government of Yukon, Department of Environment. The program also contains a daily wildlife log and observations record and moose mortality reporting.

The Executive Committee recognizes the Proponent's commitment to implement a series of mitigation measures to minimize vehicle-wildlife collisions including: sharing information about collisions, implementing speed limits, encouraging the use of Project transportation, and managing vegetation to maintain driver sightlines. This will help decrease the number of vehicle-moose collisions along the access road.

The Proponent proposed to implement annual aerial mapping of winter moose distribution within five kilometres of the access road and mine site and in adjacent control areas. Government of Yukon, Department of Environment clarified that the design recommended by them and applied in 2011 is a survey of "transects 10-km on either side of the road, with the area from five to ten km away being a clear control." (YOR #2010-0267-70-1 and YOR #2010-0267-197-1).

The Executive Committee recommends that future surveys be consistent with the design recommendations of the Government of Yukon to allow for the ongoing assessment of displacement and population reduction resulting from mine activities.

The Executive Committee has determined that the Project will result in significant adverse effects to moose through disturbance, direct injury and/or mortality. However, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent described in Appendix A, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee.

11.3.2 Caribou

The Project area does not provide important habitat for caribou. The closest woodland caribou herds to the Project are the Clear Creek Herd and the Hart River and Bonnet Plume Herds. No wildlife key areas for caribou occur within the Project area.

The Proponent noted that while woodland caribou are wide ranging, telemetry data indicate that the area around the mine site is at the edge of the range of the Clear Creek Herd. This herd is largely located on the opposite side of the North McQuesten River. Baseline data collected by the Proponent also indicate that use of the RSA by caribou is limited. Only three caribou detections were recorded in field surveys as well as past data.

The Executive Committee is satisfied that the Project will not result in significant adverse effects to caribou.

11.3.3 Grizzly and Black Bear

Both male and female grizzly bears occupy large home ranges from tens to hundreds of square kilometres, and up to thousands of square kilometres in poorer quality habitats. Male home ranges are typically several times larger than those of females. The northwestern population of grizzly bears is identified as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

The Project area provides a variety of habitats for bears, including forested riparian gullies, marsh habitats and subalpine areas. According to the proposal, preferred grizzly bear feeding habitat represents 37 percent (4 259 ha) of the total habitat within the Project area. This includes habitat along riparian corridors, forested slopes surrounding the mine site, and a few areas of along the access road, particularly adjacent to and south of the South McQuesten River.

The Proponent documented four detections of grizzly bears during wildlife surveys. Only one of these detections was close to the mine site. The remaining three detections occurred in the larger Project area. This may be due to the tendency of grizzly bears to avoid humans and associated disturbance and the fact that Project area is currently disturbed by placer mining and quartz exploration activities. Denning surveys in fall or spring were not undertaken.

Bears have large home ranges and use a diversity of habitats. Some specific seasonal habitat needs are more important than others. While specific habitat loss or alienation for bears could be problematic, the Project effect of greatest concern to the Executive Committee is the killing of bears attracted to the mine site.

The most likely source of bear mortality related to the project is the destruction of bears attracted to the mine site. While wildlife will generally avoid the noise and human presence at the mine site, inadequate storage and/or disposal of waste and petroleum products may attract bears and other wildlife. Other Projects and mines in central Yukon have been known to have incidents with bears resulting in bear destruction. Bears that become habituated to human food sources may not deterred by routine activities and noise. Nuisance bears may be captured and relocated to areas away from human activity, however bears often return. As relocation is not always effective, human food-conditioned bears are often killed due to human-safety concerns.

The Executive Committee recognizes the potential for bear injury or mortality resulting from vehicle-bear collisions. The Proponent has committed to implement speed limits to minimize vehicle-wildlife collisions and to report wildlife carcasses to reduce the risk of attracting bears that may be hit by vehicles. The Executive Committee is of the opinion that, with implementation of these measures, the Project will not result in significant adverse effects as a result of vehicle-bear collisions.

Human-induced wildlife mortality is considered a potentially significant adverse effect by the Executive Committee. To reduce the potential for human-wildlife conflicts and/or property damage, garbage and other attractants must be handled so that they do not become attractants to wildlife.

The Proponent has committed to implement a series of mitigation measures related to waste management, firearms, education, and bear-human management. Key measures include implementation of proper food and waste storage protocols to avoid attractants that would cause animals to become a nuisance, a prohibition against littering at the mine site, the implementation of a Bear Aware Program as a standard part of the health and safety orientation, and the development and implementation of a Wildlife Protection and Management Plan. Should a problem wildlife issue arise, the Environmental Manager, Mine Manager or designate(s) will initiate an appropriate response as described in the Wildlife Protection and Management Plan.

Electric fences have been used to deter bears from mine infrastructure that often attracts them (e.g. camp kitchen and food waste storage). Comments from NND and Government of Yukon support the use of bear fencing around the immediate camp area to minimize bear-human interactions. While electric fencing may be the best option to deter bear, the Executive Committee recognizes that there may be other options more suitable to the site (e.g. wildlife proof containers, indoor storage of waste).

The Executive Committee has determined that the Project will result in significant adverse effects to grizzly and black bears as a result of injury or mortality. However, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent described in Appendix A, compliance with the *Wildlife Act*, and the implementation of mitigative measures specified by the Executive Committee.

11.3.4 Migratory Birds

Several bird species have been observed in the Project area, including birds that are protected under the *Migratory Birds Convention Act* (MBCA), *the Species at Risk Act* (SARA) and/or the *Wildlife Act*. Section 3.2 provides a list of protected bird species that may occur within the Project area.

Migratory birds in Yukon typically nest between early May and late July. The same nesting sites are commonly used in successive years. The Proponent conducted baseline surveys in 2009 and a breeding bird survey in June 2011. The 2009 survey was completed outside the breeding-bird nesting period. During the breeding bird survey a total of 605 birds (46 different species) were identified. The occurrence of both the olive-sided flycatcher and rusty blackbird were confirmed but no other species at risk were identified.

Olive-sided flycatchers and rusty blackbirds are known to occur in the area of the Project. Under SARA, the olive-sided flycatcher is listed as threatened while the rusty blackbird is listed as a species of special concern (Government of Canada 2012). The Proponent has indicated that breeding of both species has been confirmed in the Mayo region based on prior study conducted by the US Geological Survey between 2006 and 2010 (USGS 2012). Olive-sided flycatchers and rusty blackbirds can generally be found in Yukon between early May and late August although some individuals may arrive earlier or depart later. The Proponent has noted an area directly south of the mine site (Lynx Creek) that contains potential preferred habitat due to a recent fire.

During the 2009 baseline surveys conducted by the Proponent, no olive-sided flycatchers or rusty blackbirds were observed. However, the Proponent conducted a breeding bird survey in 2011. During this survey, eight olive-sided flycatchers were identified within the mine site area and two along the access road while three rusty blackbirds were identified along the access road.

Destruction of birds, nests, eggs or young of bird species listed under the MBCA is prohibited. Land clearing activities that overlap with the nesting period may result in potential effects to migratory birds, including:

- habitat loss or alteration by clearing or disturbing potential nest sites;
- individual bird disturbance due to activities such as the use of explosives, drilling, and heavy equipment operation; and
- direct bird injury or mortality due to destruction of bird nests or individuals during vegetation clearing and operation of heavy machinery, etc.

In the proposal, the Proponent indicated that approximately five percent (575 ha) of all combined forest types will be lost within the Project area during construction. This includes preferred olive-sided flycatcher nesting habitat as well as less desirable habitat. Based on the breeding bird survey and amount of forest types lost, the Proponent estimates zero to 29 individual olive-sided flycatchers may be affected due to clearing activities at the mine site. The Executive Committee concludes that based on information provided by the Proponent, there may be a small amount of olive-sided flycatcher habitat lost due to the Project.

Wetland habitats and riparian areas along edges of ponds or lakes are preferred nesting habitat for rusty blackbird (Sinclair et al. 2003). The Proponent has indicated that rusty blackbirds may inhabit preferred habitat at densities of 0.0003 birds per hectare. The Project will clear remove or disturb approximately 20 ha of riparian areas. However, due to reclamation and the development of the fish habitat compensation area at closure, the Proponent expects to have a small net increase of riparian areas. The Executive Committee concludes that based on information provided by the Proponent, it is unlikely that there will be significant removal of rusty blackbird preferred breeding habitat.

Land clearing activities that overlap with the nesting period may result in the disturbance and/or destruction of nests, eggs, and or shelter of a migratory bird. Disturbances occurring in close proximity to nesting sites from Project activities, such as the use of explosives, diamond drilling, and heavy equipment operation may also result in abandonment of active nesting sites and reduced nesting success.

Land clearing activities as well as interactions with mine site activities/infrastructure (e.g. vehicle collisions, transmission line, cyanide laden solution ponds) may lead to direct injury or mortality of birds.

The Proponent has committed to minimize clearing of vegetation during the migratory bird breeding period. Furthermore, to reduce or eliminate the risk of mortality, the Proponent will clear vegetation in a manner consistent with the *Wildlife Act* and the MBCA. The Proponent also committed to reduce bird mortality along the transmission line RoW by using existing guidelines intended to reduce risk to birds.

The Proponent will implement measures to reduce wildlife mortality in the HLF area, event ponds, and ditches. These measures include fencing and controlling the growth of vegetation around event ponds so they do not attract birds as well as designing ditches and sediment control ponds to reduce potential for the entrapment of wildlife. The latter is particularly important for birds, especially waterfowl that would not be deterred by fencing around event ponds. After evaluating a variety of measures to deter birds from landing on the event ponds, the Proponent has decided to use netting in combination with Bird Balls™, for this purpose.

11.3.5 Recommended Terms and Conditions

The Executive Committee has considered the requirements of the following non-discretionary legislation:

- *Wildlife Act*
- *Migratory Birds Convention Act* and the *Migratory Bird Regulations*
- *Species at Risk Act*

The Executive Committee is satisfied that measures proposed by the Proponent and nondiscretionary legislation will effectively eliminate the potential adverse effect of loss of bird habitat (outside of the migratory bird nesting season) along the access road and mine site. However the Executive Committee suggests that sightings of olive-sided flycatchers and rusty blackbirds, or any other SARA listed species be logged and reported to Environment Canada, Canadian Wildlife Service. The Executive Committee does not expect that the Project will have an effect on the movement patterns of highly mobile species such as the olive-sided flycatcher and the rusty blackbird.

The Executive Committee has determined that the Project will result in significant adverse effects to wildlife and wildlife habitat. However, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent described in Appendix A, compliance with non-discretionary legislation, and the implementation of mitigative measures specified by the Executive Committee.

To eliminate, reduce or control significant adverse effects from the Project on injury/mortality of moose, the following mitigative measures are required:

99. The Proponent shall, in cooperation with Government of Yukon, Department of Environment, design and conduct annual winter moose surveys consistent with methodology and study area (ten kilometres from infrastructure) used in 2011.
100. As proposed, the Proponent shall provide personnel transportation on the access road (i.e. between the Silver Trail and the mine site) and encourage its use to minimize incidental hunting opportunities and direct road mortalities.
101. As proposed, the Proponent shall implement the Wildlife Protection and Management Plan (Appendix 30 to the proposal, Conceptual Environmental Management Plans) and shall provide reports to the Government of Yukon Regional Biologist and the First Nation of Na-Cho Nyak Dun every three months.

To eliminate, reduce or control significant adverse effects from the Project on injury/mortality of grizzly and black bears, the following mitigative measures are required:

102. If den sites are discovered, the Proponent shall record these locations and avoid them until they are no longer in use by bears.
103. As per the Waste Management Plan, the Proponent shall regularly collect garbage and debris destined for disposal, and prior to incineration, shall store it in wildlife-proof containers in a manner that does not attract wildlife to the mine site.
104. The Proponent shall ensure the Wildlife Protection and Management Plan identifies measures to deter wildlife access to the mine site and facilities, including the kitchen/camp facilities, HLF, event ponds and processing areas. The Proponent shall implement specific measures to deter bear access (e.g. electric fencing, indoor storage of attractants).

To eliminate, reduce or control significant adverse effects from the Project on bird injury/mortality, the following mitigative measures are required:

105. If nests are discovered, the Proponent shall record these locations and avoid them until they are no longer in use by birds.
106. The Proponent shall avoid clearing vegetation during the migratory bird nesting season (approximately May 1st to July 31st). If clearing must occur during this period, the Proponent shall ensure nest surveys are conducted by qualified and experienced personnel prior to clearing. If active nests or migratory birds are discovered, the Proponent shall postpone activities in the nesting area until nesting is completed.

11.4 Cumulative Effects Assessment

11.4.1 Overview

The Project will result in residual effects to wildlife and wildlife habitat. These effects include disturbance, injury or mortality, and loss of habitat. The Executive Committee has determined that these residual effects would occur for all stages of the Project. The loss of wildlife habitat could extend beyond the closure stage of the Project depending on the success of reclamation efforts, especially re-vegetation.

The cumulative effects to wildlife and wildlife habitat are considered in the spatial and temporal context of their range and the spatial scope of any residual effects is specific to the wildlife species considered. The spatial extent boundary has been set to a 50 kilometre radius around the mine site, based on the following rationale:

- Inclusion of a reasonable watershed scale; in this case the McQuesten River watershed (North and South). The Stewart watershed is too vast and therefore is most likely well beyond interaction of residual effects. Further it includes wildlife values that do not overlap with the Project (e.g. caribou, sheep, and goats);
- Inclusion of nearby communities (Mayo, Keno, Elsa); and
- Recognizing that wildlife do not constrain their movement to watershed boundaries. There needs to be a reasonable radial distance from the Project to capture uniform habitat and the presence of key species that may be affected by the Project.

Existing activities in the region consist of placer mines and quartz exploration projects. There are active quartz and placer claims in the area and mining land use permits that have been issued for these claims. In terms of existing quartz and placer exploration, there have been several recent projects assessed by YESAB. Appendix E includes a list of all projects assessed by YESAB in a 50 km radius around the mine site for the last six years.

Quartz exploration and placer exploration projects involve some activities that are similar to the Project. Activities may include vegetation clearing, excavation of soils, use and management of water, establishment and use of roads and trails, establishment and use of camps, use of heavy equipment, storage and use of petroleum products, management of wastes and human presence. The potential residual effects of the existing and proposed projects on wildlife, particularly the quartz and placer operations, are similar to those of this Project, although lesser in magnitude.

11.4.2 Moose

Moose are generally found on a year-round basis throughout the entire region surrounding the Eagle Gold Project and the Dublin Gulch, Haggart Creek and South McQuesten Rivers. Densities of moose may vary within the area based on quality of habitat. Moose require a diversity of habitat types based on seasonality, availability of adequate forage, and sufficient cover to escape predators. Forested areas opened by either natural or human disturbance promote early succession forest communities which provide quality moose foraging habitat. Moose rely on mature closed forest to provide cover from predators as well as reduced snow depth in winter. In late winter, moose generally use lower elevation river valleys with abundant riparian vegetation. Late-winter habitat is considered the most important seasonal habitat. Given the amount of moose habitat area that will be eliminated (i.e. cleared) by the Project in combination with the areas to be cleared by other projects (i.e. residual effect on habitat) the Executive Committee has determined that cumulative adverse effects on moose habitat are not significant.

The Proponent, referencing Ward, et al. (2006) indicated the sex ratio was low (43 bulls for every 100 cows). This suggests high levels of bull harvest/hunting and supports the understanding by the Executive Committee that moose harvest pressure could be adversely affecting the moose population around the Project site.

The Project area including the mine site and access road is located within Game Management Subzones (GMZ) 2-58, 2-59, and 2-62. The South McQuesten River Bridge is at the border where all three GMZ come together. Harvest records between 1999 and 2008 show a total reported average harvest of: 4.7 moose per year in GMZ 2-58; 1.3 moose per year in GMZ 2-59; and 2.1 moose per year in GMZ 2-62. Average harvest records for the same period for GMZ 4-05, across the Silver Trail from the South McQuesten Road, show 8.5 moose per year.

The Project will result in up to 400 people driving to, and working at, the mine site. The Proponent is proposing to bus personnel to the mine site to avoid increased hunting pressure from Project personnel that are off-shift. The allowable harvest rate or stable population guideline for moose in Yukon ranges from two to five percent but is generally four percent. This rate is based on Yukon management objectives and provides an objective or cautionary threshold in the absence of a maximum sustainable harvest rate. Over-harvesting can initiate a population decline that would continue due to predation and other factors (environmental conditions) even if hunting pressure diminishes. The Executive Committee notes that while significantly more people will be travelling on the access road, including increased winter access due to snow clearing, and at the mine site, the Project will not result in significant new access. The transmission line RoW, though a new linear feature, will generally parallel the access road and not open up large areas for hunting that were not accessible prior to the Project.

The mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and the mitigative measures recommended in this report, are considered by the Executive Committee as adequate to address potential cumulative effects to moose. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects to moose.

11.4.3 Grizzly and Black Bears

Although some bear harvest could be expected, harvest records for GMZ 2-62 indicate no grizzly bears were reported harvested in the Project area between 1999 and 2008. One grizzly bear was harvested in GMZ 2.59 in 2002 while two were harvested in GMZ 2-58 in 2003.

Consistent with the Project effects discussion on bears as noted above, it is the view of the Executive Committee that the residual effects associated with the destruction of nuisance bears as a result of the Project along with destruction of nuisance bears at other project sites represents the most significant cumulative effect to regional bear populations. Increases in personnel and attractants at the Project site may result in increased numbers of human-bear interactions and bear mortality. Increases in the number of project camps in remote locations increases the likelihood of bear-human interactions. YESAB and Government of Yukon, Department of Environment continue to recommend the use of electric fences for remote camps to deter bears from potential attractants and decrease the likelihood of bears being destroyed.

The mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and the mitigative measures recommended in this report, are considered by the Executive Committee as adequate to address potential cumulative effects to grizzly and black bears. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects to grizzly and black bears.

11.5 CONCLUSION OF THE WILDLIFE ASSESSMENT

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to wildlife and wildlife habitat.

12.0 HERITAGE RESOURCES

This section addresses potential effects of the Project on heritage resources. A description of the environmental and socio-economic setting for heritage is provided. Potential adverse effects are characterized and discussed in the context of the proposal information, stakeholder comments, relevant legislation, and proposed mitigation strategies. The Executive Committee concludes that the Project will result in significant adverse effects to heritage resources that can be mitigated by specified terms and conditions.

12.1 OVERVIEW

Proposed activities that involve the use of heavy equipment, clearing of land and moving of earth have the potential to affect heritage resources. The footprint of the mine site will undergo substantial ground disturbance during the initial construction period, and any heritage resources not identified prior to construction will likely be destroyed. Land-based activities and ground disturbance may unintentionally encounter heritage resources and cause adverse effects to this VESEC. The risk for potential Project effects on heritage resources is limited to the Project footprint during the proposed development timeline.

Heritage resources are discussed and defined under YESAA s. 2, Chapter 13 (Heritage) of the NND Final Agreement, and the *Historic Resources Act*.

YESAA defines heritage resource as:

a) a moveable work or assembly of works of people or of nature, other than a record only, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic, or aesthetic features;

b) a record, regardless of its physical form or characteristics, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic or aesthetic features, or;

c) an area of land that contains a work or assembly of works referred to in (a) or an area that is of aesthetic or cultural value, including a human burial site outside a recognized cemetery.

The NND Final Agreement defines heritage resources as including:

- moveable heritage resources;
- heritage sites, defined as an area of land which contains moveable heritage resources, or which is of value for aesthetic or cultural reasons; and
- documentary heritage resources.

The *Historic Resources Act* defines historic resources as:

- a historic site;
- a historic object; and

- any work or assembly of works of nature or of human endeavour that is of value for its archaeological, paleontological, pre-historic, historic, scientific, or aesthetic features.

The local area surrounding the Project is rich in historical and cultural significance and this contributes to the potential for heritage resources as defined above. The Project is located within the traditional territory of the NND who have used natural resources in this region for thousands of years. Members of NND continue to use traditional camps, trails, lookout sites, hunting and fishing areas, berry patches, and rivers in their territory (VIT 2011a). Explorers, prospectors, traders and missionaries began to settle in the area in the mid1800s. The fur trade drove settlement and exploration of the area through the late 1800s, but mineral exploration and mining eventually became the dominant industry (VIT 2011a).

12.2 EVALUATION OF BASELINE INFORMATION

The Proponent has made reasonable efforts to understand the presence and potential for heritage resources in relation to the Project area. The proposal references a number of studies, starting with an archaeological and historic assessment conducted in 1995 (Greer). This study did not identify any heritage sites and concluded that "*all areas favourable for pre-contact human occupation were deemed to have been destroyed by the extensive placer mining activity in the area, and all structures identified within the Project area were all determined to be related to mining activities over the past 50 years.*"

A study in 1996 (Greer) identified the following three sites of potential concern along the South McQuesten Road:

- KIT x-2 – Big Dave Lookout, pre-contact archaeological and historic deposits;
- KITx-3 – subsurface pre-contact archaeological site; and
- KITw-1 – historic cabin site.

A study in 2005 (Thomas) identified two additional sites of potential concern along the South McQuesten Road:

- KITx-4 – pre-contact archaeological site; and
- KIVa-1 – collapsed cabin.

The proponent has committed to avoiding all five of these sites with their road design and construction.

An historical resources field investigation was conducted in 2009. This investigation concluded that *"those areas that would have had the potential to contain archaeological sites, such as the areas within proximity of Dublin Gulch and Haggart Creek, have been extensively reworked by the placer mining activities that have been ongoing since 1899. No undisturbed areas were observed in any locations that would have had moderate to high archaeological potential."* However, the investigation did document three historic sites within the footprint of the Project. These sites include several abandoned buildings and structures that appear to be older than 45 years and are therefore, considered historic as per the *Historic Resources Act*. The first site includes log cabins, a house, trails, core shacks and a smoke shed near Dublin Gulch, the second site includes a cabin and overgrown trail near Dublin Gulch and the third site includes a collapsed cabin on a low bench near Haggart Creek.

A heritage resource impact assessment for palaeontological resources was conducted in 2009 in addition to a literature review. Field surveys concluded that "*most of the valley fill at Dublin Gulch and Haggart Creek has been reworked by placer mining. There is no sign of any remaining source layer for the Dublin Gulch Pleistocene fossil locality, and no additional fossil vertebrate material was found.*" However, the study also indicates that there is a high potential for surficial deposits to contain palaeontological resources "*along the south side of Dublin Gulch (at a silt borrow site, north of the current confluence of Dublin Gulch and Haggart Creek...), along Ann Gulch (at heap leach facility) and at Secret Creek (along access road).*" (FMA Heritage 2009) The literature review substantiates the findings of this study, noting that "*the Dublin Gulch area has yielded a significant Pleistocene vertebrate fossil locality*".

Based on this information, the Project will have adverse effects on the three known historic sites identified within the Project footprint, and undiscovered palaeontological and/or heritage resources that may be encountered as the Project is implemented.

12.3 Effects Related to Heritage Resources

Project components overlap directly with three known historic sites. Project activities will result in the disturbance, destruction or removal of heritage resources located at these sites. These adverse effects are unavoidable should the Project proceed. The disturbance, destruction or removal of heritage resources diminishes their value from a cultural and scientific perspective.

The area around the proposed project has also experienced over one hundred years of mining activity. There is potential for additional historic resources related to mining to be discovered during the implementation of this Project and these resources are considered valuable to the history of the area.

The Dublin Gulch area is recognized as a significant fossil site. The proposal indicates that "*most strata with high palaeontological potential have been removed during placer gold mining, except in the Ann Gulch area.*" There is potential for additional palaeontological resources to be discovered in the course of this Project being implemented, notably during initial construction of the HLF. The accidental discovery of palaeontological resources may lead to disturbance or destruction of this resource, or improper handling of the resource. These outcomes could diminish the value of a resource that according to the proposal "*is the only substantial Pleistocene record from the Mayo District*."

Historically, the NND have used the area and heritage resources continue to be discovered. Heritage resources are culturally important to NND and Chapter 13 of their Final Agreement provides various rights in relation to these resources. In particular, s. 13.3.2 states "*Subject to 13.3.5 to 13.3.7, each Yukon First Nation shall own and manage ethnographic Moveable Heritage Resources and Documentary Heritage Resources that are not Public Records and that are not the private property of any Person, that are found in its respective Traditional Territory and that are directly related to the culture and history of Yukon Indian People.*" Given the extent of ground disturbance for the Project and the historical use of the area by the NND, there is potential for heritage resources to be encountered. These resources may not be identified in advance of construction activities and could inadvertently be damaged, destroyed or removed.

The Executive Committee has considered commitments made by the Proponent to mitigate adverse effects of the Project to heritage resources. In relation to the historic sites, the Proponent has committed to avoiding all archaeological and historic sites along the access road. For the three known historic sites within the mine footprint, the Proponent has committed to work closely with Government of Yukon, Department of Tourism and Culture to determine specific mitigation measures required for each of the structures and sites. The Proponent has committed to implementing the following mitigation measures set out by the Department of Tourism and Culture prior to any Project effect to the known historic sites:

- additional photography, typically eight photos per building, except for smaller buildings for which one photograph per side will be required;
- description of building construction and materials;
- description of building condition;
- UTM locations (taken with GPS technology) of each building/feature;
- site plan drawn to scale showing site layout, building orientation and dimensions;
- photos and description of all equipment/machinery and features associated with structures or site; and
- other relevant information based on archival sources or interviews.

Implementing these measures will ensure that historic resources at the three sites are properly documented prior to any disturbance, destruction or removal from the area. Ultimately this mitigation does not avoid adverse effects at the three sites as the in-situ value of these historic sites will be lost upon removal of the artifacts. However, fully documenting the nature of these resources substantially alleviates the loss of cultural and scientific information associated with these artifacts. No information was submitted during this assessment to suggest that these sites cannot be removed or that they should be preserved. As such, the measures noted above appear to be a reasonable course of action.

In relation to undiscovered palaeontological resources, the Proponent has committed to maintaining a Fossil and Artifact Discovery Record, and having the "*construction plan for the heap leach facility at Ann Gulch to be carefully [sic] reviewed to identify any opportunity for the collection of detailed stratigraphic and palaeontological information in any exposed sections before the area is covered by the HLF liner*". Implementing these measures provides an opportunity for further palaeontological investigation that would otherwise not be available and ensures that any additional resources discovered will be properly documented.

Finally, in relation to undiscovered heritage resources the Proponent has committed broadly to the protection of heritage resources and will implement a Heritage Resources Protection Plan. The intention of this plan is to recover and report the accidental discovery of heritage resources. These measures provide some assurance that heritage resources will be considered as construction activities are implemented. However, these measures do not provide a sufficient level of involvement of the NND. NND recommended in their comments:

> *"that FNNND, with funding from Victoria Gold, identify, hire, and train cultural monitors to survey areas planned for development in advance of construction crews. The FNNND cultural monitors will be responsible for collecting and verifying NND TK/LU data, identifying areas of potential effects (especially related to vandalism), designating areas for protection, and proposing and developing additional mitigation measures."* (YOR #2010-0267-200-1).

NND also recommended that they be *"notified and receive copies of any completed Fossil and Artifact Discovery Records as part of the construction of the Eagle Gold Project to fulfill the intent of Chapter 13 of the NND Final Agreement."* The Executive Committee recognizes the importance of heritage resources to NND and the potential for resources to be encountered during this Project. In the absence of a cultural monitor there is an increased potential for heritage resources to be damaged, destroyed or removed. Further, while accidental discoveries will be reported to the appropriate authorities, it is important for NND to be informed of these discoveries to ensure its interests under s. 13.3.2 of the First Nation of Nacho Nyak Dun Final Agreement are addressed.

12.3.1 Recommended Terms and Conditions

The Executive Committee has considered the requirements of:

- the *Historic Resources Act* – specifically s. 64 (Destruction of historic objects or human remains) and s.71 (Report of findings);
- the *Archaeological Sites Regulation* (O.I.C. 2003-73) under the *Historic Resources Act* – specifically s. 4, regarding historic resources;
- the *Land Use Regulation* under the *Territorial Lands (Yukon) Act* – specifically s. 9 (Prohibitions); and
- chapter 13 (Heritage) of the First Nation of Nacho Nyak Dun Final Agreement.

Adhering to the provisions of this legislation reinforces the mitigation measures committed to by the Proponent. However, the Executive Committee has determined that the Project will have significant adverse socio-economic effects to heritage resources. These socio-economic effects can be eliminated, reduced or controlled by the application of specified terms and conditions.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse socio-economic effects of the Project to heritage resources:

To involve the NND in the monitoring and identification of heritage resources during construction.

107. The Proponent shall hire and train cultural monitors from the NND for the initial construction phase of the Project. Cultural monitors will assist with heritage surveys in areas planned for development, monitor construction areas and assist in identifying heritage resources.

12.4 Cumulative Effects Assessment

The mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and the mitigative measures recommended in this report, are considered by the Executive Committee as adequate to address potential cumulative effects to heritage resources. The Executive Committee is satisfied that the residual effects of the Project, in combination with the effects of other projects or activities will not result in significant adverse cumulative effects on heritage resources.

12.5 Conclusion of the Heritage Resources Assessment

The Executive Committee concludes that application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce, or control significant adverse effects.

13.0 LAND AND RESOURCE USE

This section addresses potential effects of the Project on land and resource use. An understanding of the environmental and socio-economic setting for land and resource use is provided, and potential adverse effects are characterized and discussed in the context of the proposal, stakeholder comments, relevant legislation and proposed mitigation strategies. The Executive Committee concludes that the Project will not result in significant adverse effects to land and resource use.

13.1 OVERVIEW

The Project overlaps with a number of land activities and resource uses. The Executive Committee agrees that a reasonable spatial extent for considering this overlap is the Local Study Area (LSA) described in the Land Tenure and Land Use Report (VIT 2011a, Appendix 3). Land and resource uses overlapping the Project within the LSA include NND traditional land uses, such as hunting, fishing, trapping and gathering, outfitting, commercial trapping and timber resources. Aside from commercial trapping, comments were received on each of these topics.

Figure 1 from the Land Tenure and Land Use report provides an overview of how outfitting concessions, game management areas and trapping concessions overlap with the Project in the context of the Regional Study Area (RSA). Figure 2 from this report focuses on the LSA.

All stages of the Project include activities that may adversely affect land and resource use. During construction, the presence of personnel, use of machinery and the associated noise and disturbance of establishing mine site infrastructure may overlap with land and resource use in the area. Specific portions of the property will have restricted access due to concerns for public safety as well as the protection of private property and critical infrastructure. This overlap continues through the operational life of the mine and during closure and reclamation when personnel and machinery will again be required to decommission the site. Overlap continues to a lesser extent through the post-closure period, depending on the level of activity required to monitor and adaptively manage the site and any remaining limitations to public access.

Project activities noted above may result in the reduced ability or lost opportunity for various land activities and resource uses to occur. The Executive Committee has considered these potential adverse effects to the following land and resource uses:

- NND traditional land use;
- outfitting activity and concession improvements;
- trapping activity and concession improvements; and
- timber resources

The Executive Committee has determined that the Project will not result in significant adverse effects to land and resource uses. The following sections outline the rationale used to arrive at this conclusion.

13.2 EVALUATION OF BASELINE INFORMATION

A Land Tenure and Land Use Report was prepared by Stantec and EDI for the Proponent (VIT 2011a, Appendix 3). This report describes land tenure and associated land use in the vicinity of the Project within both the LSA and RSA.

A Socio-economic Baseline Report was prepared by DPRA Canada for the Proponent (VIT 2011a, Appendix 17). This report provides two pieces of information that are important to consideration of land and resource use. First, a local and regional economic overview providing details on mining, outfitters, tourism, commercial trapping, commercial fishing, forestry and agriculture, oil and gas, and local services and businesses. Second, information related to traditional activities and culture in the area, notably subsistence harvesting (i.e. hunting, fishing, trapping and gathering).

It is the view of the Executive Committee that these reports provide a reasonable understanding of the land and resource use in the Project area.

13.3 EFFECTS RELATED TO NND TRADITIONAL LAND USE

There are a number of potential Project effects to traditional land use in the area:

- Effluent discharged from the mine site may have elevated concentrations of water quality parameters of concern, potentially causing adverse effects to aquatic organisms traditionally harvested.
- The Project may result in a number of effects to various wildlife species that are traditionally harvested in the area, including habitat loss and alteration, disturbance and disruption, direct injury and/or mortality and this may in turn affect the success of harvesting these species.
- Southern access to the Potato Hill area will no longer be available during the life of the mine.
- Certain portions of the mine site and associated infrastructure will be prohibited from access.

In relation to adverse effects to hydrology and the downstream aquatic ecosystem, the Mayo RRC stated that the South McQuesten River "*is a historically documented, traditionally significant, first nation fishery*" and that "*trapping and hunting opportunities in this area are also an integral part of the local traditional culture and economy*." (YOR #2010-0267-196-1) Project effects to hydrology and the aquatic ecosystem are discussed in sections 7 and 8 of this screening report. These sections conclude that the Project will result in significant adverse effects to these particular values. However, terms and conditions are recommended to mitigate these significant adverse effects so that they are no longer significant. Implementation of these terms and conditions will help to ensure that the Project does not result in significant effects to the ecological integrity of the South McQuesten River. Therefore the fishery associated with this river system will also be maintained and be available for continued traditional harvest.

Project effects to wildlife and wildlife habitat are discussed in section 11 of this screening report. This section concludes that the Project will not result in significant adverse effects. The Executive Committee acknowledges that the Project will result in a certain amount of habitat loss and potential displacement of wildlife from areas that are normally hunted in. However, there is existing development (e.g. placer mining, road use) in these areas that has resulted in decreased habitat quality as well some displacement effects. Given the conclusion arrived at in section 11, it is unlikely that traditional use of wildlife (i.e. hunting, trapping) will significantly be affected.

The NND stated the following concerns related to their traditional land use in the Potato Hill area (YOR #2010-0267-200-1):

> *"The effect of restricting southern access to Potato Hill (requiring the use of the longer northern access) will act as a deterrent to some NND traditional land users (related to increased cost of fuel and time) with associated adverse cultural implications."*
>
> *"Victoria Gold should provide NND with alternative access to the Potato Hill via the SMR and HCR. Victoria Gold should add to its commitments that it will identify, explore and agree in collaboration with NND to appropriate measures to facilitate ongoing, future NND access to the Potato Hills area." (VIT 2011a)*
>
> *"Complicated access to important land use sites, including Potato Hill." (VIT 2011a)*

The proposal notes that "*there are trails in the Potato Hills... that have been used by NND citizens for generations.*" The SMR and HCR are utilized to access this area for traditional land uses, and primarily moose hunting. The southern access to the Potato Hills area will not be available during the life of this Project; however it will become available again following closure. The following commitment made by the Proponent speaks to this aspect:

> *"The Haggart Creek Road will remain in place at closure. Following closure of the HLF and site facilities, the main access road within the Project footprint will be permanently closed and reclaimed. However, it is proposed that a single lane road will remain to provide access to the Potato Hills. The road will be left in a semi-permanent, deactivated condition which will allow the road to remain passable and be environmentally stable." (VIT 2011a)*

NND acknowledges that there is a northern access into the Potato Hills area. Even though this Project will remove the southern access for a moderate period of time, access is still possible using the northern route. In their comments on the DSR, NND expressed further concern regarding the loss of access through the mine-site to the Potato Hills area (YOR #2010-0267-346-1).

There will be a temporary loss of access through the mine-site to the Potato Hills area during the construction and operation phases of the Project. NND entered into a Cooperative Comprehensive Benefits Agreement (CCBA) with the Proponent in October 2011 for the Project and ongoing exploration activities. The CCBA advances the promotion of socio-economic and environmental objectives of NND. The details and outcome of the CCBA are confidential. However, as indicated by the Proponent, *"impacts on NND temporary loss of access to the Potato Hills were fully discussed and concluded as evidenced by the CCBA"* (YOR #2010-0267-350-1). This was confirmed by the Executive Committee through conversation with NND.

The Executive Committee notes that the HCR is currently not maintained in winter limiting current seasonal vehicle access to Potato Hill. Snow machine access is possible in winter. The Executive Committee is of the view that access to Potato Hill will be increased in winter. The Executive Committee is of the opinion that the Project will not result in significant adverse effects to accessing the Potato Hills area. The Executive Committee suggests that the Proponent ground-truth the northern access route with a representative from NND to ensure that it is useable.

Finally, certain portions of the mine site and associated infrastructure will be prohibited from access. The NND stated the following concerns related to their traditional land use in the Project area (YOR #2010-0267-200-1):

> *"Increased third party interest/use and impeded/delayed NND access to important land use sites. Prohibited access to mine site for traditional use."*
>
> *"possible direct loss or degradation of land use areas due to overlap with the mine footprint."*

The Executive Committee acknowledges that the mine site will result in certain restrictions to access that are currently not in place for traditional land uses. These restrictions are for the purposes of maintaining public health and safety, guarding private property and protecting critical mine site infrastructure. The NND particularized to a certain extent their use of the Potato Hills area for moose harvesting, and for the most part access will continue to be available through the existing northern route. However, NND did not particularize their traditional land use within the actual Project footprint. Assumptions may be made, given the current access to this area and proximity to Mayo, that it is used for certain traditional land uses. The Executive Committee also notes that there are many other access roads in the region, as well as the scale of the traditional territory available for traditional land uses. In the absence of further particulars on what traditional land use activities occur within the mine footprint (i.e. area of the LSA) it is reasonable to conclude that this Project will not have significant adverse effects due to restricting access to the mine site.

13.4 EFFECTS RELATED TO OUTFITTING ACTIVITY

Outfitting concessions have been characterized by the courts as 'valuable property'. In ***Heynen v. Yukon Territory (Government)*** 2008 the Yukon Court of Appeal stated "*concessions are generally transferrable and may be renewed indefinitely, subject to limitations found in the regulatory scheme, and thus are, in the judge's words, 'valuable property'*."

Section 53 of the *Wildlife Act* states an outfitting concession area reserves for the holder of that concession the exclusive opportunity "*to provide guides to persons for hunting big game animals in the outfitting concession area*". Section 126 of the *Wildlife Act* clarifies that an outfitting concession "*is not, and does not operate as a demise, lease or transfer of any title to or interest in land or wildlife*". This provision makes clear that holding an outfitting concession itself does not provide the concession holder with a lease, transfer of title or interest in land or wildlife.

Outfitting concession areas are established and governed by the *Wildlife Act* and the corresponding *Wildlife Regulations* and *Outfitting Concession Area Boundary Regulation*. The Project overlaps spatially with two of these concessions, namely concession #4 (Midnight Sun Outfitting Ltd.) and the adjacent concession #7 (Rogue River Outfitters Ltd.). In examining the overlap between outfitting activities and Project activities we have considered the local study area (LSA) for the Project as outlined in the Land Tenure and Land Use Study (2010). The LSA encompasses an area of approximately 64 km^2 and includes the mine footprint and a 500 m buffer on either side of the SMR and HCR. The Executive Committee is of the view that the LSA is a reasonable scale for considering the potential effects of the Project to outfitting activities.

Concession #4 and #7 are each approximately 31 000 km² in size. Concession #4 overlaps with approximately 56.2 km² of the LSA which represents approximately 0.19 percent of the concession area. Concession #7 overlaps with approximately 7.13 km² of the LSA which represents approximately 0.02 percent of the concession area.

According to the Land Tenure and Land Use Study prepared for the Proponent, outfitting activities typically occur from late-July to early-October (VIT 2011a). This timeline represents the seasonal temporal overlap between outfitting activities and the Project.

During the assessment, comments were submitted by Alan Young, the owner of Midnight Sun Outfitting Ltd. and outfitter for concession #4. Mr. Young stated:

> *"the mining proposal with camps, exploration and extracting of mineral [sic] will downsize my outfitting concession in respect to land base which equates to a loss of potential hunting area".* (YOR #2010-0267-199-1)

Mr. Young also met with an assessor on January 26, 2012 and the note to file from that meeting states:

> *"There will be a lot of noise from machinery and project activities and there will likely be no hunting signs for the workers, so he won't be able to effectively bring clients to this area since the wildlife will be pushed out. Plus his clients won't be interested in being in a project area. Therefore this land will not be available for his use until the mining activity is over, likely after 15 or 20 years. At that point it would be questionable how useable the area would be for outfitting."* (YOR #2010-0267-226-1)

These comments suggest the possibility the Project may have adverse effects on outfitting activities or the value of the concession. However, based on the information available in this assessment, the Executive Committee is of the view that adverse effects, if any, will be minimal for two reasons. First, the affected portion of each concession within the LSA is generally unsuitable for outfitting. Second, the areas potentially impacted constitute a very small part of either of the two concessions. As such, the Executive Committee is of the opinion that the Project will not have significant adverse effects on outfitting activity. The rationale for this determination is set out below.

13.4.1 Reduction/Loss of Outfitting Activity

The Executive Committee is of the opinion that the Project will not have significant adverse effects on outfitting concession operations, primarily because the area of overlap between the LSA and the two outfitting concessions has been, and continues to be, subject to considerable disturbance from other activities and is generally unsuitable for outfitting. Also, there is no indication from information provided by either concession holder that outfitting activity has occurred within the identified overlap between the outfitting concessions and the LSA.

There are a number of constraints to outfitting within the identified areas of overlap. For example, the *Wildlife Act* restricts hunting in proximity to a residence or discharging a firearm on or across roads used by the public. In terms of restrictions to hunting or discharging firearms, the SMR and HCR are both public roads. While there is no road use data for these roads, the Executive Committee is aware that they facilitate a number of land uses documented in the Land Tenure and Land Use Study (Project Proposal – Appendix 3, 2010). Therefore, these roads experience a volume of traffic commensurate to those land uses. The associated land uses (e.g. placer mining, recreation, harvesting) add to the level of human activity in the LSA.

Additional constraints affecting the suitability of lands within the overlap area being used for outfitting include the existence and use of the access road and mine footprint for placer mining and other land use activities. Furthermore, prior activities in the area and current uses affect both wildlife habitat quality and the aesthetics of the area decreasing the suitability of the area for outfitting clients.

In terms of the existing development and use of the area, Mr. Young stated "*his clients won't be interested in being in a project area*" (YOR #2010-0267-226-1). The overlap area for his concession (#4) includes the existing roads and active placer claims. Therefore, the area is already experiencing impacts to the local aesthetics (e.g. clearing of vegetation, re-contouring, storage of equipment and noise). The current use of the area could be disruptive to local wildlife populations, likely creating a zone of influence attributed to human presence and noise that may be affecting local wildlife. The current use of the area could also be disruptive for outfitting clients attempting to hunt big game.

The Executive Committee has determined that the Project will not have significant adverse effects to outfitting, given that the overlap between outfitting concessions and the LSA does not appear to be utilized or suitable for outfitting.

Although the Executive Committee does not consider there to be significant adverse effects to outfitting activity as a result of the Project, it does recognize the positive benefits of ongoing communication and dialogue between the Proponent and other resource users, including outfitting concession holders.

The Executive Committee concurs with comments provided by Yukon Government that the Proponent should fulfill its commitment to *"… communicate its plans and timing of proposed activities to other resource users e.g., trappers, outfitters, quartz and placer miners, and known subsistence harvesters"* (VIT 2012a). The Executive Committee encourages the Proponent to maintain communication and dialogue with the outfitters, and other resources users, in or adjacent to the Project area to avoid unforeseen land use conflicts.

13.5 Effects Related to Commercial Trapping Activity

Generally, commercial trapping in Yukon involves harvesting furbearers under the *Wildlife Act*. In examining the overlap between trapping activities and Project activities, we have considered the LSA for the Project as outlined in the Land Tenure and Land Use Study (2010). As noted above, the LSA encompases an area of approximately 64 km^2 and includes the mine footprint and a 500 m buffer on either side of the SMR and HCR. The Executive Committee is of the view that the LSA is a reasonable scale for considering the potential effects of the Project to trapping activities.

The LSA overlaps with registered trapline concessions (RTC) 81, 84 and 85. RTC 81 overlaps with the mine site and a portion of the HCR; while RTC 84 is southwest of the mine site and overlaps a portion of the HCR and SMR; and RTC 85 is southeast of the mine site and overlaps a portion of the SMR.

While the Project has the potential to have some impact on trapping and related concession improvements, if any, based on the information available in this assessment, the Executive Committee is of the opinion that the Project will not have significant adverse effects to trapping activity or trapping concession improvements.

13.5.1 Background

Similar to rights provided to outfitting concession holders, s. 62 of the *Wildlife Act* reserves for the holder of trapline concessions the exclusive opportunity "*to trap fur bearing animals in the area described in the trapping concession*". As noted above in the outfitting section, s. 126 of the *Wildlife Act* states a concession, in this case a trapping concession, is not and does not operate as a demise, lease or transfer of any title to or interest in land or wildlife. This provision makes clear that holding a trapping concession does not provide the concession holder a lease, transfer of title or interest in land or wildlife.

13.5.2 Reduction/Loss of Commercial Trapping Activity and Improvements

The Executive Committee acknowledges that the LSA for the Project overlaps spatially and temporally with RTC 81, 84 and 85. It further acknowledges that the overlap area between the LSA and RTCs may be suitable for trapping activities and the associated improvements (e.g. trapline trails) to facilitate these activities.

The affected trapping concession owners have not indicated that improvements (e.g. base camps with cabins, line cabins and trails) exist within the overlap that would warrant consideration for compensation as a result of impacts from Project activities. However, the owner of RTC 81, Ms. Beatty, has indicated that the overlap area is an important fur-bearing portion of her trapline concession, and the HCR is used as access to her trapline (YOR #2010-0267-340-1). Ms. Beatty expressed concern that proposed Project activities would have an adverse impact on both trapper safety and wildlife movement within the overlapping area.

In comments provided by Ms. Beatty, she specifically identified Project activities, such as increased road use by mine traffic and the installation of a power line along the roadway, as activities that would adversely affect her ability to safely use and access her trapline (YOR #2010-0267-340-1). Ms. Beatty uses the HCR as access to her trapline, and suggests that a 40 percent increase in traffic along the road is a safety hazard. She also expressed concern that Project activities would adversely impact the mobility of animals along or across the road corridor. A loss of timber in the area from clearing and road upgrades as well as the heavy use of the road could negatively disturb or impact wildlife. These concerns have been addressed in sections 11 (Wildlife) and 15 (Health and Safety) of this report. Specifically, project effects and mitigation measures to address safety concerns with the use of the HCR are set out in section 15.2.3; while concerns regarding access and egress of wildlife along the HCR corridor have been addressed in section 11.3.1.

The Executive Committee has determined that the Project will not have significant adverse effects on trapping activity, primarily because the overlap between the LSA and the areas identified for trapping are minimal. However, this does not mean commercial trappers will not experience some effects.

Although the Executive Committee does not consider there to be significant adverse effects to trapping activity as a result of the Project, it does recognize the positive benefits of ongoing communication and dialogue between the Proponent and other resource users, including trapping concession holders.

The Executive Committee concurs with comments provided by Yukon Government that the Proponent should fulfill its commitment to *"… communicate its plans and timing of proposed activities to other resource users e.g., trappers, outfitters, quartz and placer miners, and known subsistence harvesters"* (VIT 2012a). The Executive Committee encourages the Proponent to maintain communication and dialogue with trappers, and other resources users, in or adjacent to the Project area to avoid unforeseen land use conflicts.

The Executive Committee understands there was a previous agreement between Ms. Beatty and a predecessor mining company, New Millennium Mining Ltd. that was mutually satisfactory to both parties. In comments provided, Ms. Beatty indicated that she invested a great deal in reaching the agreement with New Millennium Mining Ltd. (YOR #2010-0267-289-1). Apparently the agreement with New Millenium Mining Ltd. included provisions whereby the owner of RTC 81, Ms. Beatty, agreed not to use the HCR corridor and other areas intended for use by the mining company in exchange for financial compensation for any associated loss of use along a primary area of the trapline.

The Executive Committee understands there have been discussions between Ms. Beatty and the Proponent with regards to overlap between the Project and RTC 81, and potential forms of compensation (e.g. non-financial compensation such as new access trails, financial compensation, and methods for calculation of compensable loss) for adverse effects as a result of the Project (YOR #2010-0267-297-1). Although the Executive Committee does not consider there to be significant adverse effects to commercial trapping as a result of the Project and associated activities, it encourages the Proponent to continue discussions with Ms. Beatty with the aim of reaching a mutually satisfactory arrangement.

13.6 Effects Related to Timber Resources

The majority of Project activities will occur in a forested zone. A total of 433 ha is proposed to be cleared, of which 343 ha will be trees, 53 ha will be scrubby forest and 38 ha scrub. The bulk of the forested zone is classed as moderate to low forest productivity. The Proponent estimates that approximately 20 488 m^3 of salvageable timber will be available from areas cleared for Project activities at the mine-site and along the transmission line right-of-way.

YCS submitted comments that raised concerns with the *"potentially large amounts of timber that could become available"* (YOR #2010-0267-201-1). This was in relation to forest cover cleared for the mine footprint inclusive of the power line right-of-way. YCS acknowledged commitments by the Proponent to develop a Timber Salvage Plan and recommended that the Proponent should "*actively develop a Timber Salvage Plan*".

Salvageable timber is a valuable resource in Yukon, especially in proximity to communities that rely on it for heating. Depending on the quality and handling of the timber salvaged, some of it may qualify as merchantable timber that could be used for building purposes. Timber resources are in demand near larger Yukon communities and managed to preserve sufficient fuel wood and building logs for local consumption. With any clearing activity, especially at this scale, there is a reasonable expectation that Proponent will plan their clearing to ensure utilization of timber resources, and the minimization of waste. This expectation requires the Proponent to achieve a number of goals. First, to harvest the timber in a manner that is conducive to consumption. For example, clearing trees with tracked bulldozers may make it difficult to hand fall these trees with chainsaws into fuel wood (i.e. stacked cordwood). Clearing by bulldozer tends to introduce dirt and grit to the tree surface, effectively preventing the timber from being processed any further. Second, to store the timber in a manner that is safe for handling and preserves the quality of the timber for a reasonable period of time (e.g. stored on dry land, ideally with stickers to help dry the wood). Third, to store timber in a location that is accessible and in relative proximity to communities that will utilize this resource. Finally, to coordinate with local communities and governments to ensure people are aware of the availability of this resource, to facilitate equitable access and to monitor use and clean-up of the storage sites. Failure to meet the expectation of maximizing utilization and minimizing waste could result in adverse effects.

The Executive Committee has determined that the Project will not result in significant adverse effects due to timber harvesting. In making this determination, the Executive Committee recognizes that the volume of timber is substantial. However, the Proponent has committed to a:

> *A Timber Salvage Plan with more detail will be developed to meet regulatory requirements and for permitting. In developing the Timber Salvage Plan, VIT will work with the NND, Mayo and Government of Yukon to explore potential business opportunities and to address local community access to timber salvaged from the Project activities. (VIT 2011a)*

In committing to developing a Timber Harvest Plan, and working with the NND, Mayo and Government of Yukon, the Proponent increases confidence that they will meet societal expectations to maximize utilization and minimize waste of the timber resource. The goals noted for achieving this expectation will most likely be considered in this planning exercise, in addition to many other details to make this a successful venture.

13.7 EFFECTS RELATED TO NAVIGABLE WATERS

The Proponent has proposed a number of activities that may affect water bodies considered navigable waters under the *Navigable Waters Protection Act*. Transport Canada has indicated that these activities meet the criteria set out in the Minor Works and Waters Order (YOR #2010-0267-343-1). Therefore, the Proponent does not require authorization under the *Navigable Waters Protection Act*. However, Transport Canada has listed several criteria that must be adhered to in order for the activities to be determined minor works under the Minor Works and Waters Order. These criteria are related to: overhead transmission lines; water intakes; dredging; and temporary works.

In determining the significance of effects related to navigable waters, the Executive Committee has considered the following non-discretionary legislation:

- *Navigable Waters Protection Act*
- Minor Works and Waters (*Navigable Waters Protection Act*) Order

The Executive Committee concludes that application of the mitigation measures proposed by the Proponent and compliance with non-discretionary legislation listed above will effectively eliminate, reduce, or control significant adverse effects related to navigable waters.

13.8 CUMULATIVE EFFECTS ASSESSMENT

The Project will result in residual effects to the land and resource uses including NND traditional land use, outfitting activity and concession improvements, commercial trapping activity and concession improvements and timber resources. Residual effects include the reduced ability to conduct land and resource use, the loss of opportunity due to restricted access, and the potential that some volume of the timber resources cleared are not utilized.

The cumulative effects to land and resource use are commonly considered in the spatial context of their respective administrative boundaries and temporal timeline for residual effects of the Project. Consideration of NND traditional land use would account for activity within the traditional territory, and outfitting and trapping activities the extent of their respective concessions. However, the 50 km radius used elsewhere in this report for establishing overlap is an appropriate indicator of the level of development that may be occurring within these disparate boundaries. This particular radius captures a good cross-section of the development activities occurring across NND traditional territory. The temporal overlap considers the potential timeline for residual effects of the Project to occur. Residual effects are anticipated to occur during construction through to closure.

Existing activities in the region consist of placer mines, quartz exploration projects, residential development and infrastructure. Appendix E includes a list of all projects assessed by YESAB in a 50 km radius around the mine-site for the last five years (January 1, 2007 to April 4, 2012). This provides an overview of the extent of existing development within this geographic area.

In relation to NND traditional land use, the NND traditional territory covers an area of 131 599 km^2 within Yukon. Quartz claims cover a moderate portion of the territory, often in remote areas accessible only by air travel. The 50 km radius captures a greater cross-section of the territory that is accessible by road, and therefore more likely to be used for traditional land uses. The various developments occurring throughout the traditional territory may pose similar residual effects as the Project does, namely the reduced ability to conduct traditional land uses and the lost opportunity due to restricted access.

The Executive Committee concludes that the Project would not result in significant adverse effects to NND traditional land use. While there will still be residual effects throughout the life of the mine, it is not likely they will substantially interact with residual effects from other activities. As such, the Executive Committee is of the opinion that the Project will not result in significant adverse cumulative effects to NND traditional land use.

The Executive Committee concluded that the Project itself would not result in significant adverse effects to outfitting or commercial trapping. Given the conclusion that the Project will not have significant adverse effects to outfitting and trapping in the LSA, it is not likely that these residual effects will substantially interact with the residual effects of other activities within the respective concessions. As such, the Executive Committee is of the opinion that the Project will not result in significant adverse cumulative effects to outfitting and trapping.

In relation to timber resources, there are few other developments that involve clearing of salvageable timber on the scale proposed in this Project. A large portion of quartz exploration occurs in alpine environments and therefore would not require clearing of salvageable timber. There is ongoing harvesting of local fuel wood and building logs, as well as clearing for agricultural and residential development. The Executive Committee concludes that the Project would not result in significant adverse effects to timber resources. This conclusion was based on commitments by the Proponent to develop a Timber Harvest Plan, which the Executive Committee believes will achieve the reasonable expectation of maximizing practical utilization of this resource and minimizing waste. Therefore, residual effects are anticipated to be low. The Executive Committee is aware that Government of Yukon manages other land clearing on crown land with a similar expectation, and that it is in the best interests of private land owners to maximize utilization as well. Therefore, the Executive Committee is of the opinion that the Project will not result in significant adverse cumulative effects to timber resources.

13.9 Conclusion of the Land and Resource Use Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent and compliance with non-discretionary legislation will effectively eliminate, reduce or control significant adverse effects to land and resource use.

14.0 LOCAL SERVICES AND INFRASTRUCTURE

14.1 OVERVIEW

Local services and infrastructure support the overall function of Mayo and the surrounding area. The availability, accessibility and quality of local services influence the quality of life in a community. Local services and infrastructure include:

Village of Mayo
- Municipal roads, parks and buildings
- Water, sewage and wastewater infrastructure
- Landfill and recycling facilities
- Recreational and leisure services

Government of Yukon
- Highway and bridge maintenance
- Housing (Yukon Housing Corporation)
- Health services (Mayo Health Centre)
- Social services (Yukon Family Services)
- Emergency Services
- J. V. Clark School
- Mayo Airport

NND Government
- Housing
- Health and Social Programs
- Education and Training
- Dunena Ko'Honete Ko Daycare

Federal Government
- RCMP services

Other
- Yukon College, Mayo Campus
- Grocery stores
- Supply stores and services
- Bank
- Service providers (e.g. hotels, restaurants)

The Project will directly and indirectly utilize local services and infrastructure. Goods and services from businesses and agencies in Mayo will help meet the needs of the Project and its workforce of up to 400 employees. The Project will use the road network in and around Mayo, as well as the airport to transport equipment, materials and personnel to and from the site. In the proposal, the Proponent has indicated that Mayo's waste facilities may be utilized to support the Project. Socio-economic effects of the Project on community and individual well-being could increase demand on local health and social services.

During the Public Comment Period and the public meeting in Mayo in August 2011, stakeholders raised concerns about increased pressure on local services and infrastructure, especially regarding:

- Project traffic use of local roads and highways;
- power requirements and the Yukon power grid; and
- the Village of Mayo landfill.

The Executive Committee has determined that after applying the Proponent's commitments and proposed mitigative measures the Project will not result in significant adverse effects to local services and infrastructure listed above. The following sections outline the rationale used for this determination.

14.2 BASELINE INFORMATION

The proposal includes detailed and comprehensive socio-economic baseline information, including local services and infrastructure. The information provided presents background information, methods, and results for the baseline socio-economic studies conducted during 2010. The information was compiled using existing documents and data supplemented by information gained during interviews in June 2010. Where appropriate, data for NND and Mayo were compared to corresponding broader scale territory-wide, or national information, to provide context.

The data sources used by the Proponent include:

- socio-economic assessment interviews (conducted primarily from June 7-11, 2010);
- other discipline studies prepared for the Eagle Gold proposal by the Proponent (e.g. Traditional knowledge and use, heritage, land use and tenure, training and capacity, socio-economic background research);
- secondary source material including,
  - Statistical data (Statistics Canada - census and other data; Yukon Bureau of Statistics) and
  - Various documents (e.g. reports and plans from NND and Mayo, books such as *Heart of Yukon* and *Gold and Galena*);
- other information collected during interviews;
- discussions from Project consultation activities (e.g. community open houses);
- additional information gathered during the review of the draft baseline report with NND, Mayo and others September 21-22, 2010; and
- YESAB documents

The organizations interviewed by the Proponent include:

- NND;
- Village of Mayo;
- Yukon College;
- J.V. Clark School;
- Mayo Health Centre;
- RCMP – Mayo Detachment;
- Emergency Services
- Dunena Ko'Honete Ko Day Care;
- Mayo Airport;
- Silver Trail Chamber of Commerce/Tourism Association; and
- Yukon Mine Training Association.

14.3 EFFECTS CHARACTERIZATION

The Executive Committee has considered the following aspects of the Project, as described in the proposal, when determining the potential effects:

- expected Project workforce on-site is as follows:

- up to 415 people during construction;
- 339 to 384 people during operations; and
- approximately 200 people during reclamation.

- the Project will utilize local services and infrastructure primarily during the two-year construction period and the 9.2 years operations period; use will continuously decrease during reclamation and closure.
- the Project is not likely to involve the relocation of Project personnel and their families to Mayo.
- the Project's workforce will be on a rotational schedule. Personnel will reside in the on-site camp during their on-rotation; personnel who are not from Mayo are not likely to stay in Mayo during their off-rotation.

The Project may adversely affect local services and infrastructure in the following ways:

- through the transportation of Project equipment, materials and personnel via the local road network affecting road infrastructure and increasing traffic volumes;
- numbers of mine personnel to be flown in and out of Mayo could challenge the Mayo airport facilities;
- the Project will source goods and services from businesses and agencies in Mayo potentially straining available resources;
- project personnel may utilize community services, including health and social services, as well as emergency services, potentially straining available resources; and
- the influx of personnel could result in increased social problems within the community (see section 16), which could strain existing health and wellness, emergency and social services.

The effects characterization and significance determination for local services and local infrastructure are presented in the two following sections.

14.4 Effects Related to Local Services

14.4.1 Housing and Educational Services

Significant adverse effects on housing and services such as daycare and education are not anticipated because very few workforce families are expected to relocate to the Village of Mayo for the Project. We expect a small, limited-term increase in housing demand in the Village of Mayo. The Executive Committee recognizes the importance of these increases given the small size of the community and the lack of available housing but, these increases are not expected to be significant. A moderate increase in demand at the Mayo Campus of Yukon College may occur, as local residents seek additional training and education to qualify for employment at the Project.

14.4.2 Health and Social Services

Local health and social services are provided by several governments including Village of Mayo, NND, Government of Yukon and Government of Canada. There are several factors that will limit the extent to which the Project will affect these services. These include the limited number of the personnel and their families relocating to Mayo, the scheduling of work shifts, the use of an on-site camp to house most of the personnel, the provision of personnel transportation to the mine site and active on-site management of drugs and alcohol. The Executive Committee is of the opinion that strategic planning by Government of Yukon, Department of Health and Social Services, and NND Health and Social Department for increased service demand, combined with the application of the measures recommended above, will effectively address significant adverse effects on community health and social services.

14.4.3 Emergency Services

For the purposes of this subsection, emergency services include Mayo Ambulance Service, Mayo Heath Centre, Whitehorse General Hospital, Mayo Fire Department, and the RCMP.

The Proponent has committed to comply with applicable health and safety laws and regulations and implement an Emergency Response Plan for the Project. The Proponent will have first-aid and trained emergency personnel at the mine site to provide primary care, minimizing pressure on Mayo's emergency services. However, occasional treatment or assessment at the Mayo Health Centre may be needed for more severe employee injuries or medical events. The proposal states that based on an assumed average of 2.65 injuries per 200 000 hours worked (from US statistics on injuries in gold mining), it is anticipated that there may be approximately 15 visits per year by Project employees to the Mayo Health Centre. Given that the Mayo Health Centre currently experiences approximately 2 000 clinic visits each year (based on interviews with the Mayo Health Centre), the increase in visits related to the Project would be under one percent. The Mayo Health Centre currently also serves as a backup and emergency transfer station for personnel from the Bellekeno Mine camp and until recently, for the Yukon Energy Corporation's Mayo B camp (about 200 people). And with Alexco's operation in the Keno area growing, but mineral exploration activities in the area expected to generally decrease, the capacity of the Mayo Health Centre should continue to be sufficient to provide necessary services to personnel from the Project.

The anticipated demand on the regional hospitals in Whitehorse and Dawson as a result of the Project should be negligible, given that only a small proportion of any medical situations arising at the Project will require hospital visits.

Of concern is the ability for the Mayo Health Centre and Mayo Regional Hospital's Emergency Medical Services to accommodate and react to mining-specific accidents, emergencies and injuries. Depending on the personnel and their particular backgrounds and experience, there could be a variety of levels of awareness and understanding of mining-related accidents, in particular their scope and severity. Furthermore, awareness of the roles and responsibilities for mine emergency response personnel and their counterparts in Mayo would minimize delays or confusion when responding to injuries. The Executive Committee believes that with training and communication, these issues can be avoided.

The Mayo Fire Department's service is limited to the municipal boundaries of Mayo. Any effect on the fire department's provision of emergency services is anticipated to be limited to responding to transportation incidents. Accidents involving vehicles transporting employees or materials, including potentially hazardous materials, could increase the response load for emergency services, including RCMP. The assessment of potential effects related to the transportation of cyanide to the Project site are included in section 6 of this report. The Executive Committee believes that the Proponent mitigations, along with mitigations recommended by the Executive Committee will adequately reduce the frequency and severity of potential accidents.

The presence of an up to 400-person camp for the Project may result in additional dispatches from the RCMP detachment in Mayo to respond to specific circumstances (e.g., missing persons, major accidents with injuries, assaults). Based on experience to date with the current base camp (one call) and experience at other local exploration and development projects (i.e. Alexco's Bellekeno Mine), it is predicted that an additional five to ten calls per year may be expected when the camp is at full capacity during construction and operations. The Executive Committee does not consider this a significant increase compared to the current frequency of dispatches handled by the Mayo detachment.

14.4.4 Local Businesses

Use of local goods and services (e.g. stores, bank, service providers) by the Project can have a positive effect by providing economic advantages and opportunities. With adequate planning and communication by the Proponent, the Executive Committee is of the opinion that local goods and services providers can effectively manage any increased demand and potential adverse effects caused by the Project.

14.4.5 Recommended Terms and Conditions

The Executive Committee is of the opinion that the mitigative measures proposed by the Proponent as outlined in Appendix A will help to reduce, control or avoid adverse effects on local emergency services. The Executive Committee recommends, however, an additional mitigative measure to adequately manage health and safety risks and responses, and reduce the risk of significant effects on emergency services.

The following mitigation measure is specified to eliminate, reduce or control significant adverse effects of the Project relating to local services:

108. The Proponent shall advise the Mayo Health Centre, NND Health and Social Department, Yukon Emergency Medical Services, and the Mayo Fire Department of its health and safety protocols and emergency response plans, and collaborate with these agencies to clarify and delineate roles, responsibilities and communication among the parties.

14.5 EFFECTS RELATED TO PUBLIC INFRASTRUCTURE

14.5.1 Project Use of Public Roads

Transport of materials, equipment and personnel to and from the Project site will result in increased traffic along the Alaska, Klondike and Silver Trail highways. The maintenance of public roads is the responsibility of the Yukon Government, Department of Highways and Public Works.

Mine site workforce will congregate in Mayo and be transported by bus to the Project site. Employees from Mayo and surrounding communities will be driven to Mayo by a transfer van service. Employees from outside the local area will be flown in from Whitehorse to Mayo. Access to Mayo for freight and other deliveries is by government maintained public roads. The additional volumes of traffic associated with the Project may result in additional wear and tear, or exceed the capacity of these roads in terms of volume or speed limits.

Estimated traffic volume during construction (25 months) is:

- 2 500 total semi-trailer round-trips; and
- 7 500 to 10 00 total pickup truck (<5 tonne truck) round-trips (10 to 20 pickup truck round-trips per day on average.

Estimated traffic volume during operations:

- crew shift changes are expected to occur approximately every two weeks. Personnel will travel from Mayo to the mine site by bus. This will involve approximately 100 – 120 bus round-trips per year; and
- total truck loads are estimated at 2 200 trucks per year (round-trips). As with the estimate for the construction phase, these numbers do not account for potential seasonal load limits, which would determine potential truck size and load types.

The Haggart Creek Road (HCR) is a public unmaintained road under the *Highways Act*. Although quantitative measures of traffic volumes on the HCR are unavailable, the Executive Committee agrees with the Proponent's assertion that traffic volumes are relatively low. Traffic along the South McQuesten Road (SMR) and HCR are less than the traffic along the Silver Trail. Traffic volumes on the Silver Trail and SMR are currently well below their respective capacities and the Government of Yukon, Department of Highways and Public Works has indicated to the Proponent that the predicted level of Project traffic is insignificant in terms of affecting the publicly maintained roadways along the access route (Silver Trail and SMR), and can be accommodated. Therefore, the Project is not expected to result in significant adverse effects to the road infrastructure and road safety along the Silver Trail and the SMR.

The Executive Committee notes that the Proponent will upgrade the SMR and HCR and has committed to maintaining the SMR as well as the HCR for year-round use. In general, effects on Mayo's road infrastructure are not anticipated because most Project traffic and almost all large-vehicle traffic will bypass the centre of Mayo.

Employees travelling from Whitehorse to Mayo will be using chartered aircraft and bus services. Personnel will be flown in and out of the Mayo airport. Shift changes are expected to occur approximately every two weeks. This will involve approximately 100 to 120 round-trips per year. According to the proposal, there were almost 2 700 aircraft movements in 2009-2010 in and out of the Mayo airport; this is significantly less than the 8 800 movements that were experienced in 1981. Project-related charter flights will not significantly increase flight volume to be handled by the Mayo airport.

The Executive Committee is of the opinion that the Project will not result in a significant increase in air traffic to be managed by the Mayo airport.

14.5.2 Municipal Waste

This section addresses the management and disposal of sewage/sewage sludge and solid waste. It is unclear how the Proponent intends to manage and dispose of these wastes to avoid significant adverse environmental and socio-economic effects.

The Proponent states in the SIR: "*The Project Proposal proposed to ship sewage sludge from the sewage treatment plant to Mayo for disposal in the Mayo sewage lagoons. This has changed as sewage will now be disposed of at site via a septic field."* The Executive Committee notes that the Project modifications described in the SIR have resulted a doubling of the number of Project personnel on-site, to around 400. It is unclear if a suitably sized area of appropriate soil/substrate exists to construct a septic field to properly treat the volumes of grey/black water generated by personnel at the camp. The proposal includes an estimate of 300 L of sewage per person per day (VIT 2011a, Section 5.4.3). Using these estimates the Project may generate 120 000 L/day of sewage.

Sewage disposal can result in contamination of soil and water sources through inadequate waste handling and treatment. Human waste is known to be a vector for a number of pathogens such as *E.Coli* bacteria and parasites like *Giardia spp.* Transmission occurs with the consumption of untreated or unfiltered water from contaminated sources such as creeks. In some strains of bacteria, effects can range from minor illness to death. Parasites like giardia, which causes "beaver fever" move through the environment using humans and wild animals, specifically their waste, as the distribution system. Inadequate sewage disposal may result in adverse effects to multiple VESECs (e.g. human health and safety, aquatic ecosystems, and wildlife).

Several factors influence the performance of septic fields. The percolation rate for the soils/substrate around the camp has not been provided. Septic field design and percolation rate determine the area of field required to properly treat the sewage. If the substrate is predominantly placer tailings the percolation rate may be too high for an effective septic field. The camp is currently located adjacent to the DGDC and fish habitat compensation plan watercourses. Ponds, access roads and a laydown area are located to the east and south respectively (Figure 5.1-2, SIR). The Government of Yukon's "Design Specifications for Sewage Disposal Systems" (Government of Yukon 2010b) states that: *"soil absorption systems should be situated where there will never be any possibility of future vehicle traffic"* and establishes setbacks from water bodies. It is unclear where a septic field could be situated near the camp. The release of under-treated or untreated sewage is considered a significant adverse effect.

The Proponent has not demonstrated that they can adequately manage and treat the volumes of sewage that are anticipated to be produced by the Project. Should the project site be unsuitable for a septic field, the Executive Committee recommends that the Proponent install a sewage treatment plant and consult with the responsible governments with respect to the disposal of sewage waste treatment sludge. Furthermore, any effluent from that treatment plant should meet criteria established by regulators.

The SIR states *"the decision to incinerate or deposit all or part of the solid waste in a landfill (construction and operations phases) has not yet been determined."* (Section 6.11.9.4) The original proposal states that the Mayo waste facilities will be used and this resulted in comments by Yukon Conservation Society (YOR #2010-0267-201-1) and Government of Yukon, Departments of Community Services and Environment (YOR #2010-0267-197-1) questioning the Proponent's waste disposal plans. All comments noted the limited capacity Mayo landfill. YCS has further commented that alternative methods for waste disposal should be used rather than the use of solid waste incinerators (YOR #2010-0267-341-1). YCS goes on to recommend planning with the operators of the Mayo Landfill plan for waste disposal.

The proposal states that the Mayo landfill currently receives "about 365 tonnes of garbage per year. A lifespan of approximately 15 years was projected for the landfill in 2006." (VIT 2011a, s. 6.11.6.1). The Proponent predicts that: "The Project could produce an average of 1.3 kilograms per person per day of solid waste (general waste produced in camp, including food scraps) for both the construction and operations phases. Assuming the presence of approximately 200 people in camp at any time, with year-round operations, a total of 94,900 kg or approximately 95 tonnes of solid waste would be produced each year." The Executive Committee notes that with the Project modifications described in the SIR the number of personnel in camp has approximately doubled to 400. This would result in about 190 tonnes of solid waste produced by the Project annually, representing an increase in solid waste received by the Mayo landfill of about 50 percent per year. It is the opinion of the Executive Committee that Project-related solid waste would reduce the predicted lifespan of the Mayo landfill from 2021 (in 2006) to 2016. This is considered a significant adverse effect to the Mayo landfill and to other users of this infrastructure.

The Proponent has committed to engage with the Village of Mayo to discuss anticipated waste volumes and determine the availability and best options for appropriate waste management facilities and programs (Appendix A). However, they have not provided a reasonable or practical plan for managing and disposing of Project wastes without resulting in significant adverse effects to the Mayo landfill. Without engagement and proper planning by the responsible governments, Project solid waste volumes could result in a significant adverse effect to the Mayo landfill and its existing users. The Executive Committee recommends that the Proponent consult with the responsible governments, as it has committed to do, to ensure that landfill capacity remains in the Mayo area.

14.5.3 Recommended Terms and Conditions

To eliminate, reduce or control significant adverse effects from the Project on municipal waste management and treatment, the following mitigative measures are required:

109. The Proponent shall develop a plan to treat camp effluent that is suitable for the site (e.g. effective and regulatory-compliant septic field or sewage treatment plant). The plan shall include an appropriate sewage treatment design including all the necessary supporting information (e.g. sizing information, soil percolation, water table, topography, sludge disposal) and shall be provided to responsible regulators during the regulatory approval process.

110. The Proponent shall ensure that any effluent from a sewage treatment plant will meet discharge criteria acceptable to the responsible regulators.

111. If any wastes generated by the Project are to be disposed of at the Mayo landfill, the Proponent shall consult with the Village of Mayo and Government of Yukon in advance of any such disposal. The Proponent shall come to an agreement with the responsible governments such that landfill capacity or other waste management options are available to the current and future users of the Mayo landfill.

112. As committed by the Proponent, they shall develop a detailed waste management plan to address how all waste streams (including all types of solid and special waste) will be handled and disposed. This plan shall include other waste disposal options if the Mayo landfill cannot be used for the disposal of solid waste from the Project.

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14.6 Effects Related to Energy

The Executive Committee recognizes the contributions by Mr. John Maissan, Leading Edge Projects, to the drafting of this section.

14.6.1 Overview

Yukon's electrical energy is primarily supplied by hydroelectric power plants at Whitehorse, Aishihik, and Mayo, plus a minor amount of wind. This is supplemented by large diesel generating plants in Whitehorse and Faro, a medium size plant in Dawson City, and small diesel plants in most other communities. The 138kV Whitehorse – Aishihik – Faro (WAF) and the 69kV Mayo – Dawson City (MD) power grids are connected into a single Yukon power grid by the Carmacks – Stewart Crossing transmission line. The integrated Yukon power grid is not connected to the power grids of any other jurisdiction.

The integrated Yukon grid now has a generation capacity of approximately 138 MW which can, subject to transmission capacities, be distributed anywhere within the grid. The sources of electrical capacity in Yukon are as follows (YEC 2012a):

- 92 MW of YEC hydroelectric power plants (Whitehorse 40 MW, Aishihik 37 MW, and Mayo 15 MW);
- 1.3 MW of Yukon Electrical hydroelectric power plants (Fish Lake 1.3 MW);
- 0.8 MW YEC wind capacity;
- 37 MW YEC diesel capacity (primarily Whitehorse, Faro, and Dawson City); and
- 7.2 MW of Yukon Electrical diesel capacity (back-up power supplies in grid connected communities).

In winter, the capacity at Whitehorse Rapids is reduced to about 24 MW and the overall hydro capacity is reduced to about 72.4 MW. This reduces the overall winter generating capacity to about 116.6 MW (YEC 2012b).

The Project design incorporates an electrical transmission line connection to the integrated Yukon power grid for the supply of the Project's electrical energy requirements. The Proponent will construct a new 69 kV transmission line following the HCR and SMR to the mine site from the existing 69 kV line at the Silver Trail Highway. This was calculated by the Proponent to be significantly less costly than on-site diesel-electricity generation.

The Proponent has indicated that the transmission line will be in service in the third quarter of 2013, before mine construction is complete, supplying electricity for the remainder of the construction period. YEC planning indicates that the project transmission line will be in service and VIT will be a producing industrial customer starting in 2015 (YEC 2012a).

During construction, up to 500 kW of electrical capacity will be required on-site and will be supplied by diesel generators The main back-up/emergency power during operations will be supplied by three 1.5 MW diesel generators. The electrical energy requirements during the reclamation and closure phase have not yet been determined but will be lower than during mining operations.

VIT's proposal is based on an operating plan that reduces electrical demand and energy requirements during the winter months of December through February and increases electrical demand and energy requirements in the non-winter months. The decreased demand in winter corresponds to increased electrical loads from non-industrial electricity consumers, and the higher electrical requirement in the non-winter months corresponds with the period of higher hydro power availability (YOR #2010-0267-239-1).

The electrical energy requirements during operations will increase over time and vary from summer (March through November) to winter (December through February – approximately 100 days). The proposal provides the total annual electrical energy requirements during the operating period of the project are:

1. Years 1 – 4: 114.75 GWh (1 GWh = 1 000 MWh) per year;
2. Years 5 – 6: 131.89 GWh per year;
3. Year 7: 133.51 GWh per year; and
4. Years 8 – 10: 140.14 GWh per year.

The summer and winter monthly energy and capacity requirements are:

1. Years 1 – 4: summer – 11.27 GWh per month (approximately 15.4 MW demand); winter – 4.93 GWh per month (approximately 6.8 MW demand);
2. Years 5 – 6: summer - 12.70 GWh per month (approximately 17.4 MW demand); winter – 6.36 GWh per month (approximately 8.7 MW demand);
3. Year 7: summer – 12.83 GWh per month (approximately 17.6 MW demand); winter – 6.49 GWh per month (approximately 8.9 MW demand); and
4. Years 8 – 10: summer – 13.38 GWh per month (approximately 18.3 MW demand); winter – 7.04 GWh per month (approximately 9.6 MW demand).

YEC anticipates that the losses in delivering electrical energy to the Project will be about 8.7 percent (YOR #2010-0267-338-1). YEC would thus need to generate about 109 percent of the energy (and capacity) the Project requires at the site (i.e. 8.7 percent losses from 109 percent results in 100 percent of requirement delivered to the site). This means that the annual energy generation requirements from YEC for Project operations will vary from about 125.68 GWh in years 1 – 4 to about 153.49 GWh in years 8 – 10, and the summer/winter generation demand (i.e. capacity requirement) will increase from about 16.9/7.4 MW in years 1 – 4 to 20.0/10.5 MW in years 8 – 10.

YEC's forecast for 2012 is that 415.91 GWh of generation will be required of which the long term average hydro can supply 404.18 GWh (YEC 2012b). In 2013, Eagle Industrial Minerals (reprocessing Whitehorse Copper tailings) is expected to connect to the grid and thereafter will operate from March to November each year with an annual energy load of 8.6 GWh (YEC 2012b). This will increase forecasted 2013 loads to 430.357 GWh of which the long term average hydro can supply 411.95 GWh (YEC 2012b), an increase due to increased summer load. The general seasonal nature of hydro supply and electrical loads is illustrated in Figure 12 from YEC presented below (YEC 2012c).

There are two existing industrial customers receiving service from the integrated grid, the Minto Mine which is predicted to require 26 GWh in 2013 (down from 29.4 GWh in 2012 [YUB 2012]) and the Bellekeno Mine which will require 14.6 GWh in 2013 (up from 13.1 in 2012). With the new seasonal Eagle Industrial Minerals connected to the grid in 2013, the proportion of any new load increment that is added to the grid will have 56 percent of its energy supplied by diesel generation. The diesel percentage increases with increasing load and is 78 percent at a load of 500 GWh per year (YEC 2012b). An annual grid load of about 430.4 GWh (2013) plus 125.68 GWh of load from the Project will result in an annual load of 557.9 GWh per year. An extrapolation of the YEC information suggests that new load from about 540 GWh per year and higher would be 100 percent served by diesel generation.

In their comments on the DSR, YEC has indicated that a core principle of rate regulation is that all firm load is treated equally (YOR #2010-0267-338-1). YEC is obliged to serve all customers, including VIT, and cannot differentiate or discriminate between old and new customers. While the Executive Committee recognizes the core principles under which YEC operates, the Executive Committee is required under YESAA to consider socio-economic effects related to this project.

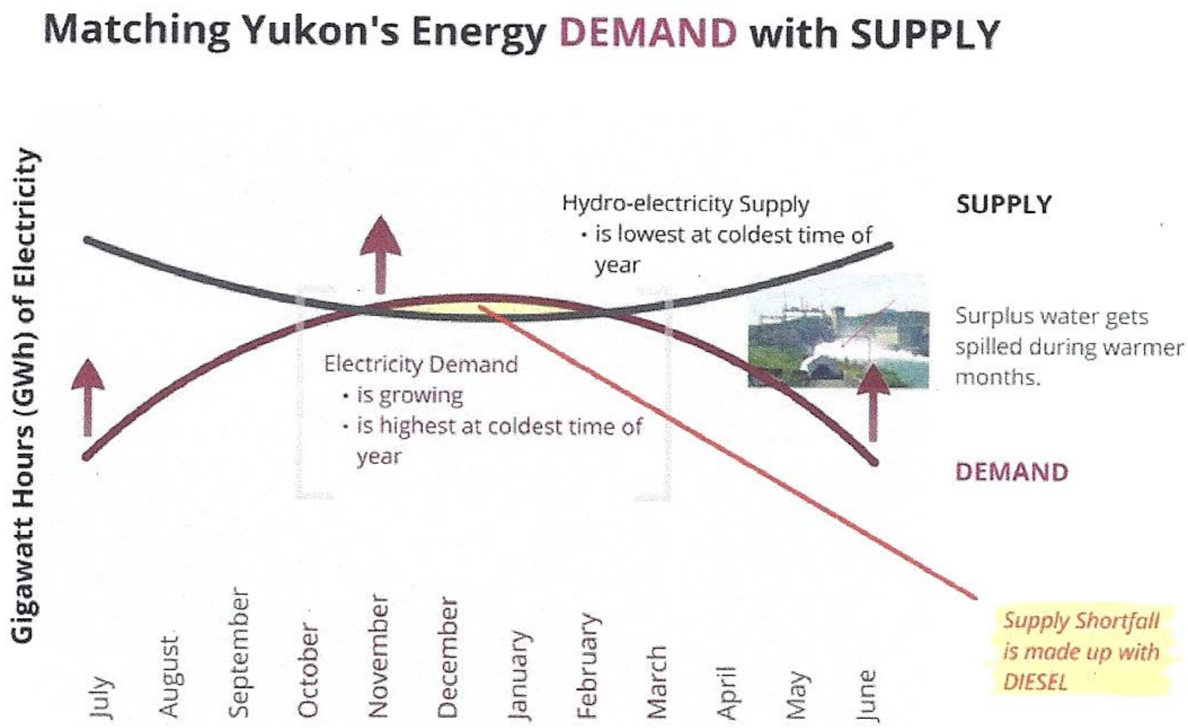


Figure 12 YEC Comparison of Demand versus Supply

The Executive Committee has identified three categories of potential effects of the Project related to electrical energy supply:

- stability and capacity;
- increased carbon emissions; and
- electrical rates.

Diesel generators are the default for meeting capacity and energy requirements (YEC 2012a). YEC is considering a number of other lower cost sources of new energy supply, including enhancement of existing hydro facilities and conservation, to meet energy and capacity requirements at costs lower than diesel. YEC has indicated that in 2015 they plan to supply incremental generation requirements by using less costly alternatives than diesel generation. Furthermore, YEC is considering establishing liquefied natural gas (LNG) generating capabilities in Whitehorse prior to 2015 to displace diesel generation and meet current and near-term load forecasts (YOR #2010-0267-338-1).

The Executive Committee recognizes that YEC is pursuing alternatives to diesel power generation and that options such as LNG may be implemented. Currently however, these alternatives are not in place and may not be fully in place at the time that the Project connects to the grid. Therefore, the following effects characterization is based on the current scenario where diesel generators are the default for meeting capacity and energy requirements.

14.6.2 Stability and Capacity

Both diesel and LNG power generation capacity is relatively low in capital cost (i.e. $1.5 million per MW) and can be installed relatively quickly. YEC's resource planning suggests that the connection of possible new industrial loads to the grid, including the Project, would accelerate the need for new capacity and energy supply. However, there is no indication that the supply could not be met. YEC would not be expected to serve a new customer until it was capable of doing so without impacting existing customers.

YEC plans on the basis of the following two criteria. The first criteria is called N-1 (normal operating system minus the loss of the largest generating or transmission-related generating resource) (YEC 2012b). YEC must be able to meet the anticipated grid system peak demand under this condition, but industrial customers such as the Project are not considered as they are expected to be self-sufficient with on-site emergency back-up diesel generators to cover emergency conditions. The second criterion is called Loss of Load Expectation (LOLE). The system would not lose its customers for more than two hours per year, and this planning criterion does include industrial loads (YEC 2011). To meet this criterion YEC will need to increase its installed generating capacity which it indicated would be diesel if other sources cannot be developed first.

The Executive Committee is satisfied that YEC is able to meet new load requirements, such as the Project, while maintaining system stability. Therefore, the Executive Committee is of the opinion that industrial and non-industrial customers are not at risk of having insufficient electrical energy supply if the Project is served by YEC and the Yukon integrated power grid.

14.6.3 Increased Carbon Emissions

Diesel power generation results in the production of about 0.8kg of CO_{2e} per kWh produced (Natural Resources Canada 2012). If approximately 86 percent of the electrical generation of the 125.68 GWh required for the Project (during the first four years) is produced from diesel generation then approximately 86 000 tonnes of CO_{2e} will be emitted annually. If the Project had a steady year-round electrical load, emissions would likely increase compared to the proposed reduced winter electrical load. If the project is not connected to the grid, but supplied entirely by on-site diesel generation, the CO_{2e} emissions would be increased by close to 14 percent, even when taking into account the grid system electrical losses that would be avoided.

The Executive Committee is cognisant of the overall increase in CO_{2e} emissions as a result of the Project. However, grid supplied electrical power to the Project results in a reduction of CO_{2e} emissions when compared to a 100 percent on-site diesel generation scenario.

14.6.4 Electrical Rates

If no alternative power generating sources are in place, YEC's information on the portion of new loads to be supplied by diesel generation indicates that 56 percent of the next increment of load will be met with diesel generation. The Project's winter load is equivalent to a steady annual load of about 76 GWh at which point about 78 percent of the load is being met with diesel generation. Averaging the lower and upper figures suggests that 67 percent of this portion of the load may be diesel generation. The “summer” (March through November) portion of load coincides with higher hydro availability and lower non-industrial loads thus we can expect a somewhat lower portion of diesel generation than would be the case for a steady year-round load, but nonetheless it will be substantial. The overall proportion of the Project’s electrical load that requires diesel generation could be 70 percent or higher. As YEC develops new renewable electricity resources this percentage will drop, but further load increases of about 25 GWh per year will occur from other sources during the life of the Project.

The variable cost of diesel generation is estimated by YEC to be $0.28 per kWh on average (i.e. blend of existing and new diesel generators) (YEC 2011). If the estimated generation requirement of 125.68 GWh is 86 percent supplied by diesel generation, this would add about $30 million per year in variable costs to YEC’s revenue requirement to be collected from customers.

The present industrial rate provided on YEC’s web site (YEC 2012d) with increases proposed for 2012 and 2013 (YEC 2012b) indicates that the Project would pay about $14 million per year in power rates. This will leave about $16 million in variable costs to be recovered from all electricity consumers including the Proponent (i.e. from electricity consumers unless subsidized by another party or parties).

YEC’s perspective is that all costs incurred on the grid system are to be shared by new and existing customers without differentiation (YEC 2012e). This is consistent with Government of Yukon’s most recent Order-In-Council direction pursuant to the *Public Utilities Act* that will affect any rate increases resulting from Yukon Energy’s 2012-2013 General Rate Application (Government of Yukon 2012b).

With the Project added to the integrated grid, the electrical energy generation will be in the order of 550 to 560 GWh per year and, after subtracting losses, sales would be in the order of 500 GWh per year. A revenue requirement of $16 million to be recovered from all consumers would average about $0.032 per kWh if applied equally to all kWh sold (including a portion to the Project) and if approved by the Yukon Utilities Board (YUB). This could represent an increase of 15 to 25 percent over present rates.

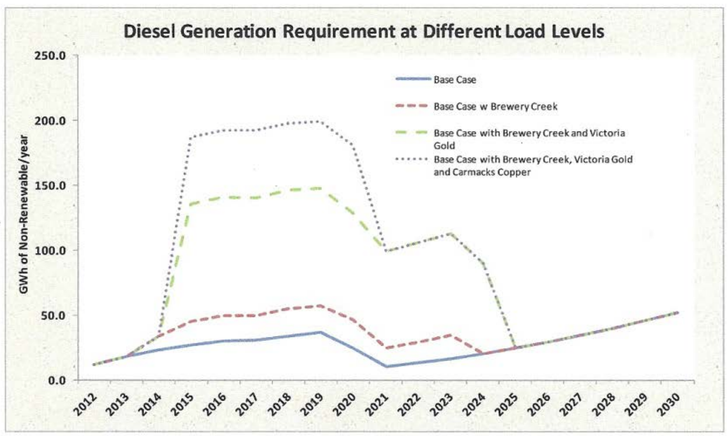
The Executive Committee considers a rate increase of 15 to 25 percent over present rates to be significant and adverse. This rate increase is likely to occur, subject to approval by the YUB, if all current customers remain firm loads connected to the grid and there are no changes to the current sources and capacity of electricity supply. However, in their comments on the DSR, YEC has indicated that they have *“no plans to connect major incremental load to the system that will result in significant rate increases to its customers due to significant increases in diesel generation”* (YOR #2010-0267-338-1). Furthermore, YEC is considering new sources of electricity supply.

As YEC develops new sources of electricity supply (whether capacity, energy or a combination of both) that are lower in cost than diesel generation, rate impacts on all electricity customers will lessen. For example if YEC can develop LNG electricity generation for a variable cost of $0.11 per kWh (YEC 2012c) and this displaces the Project’s requirement for diesel generation, the estimated $30 million per year in variable diesel cost will drop to $12 million in variable cost per year. Revenue collected from the Proponent would likely cover the cost from the sales of 500 GWh. As such, additional revenue requirements would not need to be recovered from all consumers.

In their comments on the DSR, YEC has stated that:

> *"if this 107 GW.h incremental non-hydro generation was supplied 100% by incremental LNG generation, the incremental annual fuel and variable [operations and maintenance (O&M)] cost would be fully recovered from the incremental annual revenues from Eagle Gold, and there would be no variable fuel and O&M costs to be recovered from increased rates." (YOR #2010-0267-338-1).*

Longer term lower-cost (per kWh) energy projects such as hydro, are generally capital intensive and depreciated over long periods of time and potentially risky if such projects are built to supply relatively short term industrial loads such as this Project. The YEC illustration below (Figure 13) shows the significant, but not long term, increase in grid diesel generation loads as potential industrial loads, including the Project, connect to the grid and then shut down at the end of their anticipated lives without new electrical loads to replace them (YEC 2012c).



Diesel Energy Requirement (GWh)	2012	2015	2020	2025	2030
Base Case	11.5	27.0	24.4	24.5	51.9
Base Case with Brewery Creek	11.5	45.5	47.1	24.5	51.9
Base Case with Brewery Creek and Victoria Gold	11.5	135.2	128.8	24.5	51.9
Base Case with Brewery Creek, Victoria Gold and Carmacks Copper	11.5	187.1	181.0	24.5	51.9

Figure 13 Yukon Projected Diesel Generation Requirements (from YEC)

In considering the significance of potential increases in electrical rates, the Executive Committee considered YEC's intent to develop future alternative power sources to diesel generation. The Executive Committee has also considered the revised proposal of the Proponent. By reducing winter load (when, almost certainly, 100 percent of additional electrical load under the current infrastructure would require diesel generation) and increasing summer load (when YEC's hydro availability is at its highest seasonal level) rate impact on all electricity customers is reduced. It appears from YEC information that steady year-round electrical loads, originally proposed by the Proponent, may have required more of the energy requirement to be met with diesel generation. This would have resulted in a higher increase in electrical rates rather than the approximately 15 to 25 percent rate increase resulting from the reduced winter load.

In determining the significance of effects, the Executive Committee also considered the reversibility of these effects. Whether diesel or LNG is used to generate the portion of the Project's electrical load that cannot be supplied by renewable energy sources, the largest portion of those costs are variable and would end with the termination of the electrical load on Project closure.

The Project's electrical load along with increasing industrial, commercial and residential demand may rationalize the development of new long-term renewable energy projects that will be beneficial to all electricity consumers in the future, even after the closure of the Project. The Executive Committee notes that all present electricity consumers are benefitting from hydro projects including Mayo, Aishihik, and the fourth turbine at Whitehorse Rapids that provide lower cost electrical energy supply.

The Executive Committee has also considered the following non-discretionary legislation:

- *Public Utilities Act* and regulations

The *Public Utilities Act* provides the YUB with the mandate to set rates or approve any increase in rates proposed by YEC through a General Rate Application. Furthermore, Government of Yukon may instruct YEC and the YUB on rate and rate setting through an Order-In-Council. As such, any potential rate increases to YEC customers due to the Project would have to be approved by the YUB and meet requirements of any Order-In-Council by Government of Yukon.

The Executive Committee is of the opinion that the Proponent's implementation of their operating plan that reduces electrical demand and energy requirements during the winter months and increases electrical demand and energy requirements in the summer months is essential to prevent significant adverse effects on electrical rates. The Executive Committee determined that the following considerations will effectively eliminate, reduce, or control significant adverse effects to local electricity supply and the Yukon grid:

- application of the mitigation measures proposed by the Proponent;
- compliance with non-discretionary legislation;
- YEC's plans for new sources of electricity supply; and
- YEC's statement that they have *"no plans to connect major incremental load to the system that will result in significant rate increases to its customers due to significant increases in diesel generation"* (YOR #2010-0267-338-1).

14.7 CUMULATIVE EFFECTS ASSESSMENT

As an important regional service provider, Mayo's local services and infrastructure are utilized by several different sectors. The Project may result in some residual effects on local services and infrastructure, but they are not anticipated to be significant. The demands of tourism, the development of Alexco's operations in the Keno area, continued mineral exploration and development, and other activities, in combination with the Project, may stress infrastructure and services in and around Mayo. Proponent planning and consultation with services and infrastructure administrators will help to avoid significant adverse effects on this VESEC. With this approach, significant adverse cumulative effects are not anticipated.

14.8 Conclusion of the Local Services and Infrastructure Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects on local services and infrastructure.

15.0 HEALTH AND SAFETY

15.1 OVERVIEW

The Project involves activities that have inherent health and safety risks to both the on-site personnel and the public. The Proponent intends to minimize and control these risks by effectively implementing a suite of management plans and other tools. Potentially adverse effects remain to health and safety resulting from accidents or malfunctions and chronic or acute exposure to sources of risk. Key issues concerning health and safety include:

- project traffic use of public roads;
- use of explosives;
- noise;
- mine site hazards;
- camp facilities; and
- effects of the environment on health and safety.

Vehicle traffic to the mine site will follow the Silver Trail (Highway 11) north of Mayo and west on the South McQuesten Road (SMR). The Silver Trail and the SMR are currently maintained year-round. The SMR crosses the South McQuesten River and becomes the Haggart Creek Road (HCR). The Project proposes to open the seasonal-only HCR to year-round use. Portions of the HCR follow one or both banks north along Haggart Creek, predominately on historic placer tailings. The mine site is at the end of the east branch of the HCR. Project vehicles will increase traffic volumes on the SMR and the HCR.

During project operations over 5 000 000 kg of explosives per year will be manufactured and used at the mine site (Table 5.5-2 SIR). While explosive manufacture, storage and use are closely regulated by Natural Resources Canada and Government of Yukon, accidents would have significant adverse effects on personnel health and safety.

During the Public Comment Period and the public meeting in Mayo in August 2011, stakeholders raised concerns about the health and safety, especially regarding:

- road and highway use;
- cyanide management and use; and
- mine site infrastructure.

Health and safety issues related to cyanide have been addressed in section 6.

15.2 PROPONENT PLANS AND BASELINE INFORMATION

The preferred method for minimizing significant adverse effects to health and safety is avoiding hazards. Training, education, and planning have been committed to by the Proponent to control and minimize adverse effects to the health and safety of personnel. The following section outlines selected relevant plans and baseline data.

15.2.1 Emergency Response Plan

The Proponent provided a conceptual emergency response plan (VIT 2011a, Appendix 33, Emergency Response Plan) that outlines the key risk management planning and contingency response measures to address accidents, malfunctions, and emergencies. The Proponent has indicated that a detailed and comprehensive emergency response plan (ERP) will be completed as required by the Quartz Mining License. Furthermore, the plan will be modified throughout the life of the project when necessary. The ERP will be applicable to the mine site area and the Silver Trail, SMR, and the HCR.

The Proponent has indicated that the purpose of the ERP is:

> *"…to provide a course of action in responding to accidents, system failures, or other emergency situations which may occur at the mine site during any phase of the Project. In particular, the ERP identifies the appropriate course of action for the following typical emergency situations:*
>
> - *Release of hazardous or toxic substances (spill)*
> - *Fire or explosion*
> - *Slope failure (open pit and waste rock storage areas)*
> - *Heap Leach Facility breach*
> - *Natural disaster*
> - *Security breach or threat to personnel or facilities*
> - *Transportation emergencies*
> - *Medical emergencies*
> - *Missing persons*
> - *Site evacuation."* (VIT 2011a, Appendix 33)

The ERP also includes procedures for internal and external notification of relevant external agencies, services, and potentially affected parties. Details are provided for roles and responsibilities, inspections and maintenance, security, identification and mitigation of hazards, and emergency response procedures.

15.2.2 Occupational Health and Safety Plan

The Proponent provided the objectives of an occupational health and safety plan (VIT 2011a, s. 11 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The objectives will be to promote safety awareness to all on-site personnel, public, and area stakeholders. The plan will incorporate guidance from the National

Institute for Occupational Health and Safety as well as relevant territorial regulations. Health and safety procedures will be communicated during mandatory site orientation sessions.

15.2.3 Access Road

The Proponent outlined the proposed access route to the mine site as well as traffic management strategies in the proposal and several appendices. Appendix 19 (VIT 2011a) outlines the current existing access route conditions as well as the required upgrades for the Project. The Project will access the site using public roads. Total driving distance from Mayo is approximately 85 km. From Mayo, the first 40 km is on the Silver Trail (Highway 11 to kilometre 87.2) followed by 23 km on the SMR to the South McQuesten River Bridge. After the bridge the HCR continues 22 km to the mine site.

The SMR and the HCR are considered public roads under the *Highways Act*. The Government of Yukon maintains the SMR during the summer only while the HCR is considered a public unmaintained road. The SMR and the South McQuesten River Bridge were upgraded by the Government of Yukon in 2009 and 2010 and are structurally sufficient to meet the traffic volumes and load capacity standards for a resource access road. Currently, the Proponent and/or local placer miners in the area maintain the HCR on an as-needed basis. The width of the HCR varies between one and two lanes and requires upgrading to meet the needs of the Project.

There is no road use data available for the SMR and the HCR. The proposal indicates that traffic data was collected by the Government of Yukon in two locations on the Silver Trail at km 0, just east of the Stewart Crossing bridge and at km 63.4, north of Mayo towards Keno City. Average daily traffic between 1997 and 2008 ranged from 71 to 262 vehicles at km 0 and 90 to 147 vehicles at km 63.4.

The Proponent provided the objectives of a traffic and access management plan (VIT 2011a, s. 10 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The final plan will include:

- locations of signage and pullouts for the single-lane two-way HCR;
- measures to mitigate potential hazards associated with construction-related truck movement;
- procedures for road maintenance and monitoring; and
- mine site security measures.

The conceptual traffic and access management plan also lists measures that will be implemented to convert the existing HCR to a single-lane two-way access road. The Proponent indicates that the final plan will be developed with Government of Yukon, Department of Highways and Public Works and will be consistent with Yukon regulatory and policy requirements.

15.2.4 Noise Assessment Report

The Proponent has not collected baseline data on sound levels in or around the project area. The Project is located in an area with noise generated by natural sources and from heavy equipment supporting placer mining activities in the Haggart Creek and neighbouring watersheds. Noise receptors include wildlife, other placer or quartz miners in the Haggart Creek and neighbouring watersheds and users of the HCR. The Proponent developed a noise assessment report (VIT 2011a, Appendix 10) to predict noise and related effects from the project. In the absence of Yukon specific regulatory guidance, the noise assessment report used guidelines from other jurisdictions to discuss acceptable noise levels including:

- British Columbia Oil and Gas Commission: Noise Control Best Practices Guideline;
- Alberta Energy Resources Conservation Board: Directive 38: Noise Control;
- Environment Canada: Environmental Codes of Practice for Steam Electric Power Generation – Construction Phase;
- Ontario Ministry of the Environment: Noise Pollution Control(NPC) NPC-119 Blasting; and
- Ontario Ministry of the Environment: Guidelines on Information Required for the Assessment of Blasting Noise and Vibration.

The noise assessment report predicted sound levels from the Project using sound level modeling at four locations approximately 1.5 km north, south, east, and west of the Project location. The Proponent then estimated the cumulative sound levels by combining Project sound levels with predicted background levels (VIT 2011a, Appendix 10). These cumulative sound levels were compared with the identified permissible sound levels to determine potential effects.

Based on the modeling provided by the Proponent, Project daytime and night time noise levels during construction, operations and decommissioning are anticipated to be within the generally accepted applicable regulatory criteria in Canada (i.e. Environment Canada Code of Practice).

However, the noise generated by explosives use is expected to carry well beyond the mine site.

15.2.5 Noise Abatement Plan

The Proponent provided the objectives of a noise abatement plan (VIT 2011a, s. 14 of Appendix 30, Conceptual Environmental Management Plans) that will be completed prior to the commencement of the Project. The final plan will outline practices to reduce the level of noise (e.g. locating or enclosing major noise-generating equipment, operating equipment in such a way to minimize noise, turning off equipment off) and will include specific measures for blast management (e.g. restricting and managing public access to the mine site).

15.3 Effects Related to Project Traffic Use of Public Access Roads

The Project will increase the number of vehicles using the SMR and particularly the HCR. An increase in the number of vehicles could lead to an increase in the number of vehicle accidents. Accidents can be single vehicle, vehicle-vehicle, vehicle-pedestrian/off-road vehicle (ORV) or vehicle-wildlife. All types of accidents can result in injuries to the vehicle drivers/passengers. If an accident results in a spill of hazardous materials then significant adverse environmental effects might also occur (see section 6).

The HCR requires upgrades from the existing public unmaintained road to a two-way one-lane radio-controlled resource access road. The Proponent has indicated that the HCR will meet the design standards under the Transportation Association of Canada for Low Volume Roads (LVR 50) and acceptable engineering practices for one-lane two-way roads. The entire HCR will be upgraded to 5 m in width incorporating a 3 m travelled road lane and two 1 m shoulders. Pullouts will be constructed approximately every 100 to 300 m to allow vehicles to stop or pass as necessary. A parking area will be constructed at the South McQuesten River with signage in the parking area to describe road use and radio protocols. Signage and kilometre markers will also be posted and visible from either direction along the HCR.

Total traffic volume during the 25 month construction phase is predicted to be approximately 2 500 semi-trailer round-trips and 7 500 to 10 000 less than 5 tonne truck round-trips. Traffic volumes during the operations phase are predicted to be approximately 100 to 120 round-trips by busses per year for crew shift changes to and from Mayo. Total truck loads during the operation phase are predicted to be 2 200 round trips per year. The largest vehicles requiring access to the Project site will include B-train vehicles, trucks with long loads, and trucks with wide loads during the construction phase.

The HCR is a public unmaintained road under the *Highways Act*. Although traffic volume data along the HCR is unavailable, the Proponent has indicated, and the Executive Committee agrees, that traffic volume is relatively low. Less traffic currently uses the SMR and HCR than the Silver Trail. Use of the Silver Trail and SMR is currently well below their respective capacities and the Government of Yukon, Department of Highways and Public Works has indicated to the Proponent that the predicted level of Project traffic is insignificant in terms of affecting the publicly maintained roadways along the access route (Silver Trail and SMR), and can be accommodated. Therefore, the Project is not expected to result in significant adverse impacts to the road infrastructure along the Silver Trail and the SMR.

Common factors contributing to single vehicle accidents include the avoidance of wildlife and debris, excessive vehicle speed for the road conditions, driver fatigue and alcohol. Weather, poor drainage/glaciation, narrow lanes and shoulders and sharp curves can all contribute to single vehicle accidents. The Proponent has committed to upgrade the HCR to what is considered a reasonable standard for Project traffic. The Proponent and Government of Yukon, Department of Highways and Public Works have committed to maintain the HCR and SMR to appropriate standards. The Executive Committee understands that speed limits, appropriate for the road design, will be signed and enforced. Managing driver fatigue and alcohol use of project personnel are expected to be addressed in the Proponent's Occupational Health and Safety Plan (VIT 2011a).

Members of the NND and the general public use the SMR and HCR for various activities including subsistence hunting and fishing, trapping, tourism opportunities, and as access to placer mining operations. It is understood that this use is more frequent on the SMR up to the South McQuesten River Bridge (the start of the HCR) than the HCR. The South McQuesten River Bridge is a popular destination for grayling fishing in the spring and is also used regularly to access the river for hunting and tourism. Comments received during the Public Comment Period indicate that the South McQuesten River is a prime grayling fishing area and that the area is an important First Nation fishery. It is also conceivable that after upgrades to the HCR are completed, public traffic may increase on that road as well.

The Executive Committee agrees with comments received from NND and members of the Mayo community that suggests a parking area north of the South McQuesten River (i.e. at the beginning of the HCR) could help avoid vehicle-vehicle and vehicle-pedestrian accidents in this area (VIT 2011a, Appendix 19, Eagle Gold Access Report). The Executive Committee expects Project vehicle speeds to decrease in this area to ensure safe crossing of the South McQuesten River Bridge.

Moose using the South McQuesten River valley increase the risk of vehicle-wildlife collisions in this area. During a June 18, 2010 reconnaissance of the access road and mine site, YESAB assessors noted seven sets of moose footprints in the gravel near the South McQuesten Bridge. The Proponent has committed to maintaining a record of Project vehicle-wildlife collisions. If this record demonstrates that collisions with moose are occurring in the South McQuesten River valley the Proponent should change operational procedures to minimize these collisions. While any number of collisions is undesirable, over two collisions in this area annually would approximately equal the licenced moose harvest in the Game Management Sub-Zone. An option would be lower speed limits for Project vehicles in this area to decrease the likelihood of collisions.

Vehicle-vehicle accidents are likely to have the greatest adverse effect on health and safety. These accidents can be decreased by driver knowledge of other vehicles on the access roads (e.g. through radio use), increased line of sight, decreased vehicle speeds, increased pull-outs and better road design/conditions. The Executive Committee notes the proposed road design standards and recognizes the frequency of proposed pull-outs.

The HCR will be upgraded to a two-way single-lane radio-controlled road. The HCR, which is currently limited to summer access, will also be ploughed and used during the winter months. Winter use of the HCR has predominantly been by snowmobile. The Executive Committee recognizes that the Proponent will provide for and manage communication between Project vehicles and is more concerned about collisions between project and non-project vehicles. As indicated in Appendix 19 to the proposal (Eagle Gold Access Road Report, p. 10), "local residents and local placer miners are known to use this road and may not have the radio equipment to comply with this requirement." Radios, and their proper use by drivers, are one of the most important methods to minimize vehicle-vehicle accidents and mitigate potential effects on health and safety.

NND has expressed concern that the requirements for carrying and using radios to safely travel the SMR and HCR may deter certain users. In particular NND citizens' ability to use the access road for traditional use may be affected (YOR #2010-0267-346-1). Users who do not have access or do not want to use radios may avoid the area.

The Executive Committee recognizes the signage proposed at the South McQuesten River parking area should be part of a broader education campaign about radio use on the HCR. Furthermore, directed communication should be undertaken by the Proponent with known HCR users to communicate radio protocols. The SMR and HCR directly overlap with the Registered Trapping Concession 81 (RTC81). The trapping concession holder, Ms. Beattie, has expressed safety concerns with using the HCR with the increased volumes of traffic (YOR #2010-0267-289-1).

The Project will significantly increase traffic along the Silver Trail, the SMR and the HCR. Potential effects may result in adverse effects on public health and safety through vehicle-vehicle or vehicle-pedestrian/wildlife collisions resulting in injury or death. The Silver Trail and the SMR are designed to allow two-way traffic and have posted speed limits. Increased volumes of traffic are not likely to cause increased collisions along the Silver Trail or the SMR.

The Executive Committee recognizes that it is possible to safely manage traffic along a one-lane two-way access road. However, there is an increased likelihood of collisions on a road of this type, particularly if there are users who do not fully understand or have the necessary equipment to safely travel the road.

15.3.1 Recommended Terms and Conditions

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- *Highways Act* and Highways Regulations
- *Transportation of Dangerous Goods Act*

The Executive Committee concludes that the Proponent's commitments as outlined in Appendix A will help to reduce, control or avoid adverse impacts on local emergency services; however, we recommend additional mitigative measures to adequately reduce the public health and safety risks with regard to the one-lane two-way radio-controlled HCR.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse socio-economic effects of the Project to health and safety.

To ensure public and personnel safety using the South McQuesten Road and the Haggart Creek Road as access to the mine site:

114. The Proponent shall ensure that the one-lane two-way Haggart Creek Road is operated as outlined in the Eagle Gold Access Road Report (VIT 2011a, Appendix 19).
115. The Proponent shall ensure regular known users of the Haggart Creek Road (i.e. placer mining operators and the Registered Trapping Concession 81 holder) and NND have the means and knowledge to use the one-lane two-way radio controlled access road. This will include posting the radio frequency used for traffic control on signage at the South McQuesten River Bridge and where appropriate in communications with other road users.
116. During construction and operations, the Proponent shall follow-up with regular known users of the Haggart Creek Road (i.e. placer mining operators and the Registered Trapping Concession 81 holder) and NND to address concerns that may arise.
117. The Proponent shall provide regular known users of the Haggart Creek Road and NND regular updates on the schedule of transportation related activities to and from the mine site.

118. As proposed, the Proponent shall maintain a log of project vehicle-wildlife collisions. If collisions with moose are occurring more than twice a year near the South McQuesten River valley, the Proponent shall change their Traffic and Access Management to avoid these collisions (e.g. lower speed limits in this area).
119. The Proponent shall monitor the use and management of the South McQuesten Road and the Haggart Creek Road and update the Traffic and Access Management Plan, with input from the Government of Yukon, Department of Highways and Public Works, as necessary over the life of the Project.

15.4 EFFECTS RELATED TO THE USE OF EXPLOSIVES

The Project will use explosives during construction to develop infrastructure site pads and the pre-production open pit mine. During operations, explosives will be used to extract waste rock and ore from the open pit. The Proponent will store and manufacture explosives on-site in two buildings, the explosives storage facility and the magazine (blasting cap) storage facility, located southwest of the open pit. The explosives storage facility will store approximately 40 tonnes of fixed emulsion and have the capacity to store 130 tonnes of ammonium nitrate in two 65-tonne silos. Approximately 2 000 to 6 100 tonnes of ammonium nitrate-fuel oil (ANFO) explosives will be required annually during operations.

Transporting, storing, handling and detonating explosives poses inherent safety risks to personnel. Effects associated with poor operating practices, accidents or malfunctions may be serious and include injury and death. These effects are considered low in frequency but potentially irreversible and therefore significant. The Yukon Worker's Compensation Health and Safety Board has expressed concern and noted sections in the *Occupational Health and Safety Act* and *Occupational Health and Safety Regulations* to address their concerns regarding the use of explosives (YOR #2010-0267-197-1).

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- *Occupational Health and Safety Act*, and *Occupational Health and Safety Regulations*;
- *Explosives Act* and associated explosives regulations;
- *Transportation of Dangerous Goods Act*; and
- *Quartz Mining Act*, and *Quartz Mining Land Use Regulations* (Schedule 1, Part N).

Additionally, the Executive Committee considered the proposed measures and/or commitments made by the Proponent to reduce the effects due to the manufacture, storage, and use of explosives, as outlined in Appendix A. The Executive Committee considers the Proponent's proposed mitigation measures adequate to eliminate, reduce or control significant adverse effects of the Project on health and safety.

15.5 Effects Related to Noise

Noise from project activities may have potential health and safety effects to the public and on-site personnel. The Proponent has modeled cumulative predicted sound levels 1.5 km from the Project from activities other than blasting and compared them to established guidelines. Noise levels are well below the suggested daytime limit of 50 dB and night time limit of 40 dB. Within the Project area, it is likely that point sources of noise such as crushers and heavy machinery will be above limits. Anyone on-site will be wearing personal protective equipment (PPE) consistent with the Proponent's Occupational Health and Safety Plan. The Executive Committee is concerned about sources of, and receptors for, noise beyond the mine footprint. Noise will result from various sources over the life of the mine but the most important source of noise beyond the mine site is the use of explosives.

Noise may result in the following effects to the health and safety of the public and personnel (Singal, 2000):

- annoyance;
- sleep disturbance;
- disruption of normal functions (e.g. communication and interaction, activities);
- distraction and reduced task performance;
- anxiety and stress;
- startle reflex (e.g. reactions ranging from mild surprise to severe shock);
- physiological changes (e.g. blood pressure and heart beat); and
- physiological impacts (e.g. nausea, headache, insomnia and hearing damage).

The loudest Project source of noise is the use of explosives. Blasting will occur during construction in the development of the open pit, development of infrastructure pads, and quarry development. The Proponent has indicated that the maximum peak sound pressure level of 120 dB is the cautionary limit for blasting. Blasting will occur only during daylight hours and will be scheduled to occur once per day at shift change or lunch break. The Proponent predicted that peak sound power level (PSL) at 500 m to be 196 dB. This number was applied in modeling at 1.5 km from the Project. At 1.5 km, noise from blasting is expected to be 92 dB north; 85 dB east; 82 dB south; and 103 dB west. These numbers are below the cautionary limit of 120 dB.

Within the project area, noise levels from blasting will be higher than 120 dB. On-site personnel may be potentially affected by noise from blasting without the proper safety measures in place. The Proponent has indicated in the conceptual noise abatement plan (VIT 2011a, s. 14 of Appendix 30 of the proposal) that they will "[e]nsure, by restricting access to the mine site, that recreational land users are not present in the vicinity of the mine during blasting operations." This is a practical mitigation on-site where access is gated and controlled.

However, the HCR is located directly adjacent to the project area, approximately 1000 m west of the open pit. Sound levels from blasting in the open pit will be between 196 dB and 103 dB. It is likely noise levels will exceed 120 dB. Members of the public and uninformed mine personnel may be potentially affected by noise from blasting when traveling on the HCR. Although the likelihood of someone being on the HCR directly west of the open pit when blasting occurs is low, the extent of the effect to those individuals would be high. The Executive Committee notes that the HCR will be a radio-controlled road. To avoid effects of blasting noise on users of the HCR, the Executive Committee requires the Proponent to actively manage users on that portion of the HCR during blasting until it demonstrates that blasting noise levels are below 120 dB at the nearest point of the HCR.

15.5.1.1 Recommended Terms and Conditions

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- *Occupational Health and Safety Act* and Occupational Health and Safety Regulations;
- *Public Health and Safety Act* and *Public Health Regulations*;

The Executive Committee concluded that Proponent commitments as outlined in Appendix A will help to reduce, control or avoid adverse impacts on health and safety; however, we recommend additional mitigative measures to adequately reduce the public health and safety risks with regard to noise.

The following terms and conditions are specified by the Executive Committee to mitigate significant adverse socio-economic effects of the Project to health and safety.

The Noise Assessment Report (VIT 2011a, Appendix 10) suggests that follow-up sound level monitoring is not required and that the initiation of a monitoring program would be complaint-driven. Due to the proximity of the HCR to the open pit, sound level monitoring is considered important in order to ensure the safety of those using the HCR.

To ensure the safety of members of the public traveling on the HCR:

120. The Proponent shall install signs on the HCR at points outside of the 1.5 km boundary identified in the Noise Assessment Report. Signs should include warnings and information relating to blasting activities including time of day and frequency.
121. The Proponent shall notify HCR users via radio in preparation of blasting events.
122. The Proponent shall monitor sound-levels related to blasting activities along that portion of the HCR that is within the 1.5 km boundary identified in the Noise Assessment Report. Should noise levels on the HCR exceed 120 dB the Proponent shall use personnel to control and inform traffic on this portion of the HCR during blasting events until such time as the noise monitoring demonstrates blasting noise is consistently below 120dB.

15.6 Effects Related to Mine Site Hazards

The Project involves activities and infrastructure that have inherent health and safety risks associated with them to on-site personnel. Explosives, large transportation equipment, large rock processing machinery as well as hazardous materials will be used during project construction and operations. Potential effects to health and safety are related to accidents and malfunctions and can range from minor injuries to injuries with long-term recovery or disability and even death. These could result from unsafe practices by mine site personnel, poor emergency response, inadequate monitoring of facilities and infrastructure as well as failure of major mine components. Failure of major mine components has been addressed Infrastructure stability has been addressed under Infrastructure Stability in section 10 of this report.

In their comments on the DSR, Workers Compensation Health and Safety Board indicated that it would be worthwhile for the Proponent and general contractor to have a pre-project meeting (YOR #2010-0267-337-1). This would facilitate discussion on safety issues regarding construction and operations.

Although potential health and safety effects due to site hazards are considered significant, the Proponent has developed measures to address the safety of on-site personnel and has developed a conceptual Emergency Response Plan. A comprehensive plan will be developed, and is required, for the Quartz Mining License Application.

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- *Occupational Health and Safety Act* and *Occupational Health and Safety Regulations*;
- *Public Health and Safety Act* and *Public Health Regulations*;
- *Quartz Mining Act* and *Quartz Mining Land Use Regulations.*

The Executive Committee concluded that Proponent commitments as outlined in Appendix A and compliance with non-discretionary legislation will be adequate to reduce, control or avoid adverse impacts on health and safety with regard to mine site hazards.

15.7 EFFECTS OF THE ENVIRONMENT ON HEALTH AND SAFETY

Extreme environmental events, beyond those that are anticipated, could increase the risk of design failure, impact the implementation of various aspects of the Project or result in direct injury to mine personnel. A certain amount of environmental variability is already taken into account in the project design standards, operating plans and the emergency response plan.

The potential adverse effects of the environment on health and safety largely involve terrain instability, seismic activity, extreme weather events (extreme precipitation or temperatures), and local forest fires.

Potential effects to health and safety relating to terrain instability, seismic activity, and extreme weather event are largely related to failure of major mine infrastructure. Failure of major mine components has been addressed Infrastructure stability has been addressed under Infrastructure Stability in section 10 of this report.

The risk of forest fires is greater during the summer months and increases during periods of higher temperatures and lower precipitation. Forest fires can be ignited by natural sources such as lightning strikes as well as human activities. Forest fires could result in adverse affects to the health and safety of on-site personnel ranging from smoke inhalation to various degrees of burns. The mine site will be cleared of vegetation (i.e. forest fire fuel) which will limit a forest fire moving across the site. However, fuel and explosives storage would be particularly vulnerable. Should an emergency firebreak need to be constructed, the required heavy machinery would be available at the mine site. Should a forest fire reach so close to the mine site or the HCR/SMR access road that personnel cannot be evacuated, it could result in a significant adverse effect to the safety of personnel.

Government of Yukon, Department of Community Services, has indicated that during fire conditions, fire suppression will be dedicated to the highest priorities subject to available resources, prevailing fire conditions, and the need to retain such resources for the overall protection of Yukon communities. Depending on the priorities at the time there may be limited resources and equipment dispatched to the fire site (YOR #2010-0267-197-1). They also provided recommendations that the areas around the camp are protected using FireSmart Guidelines. The immediate area around the camp will be cleared of vegetation that could potentially fuel a forest fire.

Although potential health and safety effects due to forest fires are considered significant, the Proponent has developed measures to address the safety of on-site personnel and has developed a conceptual emergency response plan that includes site evacuations. A comprehensive plan will be developed, and is required, for the Quartz Mining License Application.

In determining the significance of the above noted effects, the Executive Committee has considered the following non-discretionary legislation:

- *Occupational Health and Safety Act* and *Occupational Health and Safety Regulations*

The Executive Committee considers the Proponent's proposed mitigation measures adequate to eliminate, reduce or control significant adverse effects of the Project on health and safety.

15.8 Cumulative Effects Assessment

The residual effects of the Project on health and safety will interact with the residual effects of other projects beyond the project site. This cumulative effects assessment will focus on the residual effects of the project and other projects as they contribute to traffic use on the access road (HCR and SMR).

Existing activities in the region consist of placer mines and quartz exploration projects, as well as, several residential dwelling and camps. There are several quartz and placer exploration projects active in the Haggart Creek watershed. There have been several recent projects assessed by YESAB.

Generally speaking, quartz exploration projects and placer exploration involve activities that are similar to the proposed project. Residual effects overlap when all projects use the HCR and SMR to access their respective project sites. An increase in the number of vehicles on the HCR and SMR increases the likelihood of single-vehicle and vehicle-vehicle collisions. Of concern to the Executive Committee is an increase in frequency and severity of vehicle-vehicle collisions on the HCR.

The Executive Committee notes that education of regular HCR users regarding driving and radio protocols will help mitigate the frequency of collisions on the HCR. Furthermore, the terms and conditions proposed to mitigate project effects related to project traffic on the access road will also decrease the likelihood and significance of the cumulative effects.

The commitments made by the Proponent, the non-discretionary legislation, and the mitigation measures recommended in this report are considered adequate to reduce the cumulative effects to health and safety. The Executive Committee has determined that the Project will not result in residual effects that in combination with the residual effects of other projects for which proposals have been submitted or existing/and proposed activities cause significant adverse cumulative (environmental or socio-economic) effects.

15.9 Conclusion of the Health and Safety Assessment

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce or control significant adverse effects to health and safety.

16.0 CULTURAL AND COMMUNITY WELL-BEING

This section addresses potential project-related effects on the cultural and community well-being of Mayo and the NND. Cultural and community dynamics are influenced by factors such as demographics, individual and community health and wellness, family stability, community cohesion, cultural well-being, and, social contexts. The ability of a community to cope with changes to its structure and dynamics brought on by a development projects is determined in part by its vulnerability and resilience/adaptability. Some characteristics that contribute to a community's resilience and adaptability include:

- social capital (e.g. social networking, community associations, and volunteers);
- health/wellness and social infrastructure (e.g. recreational facilities and social services);
- experience and engagement with industrial development projects;
- strong cultural connections within the community;
- skilled/educated labour force;
- diversified economy; and
- strong connection to the community (e.g. many long-term residents).

Aspects of a community that may contribute to its vulnerability include:

- existing social problems (e.g. substance abuse and family violence);
- negative experience with or too many industrial development projects;
- compromised population health status;
- low-skilled/uneducated labour force;
- small population;
- high unemployment;
- high crime rates;
- narrow economic base; and
- frayed social fabric.

This section of the report will consider the effects of the project due to employment and economic opportunities and community vitality. The Proponent considered five components of employment and economic opportunity in their proposal including employment opportunities, contracting opportunities, royalties and taxes, effects from expenditures, and effects on other local and regional activities. The Proponent considered three aspects of community vitality in their proposal including population and demographics, crime, and community involvement. The Executive Committee will also consider the effects of employment of local residents on individual well-being, family dynamics and community interactions.

Cultural activities related to subsistence and/or traditional land uses are considered further in this report in the section 14. Effects to facilities for emergency services, health centers, landfill, sewage lagoons, child care, roads, the Mayo Airport, local educational facilities and services, and electrical power supply are considered section 15.

First Nation of Na-Cho Nyak Dun

The NND have lived throughout the northeast Yukon and Mayo area for generations. The NND Government is affiliated with the Northern Tutchone Council. In 2004, Indian and Northern Affairs Canada estimated the registered population of the NND at 460. Although a significant number of the First Nation members live in the Mayo area, some live in other Yukon communities and outside the Territory.

The NND Final Agreement and Self-Government Agreements were signed in 1993. As a self-governing First Nation, the NND has the ability to make laws on behalf of their citizens and their lands. The NND assumed self-government responsibility for program service delivery in several areas (e.g. housing and infrastructure). In anticipation of involvement in development activity in the area, NND has developed several policies and practices, including:

- Guiding Principles Towards Best Practices Codes for Mineral Interests within the First Nation of Na-Cho Nyak Dun Traditional Territory (NND 2008b); and
- Cooperative Engagement Process for Economic Activities Proposed in the Traditional Territory of the First Nation of Na Cho Nyak Dun (NND 2008a).

NND entered into a Cooperative Comprehensive Benefits Agreement (CBA) with the Proponent in October 2011 for the Project and ongoing exploration activities. The CBA advances the promotion of socio-economic and environmental objectives of NND. The details and outcome of the CBA are confidential. However, key outcomes of the CBA were summarized by the Propnent and include (VIT 2011, Potato Hills Press):

- an outline for the funding and terms of reference to hire a NND Liaison, NND Environmental Monitor, and a CBA Committee to oversee the implementation of the agreement;
- establish a process for ongoing communication between the NND and VIT;
- provide for scholarships, training, health and wellness programs for NND employees and opportunities for NND businesses; and
- provide financial support and profit sharing opportunities that may result from a successful project.

Village of Mayo

The Project is located near the Village of Mayo, a community of 466 people (Government of Yukon, Health and Social Services and Yukon Bureau of Statistics, 2008), in the heart of Yukon. Mayo lies within the traditional territory of the NND and just over half of Mayo's population is of aboriginal ancestry (Statistics Canada, 2007). Mayo serves as a distribution and service centre for the surrounding area providing support for mineral exploration and development, tourism, and other activities. Mayo demonstrates several features of resilience that may help the community to adapt to changes brought about by industrial development, and some characteristics that may make it vulnerable to impacts of development projects.

16.1 Evaluation of Baseline

The Proponent provides a description of socio-economic baseline studies and interviews used in the consideration of socio-economic effects of the Project in the proposal. Baseline information related to employment and economic opportunities, community vitality, human health and well-being are summarized by the Proponent. Additional information is provided in Appendix 17 to the proposal (Socio-economic Baseline Report).

Given that the socio-economic baseline study was completed in 2010, Government of Yukon, Department of Economic Development suggested in their comments that some of the information is dated (YOR #2010-0267-197-1). However, they conclude that the baseline information provides good context for the effects considerations.

16.2 Effects Related to Employment and Economic Opportunities

16.2.1 Employment, Contracting and Expenditures

The Proponent provides a description of employment opportunities during the construction operation and decommissioning of the project. The Proponent has indicated a peak workforce requirement of 400 during construction (2012 – 2014), 442 during operations (2014 – 2023), and approximately 200 during closure (2024 – 2033). The anticipated workforce requirements will be a combination of VIT employees and construction contractor skilled and unskilled labour.

The Proponent estimates that capital costs for the construction period will be $281 million and that up to 70 percent of the capital cost expenditures will be made at the local or regional level. The estimated costs during operations range from $85 to $96 million. Again, the Proponent indicates they plan to optimize local and regional contracts with engineering, construction and service provision companies. Government of Yukon, Department of Economic Development indicated that a breakdown of the local and regional capital expenditures costs would be helpful in identifying what sectors of contractors may benefit.

The Proponent has committed to the following mitigation and enhancement measures to minimize potential effects on opportunities for employment:

- VIT will strive to hire as many NND citizens and other local and Yukon residents as practical to fill employment positions;
- VIT will work with Yukon College, the NND, the Yukon Mine Training Association, and potentially other organizations to develop programs and training relevant to mining. These programs will aim to provide individuals in the local area who are currently unemployed or under-employed to get the necessary upgrading and skills that will permit employment with the Project. Contributions of advice, expertise, mentorship and program development assistance for programs will be considered on a case-by-case basis.

- VIT will also provide opportunities for students to be employed at the Project during the summer.
- VIT will develop a business opportunities pamphlet as a tool to clearly communicate to local businesses the Project-related opportunities to enable them to plan for and participate in pursuing contracts/business opportunities with the Project. The business opportunities pamphlet will be distributed to Yukon businesses in 2011.
- VIT will develop a database of local and Yukon businesses in which those businesses can identify the goods and services they could offer to the Project.
- VIT will seek to 'right-size' contracts where practical to enable local businesses to take advantage of the opportunities available with the Project.
- VIT will assist, as appropriate, in facilitating the exchange of information between parties who are interested in possible joint ventures. The company will not, however, enter into any joint ventures itself.

The Proponent concludes that the effects of employment and contracting opportunity will overall be positive. The Executive Committee generally agrees with these conclusions. Government of Yukon, Department of Economic Development, and NND identify that while overall employment opportunities will be positive, there are negative effects that result of employment opportunities that should be considered. NND identified that high school dropout rates may increase due to attractive job opportunities at the mine (YOR #2010-0267-200-1). High school students may limit their future employability by leaving high school before graduating.

These types of issues can be resolved by ongoing communication between all parties to ensure that negative effects associated with the Project are addressed in an appropriate way. To that end, the Proponent has also committed to:

- key socio-economic indicators (including those relevant to employment and economic opportunities) will be monitored by VIT during all phases of the Project. A process for confirming the indicators, reporting and responding to monitoring results will be cooperatively established with NND, Mayo, Government of Yukon and others.

It is likely that monitoring key indicators cooperatively will enable approaches and processes to be revised as necessary to minimize negative effects of the Project.

16.2.2 Royalties and Taxes

Project royalties will be required under the new 2010 *Quartz Mining Act Royalty Regulation*; the annual royalty payment is made on a sliding scale based on the mine profit. The rate ranges from three percent on annual profit greater than $10 000 to a rate of 12 percent on profits greater than $35 million. The amount retained by Government of Yukon will vary annually based on the *Quartz Mining Act Royalty Regulation*. The amount of royalties retained by Government of Yukon will be in accordance with overall royalty provisions agreed to with the Government of Canada as set out in the 2001 *Yukon Northern Affairs Program Devolution Transfer Agreement*. The amount of royalties collected by Government of Yukon and shared with NND will be in accordance with the Final Agreement provisions.

The Proponent estimated total federal income tax to be approximately US $48.8 million and territorial income tax to be approximately US $76.8 million generated as a result of the project. They have concluded that no mitigation or enhancement measures are required for this project with respect to royalties and taxes.

The Executive Committee generally agrees with the Proponent’s conclusion. Government of Yukon, Department of Economic Development stated that it would be helpful to do a sensitivity analysis of taxes generated based on scenarios with variable income. However, they are not concerned with any adverse effects as a result of royalties and taxes collected for the project.

16.3 Effects Related to Community Vitality

The Proponent identified the following aspects of community vitality that may be affected by the project population, local educational facilities and services Education and capacity development, crime, and community Involvement.

Effects to schools and health services and facilities in Mayo have been addressed in section 15. NND’s comments raised the concerns about changes to family dynamics and possible individual discrimination or intercultural conflict as a result of employment (YOR #2010-0267-200-1).The Executive Committee will consider these aspects as well in this section.

16.3.1 Populations Increase and Variation in Crime Level

The Proponent describes the Project as using a self-contained camp designed to discourage in-migration into Mayo by people who are employed by the Project. However it is recognized that people may migrate into Mayo during any of the mine phases indirectly as a result of the mine. The introduction of new residents to Mayo may have adverse effects such as straining the housing market, cultural disruption, potential for increased access to non-prescription drugs, and increased alcohol abuse. These adverse effects could result in an increase in crime rates. Alternatively beneficial effects could boost enrolment in local schools, local organizations and committees and maintain and/or improve the overall character of Mayo. NND has indicated in their comments that any additional stresses to the housing market may have adverse effects to village residents because of the already strained market (YOR #2010-0267-200-1).

The Proponent recognizes it is difficult to predict with confidence the amount of in-migration to Mayo as a result of the Project and has committed to mitigations to work with the community if issues arise. They have committed to the following mitigations to manage project effects related to population increase:

- the Project will be a camp operation. All employees will be housed on-site. Employees and contractors will generally be transported to and from Whitehorse to restrict unwanted access to Mayo between on-site rotations;
- there will be a ‘zero tolerance’ policy with respect to drugs and alcohol on the Project site;

- policies and procedures will be established with respect to the use of local roads and highways (e.g. speed limits, courteous driving practices) under the Project's control;
- cultural awareness training for all Project employees will reduce the potential for conflict with local residents; and
- support for life skills programs including money management and alcohol and drug abuse.

Key to addressing issues as they arise is the Proponent has committed to:

- key socio-economic indicators (including those relevant to employment and economic opportunities) will be monitored by VIT during all phases of the Project. A process for confirming the indicators, reporting and responding to monitoring results will be cooperatively established with NND, Mayo, Government of Yukon and others.

The Executive Committee is satisfied that considering these Proponent commitments mitigations and the ongoing commitment of VIT to cooperate with key parties, the Project will not result in significant adverse effects as a result of population increase or transient personnel interactions.

16.3.2 Employment Affecting Individual Values, Family Dynamics and Community Involvement

Existing residents of Mayo who become employees will be required to communicate and relate with members of the workforce with different cultural and ethnographic backgrounds. This may be a positive sharing of different world views or it may be negative experience with possible prejudice, discrimination or hostility. This type of workforce interaction could result in increased stress or anxiety to members of the workforce.

Residents of Mayo who become employees may be exposed to an unfamiliar work schedule and income. Individuals without the necessary life skills or experience to manage a regular work schedule with other interests such as traditional activities or recreational activities may feel a sense of isolation, depression, loss of productivity and concentration, or resentment. Changes to income may result in adverse social behaviours such as high-cost item purchases, binge drinking, or illicit drug use.

The two-week in two-week out schedule of employment will also affect the employee family dynamics. The adverse family effects may include: increased disruption of family structure, dynamic, and routine; decreased benefits of two-parent household (including gender role modeling); increased tension, anxiety, depression in parent left behind due to increased family responsibility; increased levels of family neglect; increased resentment and anger towards absentee spouse; increased incidents of marital conflict; increased incidents of domestic and child abuse; personnel isolation and separation from family; higher levels of divorce and single parenting, and; increased unsustainable financial decision-making and spending due to lack of financial management skills.

Residents who become employees may feel they have to stop community involvement activities to manage the new workforce.

It is difficult to predict with any certainty the potential effects that an individual, their family and their community may face as a result of being employed.

The Proponent has committed to mitigations to reduce the effects of employment such as:

- VIT will encourage its employees, who are residents of Mayo, to continue or initiate involvement in community activities or organizations;
- VIT will also support an annual community appreciation day to encourage an understanding of the people and activities taking place in and around Mayo, and to enhance community involvement. VIT will provide support for NND and Mayo community events, via corporate sponsorships, on a case-by-case basis;
- cultural awareness training for all Project employees will reduce the potential for conflict with local residents; and
- support for life skills programs including money management and alcohol and drug abuse.

The Executive Committee anticipates that some positive effects of the Project on community structure and dynamics may include individual capacity building through training and work experience, improved individual and family well-being, and continued development of community resilience to the effects of industrial projects. Adverse impacts may involve negative personnel interactions with community members, and increased substance abuse incidences and substance abuse-related issues and incidents.

Taking into account the commitments of the Proponent and ongoing commitment to monitor key-socio-economic indicators and work with Mayo, NND, Government of Yukon and other parties the Executive Committee has determined the project will not result in significant adverse effects.

16.3.2.1 Determination of Significance

In determining the significance of effects on cultural and community well-being, the Executive Committee has considered the following non-discretionary legislation:

- *First Nations (Yukon) Self Government Act*
- *Quartz Mining Act* and *Quartz Mining Act Royalty Regulation*
- *Yukon Northern Affairs Program Devolution Transfer Agreement*

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent and compliance with non-discretionary legislation will effectively eliminate, reduce or control significant adverse effects to cultural and community well-being.

16.4 Cumulative Effects Assessment

The project will be undertaken while other projects in the area are occurring. In particular, regional mineral development activities include the Bellekeno Mine and seasonal exploration activities. Cumulative effects on Mayo's community cultural and community well-being could result from the combined effects of development projects. As discussed above, the project is not likely to result in residual impacts on family or community dynamics, primarily because the project will be a camp operation and employees will be transported to and from Whitehorse to reduce the interaction with Mayo. Thus, cumulative effects pertaining to these issues are not expected to be linked to the project.

It is possible that residual impacts of adverse interactions among personnel and community members could combine with related negative effects of other projects. Impacts may be positive or negative, direct or indirect, and often are not easily attributable to a project, because they involve a multitude of factors, including personal choice. In general, the Executive Committee believes that the Proponent commitments, listed above, will help to build awareness and capacity within the community to address adverse effects on community health and wellness. The Executive Committee recognizes that the Proponent will establish a cooperative process to monitor and respond to socio-economic indicators, to address issues as they arise. With this approach, significant adverse cumulative effects are not anticipated.

16.5 CONCLUSION OF THE CULTURAL AND COMMUNITY WELL-BEING ASSESSMENT

The Executive Committee concludes that with the application of the mitigation measures proposed by the Proponent and compliance with non-discretionary legislation will effectively eliminate, reduce or control significant adverse effects to cultural and community well-being.

17.0 SECURITIES AND BONDING

This section addresses potential effects of the Project related to securities and bonding held by Government of Yukon. The Executive Committee has determined that the Project will result in significant adverse effects related to securities and bonding; however, these effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee. The following sections provide a rationale for this determination.

17.1 OVERVIEW

The Government of Yukon has a mandate to regulate major mining projects, including their closure and reclamation, on public lands in Yukon. Government of Yukon has instituted the 'Yukon Mine Site Reclamation and Closure Policy' and supporting guidelines to foster responsible and progressive mine reclamation and closure in Yukon (Government of Yukon 2006). One of the principles of this policy is that security retained by Government of Yukon equals site liability at all stages during the mine life. The Executive Committee notes the release of the 'Yukon Mine Site Reclamation and Closure Policy - Financial and Technical Guidelines' that are directly relevant to many aspects of the proposed Project. In particular, 'Guideline #T-05' regarding acid rock drainage potential (ARD/ML), 'Guideline #T-09' regarding mine rock piles and 'Guideline #T-14' regarding leach pads address key Project closure issues.

The Proponent provided a conceptual closure and reclamation plan (CCRP) (VIT 2011a, Appendix 24) that outlined estimated closure and reclamation costs as well as temporary/seasonal closure costing. The CCRP summarizes the Proponent's goals for closure and reclamation security as:

- *undertake progressive closure and reclamation during operations to offset post-closure costs;*
- *develop and prepare a final mine closure and reclamation plan that meets closure objectives;*
- *post security for Project closure in accordance with applicable Yukon regulations (*Yukon Waters Act *and Regulations and* Yukon Quartz Mining Act*), including Yukon Government's mine reclamation policy; and*
- *ensure that security provisions are adequate and available to fund closure activities at any time during the operation.*

17.2 EFFECTS RELATED TO SECURITIES AND BONDING

The estimated closure and reclamation costs included direct, indirect, and annual operations and maintenance costs. To estimate cost, three scenarios were evaluated: 1) premature closure, construction plus two years of operations; 2) premature closure, construction plus four years of operations, and; 3) full mine build-out, construction plus seven operating years. The estimates for the two premature closure scenarios included costs for full closure and reclamation. As presented in the CCRP, total estimated reclamation liability at the end of each period was (VIT 2011a, Appendix 24):

- Scenario 1: $32.4 million
- Scenario 2: $41.2 million
- Scenario 3: $52.1 million

The CCRP was developed for the initial proposal submitted (VIT 2011a). The Proponent submitted a Supplementary Information Report (SIR) outlining modifications to the Project based on their completed feasibility study. The modifications included increasing the amount of waste rock generated from 66 to 132 million tonnes and ore from 66 to 92 million tonnes. The size and surface area of the WRSAs, HLF, and open pit walls have all increased accordingly. Furthermore the operational mine life increased by approximately two years. The CCRP and in particular the estimated closure and reclamation costs were not updated to account for modifications presented in the SIR.

The Proponent has indicated that a detailed and comprehensive closure and reclamation plan will be completed as required by the Water Use Licence and Quartz Mining License applications. This plan will include revised estimates for closure and reclamation costs based on feasibility level engineering design. The feasibility study prepared for the Proponent has estimated reclamation and closure costs (i.e. net of salvage value) to be $64.2 million (Wardrop 2012).

The Executive Committee acknowledges that Government of Yukon must approve the final reclamation and closure plan for the Project. This plan must incorporate reporting requirements and monitoring plans and will be refined and updated on a regular basis, or as required by Government of Yukon, throughout the life of the mine. An annual report must be submitted to regulators, which details all progressive and ongoing reclamation that occurred during the preceding year. Programs to monitor the effectiveness of reclamation measures must be developed and implemented subject to regulatory review and approval. The results of programs to monitor the effectiveness of progressive reclamation measures, as well as measures taken to address unexpected reclamation developments must also be detailed in annual reports.

There are examples in the Yukon where appropriate planning and security was not required or secured and territorial or federal governments have had to take on closure and reclamation costs. In the past inadequate closure and reclamation has resulted in serious environmental damage. Examples include the Faro Mine, the United Keno Hill Mine, Clinton Creek Mine and the Mount Nansen Mine. In contrast, where mine properties have been adequately secured, closure has resulted in more appropriate reclamation and minimal environmental impact. One such example is the Brewery Creek Mine.

Financial security is ultimately determined by Government of Yukon through the regulatory process. The Quartz Mining License and, where applicable, the Water Use Licence, will stipulate the amounts, types and duration for security to be held. Security requirements are reviewed and revised at least every two years. It is important that the Proponent provides sufficient financial security to deal with mine closure and reclamation requirements in a variety of scenarios, including unplanned early closure. Security should be sufficient to ensure that Yukoners and other Canadians are not held financially responsible for mine closure and reclamation.

The Executive Committee is confident that as part of the regulatory process, the Proponent will be required to update their closure and reclamation plan to reflect modifications to the Project identified in the SIR. However, there are uncertainties related to aspects of the Project that must be considered by the Proponent and Government of Yukon when estimating closure and reclamation costs. These uncertainties have also been expressed by Environment Canada in their comments on the DSR (YOR #2010-0267-339-1).

As outlined above in sections 7 and 8, there are uncertainties related to various aspects of the Project including baseline data, water balance modeling predictions, geochemical characterization, derivation of SSWQO, and passive water treatment during post-closure. The Executive Committee is confident that mitigations recommended in this report will effectively eliminate, reduce, or control significant adverse effects related to these uncertainties. However, addressing these uncertainties may result in additional costs that have not been included by the Proponent in its estimation of closure and reclamation costs. It is important that these additional costs be taken into consideration when determining the appropriate level of security and bonding required for the Project.

The Executive Committee has recommended terms and conditions to: update and refine climate, hydrology, and hydrogeology baseline data; conduct additional geochemical characterization and update source term predictions; consider alternative methods and review SSWQO, and; incorporate various additional information collected into the water quality model, groundwater model, and water balance models. Implementing these recommendations may result in required changes to aspects of the Project such as the water management plan, water treatment process, and closure and reclamation plans. These required changes could have implications for closure and reclamation estimates and, as a result, implications for security and bonding requirements.

Of particular relevance to estimating reclamation and closure costs and determining related security requirements, are recommendations surrounding uncertainties with the proposed passive treatment systems (PTS). As outlined above, there are uncertainties related to the effectiveness of the PTS to treat runoff and seepage at closure. The Executive Committee recommended terms and conditions to develop the PTS using a phased approach including pilot scale and full scale testing which cannot be accomplished until the operations phase of the Project. Furthermore, recommendations were made to ensure that active water treatment remains in operation until alternative treatment methods such as PTS are proven to be effective. Should PTS be proven ineffective for the Project, alternative treatment methods must be implemented. This may include the possibility of long-term perpetual active mine water treatment. Alternative treatment methods or long-term perpetual active mine water treatment may cost significantly more than the proposed PTS.

The Executive Committee has determined that the Project may result in significant adverse effects if the Proponent and Government of Yukon do not consider uncertainties identified in this report when determining security and bonding requirements. However, the effects can be eliminated, reduced or controlled through the mitigations proposed by the Proponent, compliance with relevant legislation, and the implementation of mitigative measures specified by the Executive Committee.

17.2.1 Recommended Terms and Conditions

In determining the significance of the effects if security and bonding held by the Government of Yukon is not adequate, the Executive Committee has considered the following non-discretionary legislation:

- *Quartz Mining Act* and *Quartz Mining Land Use Regulations*
- *Waters Act* and *Water Regulations*

The Executive Committee recognizes the Proponent commitments as outlined in Appendix A will help to eliminate, reduce, or control significant adverse effects related to inadequate securities and bonding. However, we recommend additional mitigative measures to ensure that securities and bonding are adequate to meet requirements for reclamation and closure.

To ensure that appropriate reclamation and closure cost estimates are used for determining security and bonding requirements:

123. When finalizing the detailed closure and reclamation plan and estimating closure and reclamation costs, the Proponent shall consider:
    a. uncertainties related to baseline data, water balance modeling predictions, geochemical characterization, derivation of SSWQO, and passive water treatment during post-closure;
    b. the recommendation to conduct pilot and field scale testing for the proposed passive treatment systems; and
    c. feasible closure and reclamation requirements if passive treatment systems are ineffective.
124. The Proponent shall conduct a sensitivity analysis to estimate a range of security and bonding requirements (closure and reclamation costs) at various stages of the Project.

17.3 Conclusion of the Securities and Bonding Assessment

The Executive Committee concludes that application of the mitigation measures proposed by the Proponent, compliance with non-discretionary legislation, and implementation of the mitigative measures specified by the Executive Committee will effectively eliminate, reduce, or control significant adverse effects.

PART III ASSESSMENT RECOMMENDATION

18.0 RECOMMENDATION

Pursuant to s. 58 (1) (b) of YESAA the Executive Committee recommends to the Decision Bodies that the 245BEagle Gold Project be allowed to proceed without a review, subject to the terms and conditions specified below; as the Executive Committee has determined that the Project will have significant adverse environmental and/or socio-economic effects in Yukon that can be mitigated by these terms and conditions.

19.0 TERMS AND CONDITIONS OF RECOMMENDATION

To ensure cyanide related facilities are constructed in a manner to minimize the risks of potential cyanide release:

1. The Proponent shall implement quality assurance and quality control (QA/QC) programs during construction of the cyanide facilities (i.e. cyanide unloading, storage, mixing facilities and other cyanide facilities). QA/QC records shall be retained for third-party review.
2. The Proponent shall have appropriately qualified personnel to: (i) review the cyanide facilities construction; (ii) provide documentation that the facility has been built as proposed; and (iii) approve the construction.

To ensure the ongoing safety of on-site personnel who are in close contact with cyanide and cyanide related facilities:

3. The Proponent shall develop and implement documented operating procedures describing how cyanide-related tasks such as unloading, mixing, plant operations, entry into confined spaces and equipment decontamination prior to maintenance will be conducted to minimize personnel exposure. These procedures should require, where necessary, the use of personal protective equipment (PPE) and address pre-work inspections. The documented operating procedures should include a management of change section to require review of proposed process and operational changes and modifications for their potential impacts on personnel health and safety, and incorporate the necessary personnel protection measures.
4. The Proponent shall determine the appropriate pH for limiting the evolution of HCN gas during mixing and production activities. Where the potential exists for significant cyanide exposure, the Proponent shall use ambient or personal monitoring devices to confirm that controls are adequate to limit personnel exposure to HCN gas and cyanide dust to 10 ppm on an instantaneous basis and 4.7 ppm continuously over an eight-hour period.
5. The Proponent shall identify areas and activities where personnel may be exposed to cyanide in excess of 10 ppm on an instantaneous basis and 4.7 ppm continuously over an eight-hour period and require the use of PPE in these areas or when performing these activities.
6. The Proponent shall maintain, test and calibrate HCN monitoring equipment as directed by the manufacturer, and retain records of these activities for at least one year.
7. To prepare personnel to safely manage cyanide the Proponent shall:
   a. Train personnel to perform their normal production tasks, including unloading, mixing, production and maintenance, with minimum risk to personnel health and safety and in a manner that prevents unplanned cyanide releases.

b. Identify training elements necessary for each job involving cyanide management in training materials.

c. Use appropriately qualified personnel to provide task training related to cyanide management activities.

d. Provide refresher training on cyanide management to ensure that employees continue to perform their jobs in a safe and environmentally protective manner

e. Evaluate the effectiveness of cyanide training by testing, observation or other means.

f. Retain personnel employment records documenting the training they receive, and ensure the records include the names of the employee and the trainer, the date of training, the topics covered, and if the employee demonstrated an understanding of the training materials.

8. The Proponent shall place warning signs where cyanide is used advising personnel that cyanide is present, and that smoking, open flames and eating and drinking are not allowed, and that, if necessary, suitable PPE must be worn. This will include the identification of unloading, storage, mixing and process tanks and piping containing cyanide to alert personnel of their contents, and to designate the direction of cyanide flow in pipes.

9. The Proponent shall locate showers, low-pressure eye wash stations and dry powder or non-acidic sodium bicarbonate ($NaHCO_3$) fire extinguishers at strategic locations throughout the operation and maintain, inspect and test them on a regular basis.

10. The Proponent shall have water, oxygen, a resuscitator, antidote kits and a radio, telephone, alarm system or other means of communication or emergency notification readily available for use at cyanide unloading, storage and mixing locations and elsewhere in the operation.

11. As proposed, the Proponent shall ensure a certified cyanide transporter is used and appropriate driver training, radio contact capabilities, vehicle maintenance, and emergency clean-up kits will be on trucks carrying NaCN. Furthermore, the Proponent shall ensure that emergency clean-up kits include equipment to contain NaCN as well and material to protect from, and respond to, cyanide toxicity in spill responders.

12. The Proponent shall inspect its first aid equipment regularly to ensure that it is available when needed, and to store, test and replace materials such as cyanide antidotes as directed by their manufacturer to ensure that they will be effective when needed.

13. The Proponent shall provide information on first aid procedures and other informational materials (e.g. material data safety sheets [MSDS]) on cyanide safety in the areas where cyanide is managed.

14. The Proponent shall develop and implement procedures to investigate and evaluate cyanide exposure incidents to determine if the programs and procedures to protect personnel health and safety, and to respond to cyanide exposures, are adequate or need revising.

15. The Proponent shall provide its own on-site capability to provide first aid or medical assistance to personnel exposed to cyanide.

16. The Proponent shall develop procedures to transport personnel exposed to cyanide to locally available qualified off-site medical facilities.

To minimize exposure of wildlife and birds to toxic levels of cyanide in the HLF area and event ponds:

17. The proponent shall implement the mitigation measures committed to in the proposal at Table 6.9.10 No. 13 and 17. If wildlife mortality occurs despite the implementation of these measures, the proponent shall:

a. report the incidence of mortality to the responsible regulator; and

b. develop and implement further mitigation measures to avoid or prevent wildlife mortality as directed by the responsible regulator.

18. The Proponent shall ensure that the use of sprinklers to apply process leach solution to the Heap Leach Facility will not result in dispersion of cyanide to the surrounding environment. Consideration must be given to sprinkler placement, environmental conditions, and proximity of wildlife.

To ensure the appropriate emergency response plans (ERPs) are in place should there be a cyanide emergency:

19. The Proponent shall develop an emergency response plan (ERP) that considers the potential cyanide failure scenarios appropriate for the Eagle Gold Mine site, the transportation route within Yukon to site and considers site-specific environmental and operating circumstances. The ERP should describe specific response actions (as appropriate for the anticipated emergency situations) such as clearing site personnel and advising potentially-affected nearby land-users and communities, use of cyanide antidotes and first aid measures for cyanide exposure, control of releases at their source and containment, assessment, mitigation and future prevention of releases.

20. The Proponent shall include local response agencies and medical facilities in Mayo, and if appropriate, in Whitehorse, in the cyanide emergency planning and response process. The Proponent shall make formalized arrangements with the available qualified off-site medical facilities (either Mayo and/or Whitehorse) so that these providers are aware of the potential need to treat patients for cyanide exposure.

21. The Proponent shall involve key stakeholders in the cyanide emergency response planning process.

22. To ensure cyanide-related elements are included in the ERP, the Proponent shall include in the plan the following:

    a. Requirement for appropriate training for emergency responders.

    b. Call-out procedures for the coordinators and response team members.

    c. Duties and responsibilities of the coordinators and team members.

    d. Procedures to inspect emergency response equipment to ensure its availability.

    e. Roles of outside responders, medical facilities and communities in the emergency response procedures.

23. The Proponent shall ensure that the following communication elements are in the ERP:

    a. Notification to management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency.

    b. Notification to potentially affected communities of the cyanide related incident and any necessary response measures.

    c. Communication protocols with the media.

24. The Proponent shall ensure that the ERP remains current and effective by:

    a. Reviewing and evaluating the cyanide-related elements of its ERP for adequacy on a regular basis.

    b. Evaluating and revising the ERP after any cyanide-related emergency requiring its implementation.

    c. Regularly reviewing the ERP with stakeholders.

25. The Proponent shall periodically conduct emergency drills to test response procedures for various cyanide exposure scenarios, and incorporate lessons learned from the drills into response planning.

26. The Proponent shall commit to soliciting and actively considering personnel input in developing and evaluating health and safety procedures at the project.

To ensure adequate communication in the case of a cyanide emergency:

27. The Proponent shall advise potentially affected communities regarding appropriate communications and response actions that would be taken in the event of a cyanide emergency.

28. In the event of a cyanide release or exposure incident in Yukon related to the Project, the Proponent shall make publicly available the following information:

    a. Hospitalization or fatality related to cyanide exposure;

    b. Nature of release on or off the mine site requiring response, remediation, or reporting under applicable regulations;

    c. Nature of release that exceeds applicable cyanide limits or that causes applicable limits to be exceeded.

To ensure process leach solution leakage through the liner system in the upper portion of the Heap Leach Facility (HLF) can be monitored, captured and controlled:

29. The Proponent shall implement quality assurance and quality control (QA/QC) programs during construction of the HLF and liner system. QA/QC records should be retained for third-party review.

30. The Proponent shall have appropriately qualified personnel: (i) review design and oversee construction of the HLF and liner system; (ii) approve the final construction; and (iii) provide documentation to responsible regulators that the facility and liner system has been built in accordance with regulatory approvals.

31. The Proponent shall ensure that seepage collected in the underdrain system reports to a point of control (e.g. lined sump) to allow the Proponent to monitor, collect, and manage seepage. Seepage shall be sampled and monitored prior to discharge to surface water.

32. The Proponent shall sample water collected from: the proposed Leak Detection Recovery System; the underdrain sump; and additional surface and ground monitoring locations as dictated in the HLF Operations and Maintenance System plan required as part of the Water Use Licence and Quartz Mining License application guidelines.

33. Prior to completion of the HLF liner system, the Proponent shall develop a plan satisfactory to responsible regulators that includes sampling frequency, reporting timelines, and response measures.

34. In conjunction with responsible regulators, the Proponent shall evaluate the construction, QA/QC reports, and performance of the Phase 1 HLF liner system prior to construction of the Phase 2 and 3 HLF liner systems. Should the actual performance of the Phase 1 HLF liner system not meet predicted performance, the Proponent shall, in conjunction with responsible regulators, review the Phase 2 and 3 HLF liner systems and if necessary, modify their design.

To ensure process leach solution leakage through the liner system in the event ponds is minimized:

35. Unless otherwise demonstrated to the satisfaction of the responsible regulators that a different liner system will adequately mitigate adverse effects from uncontrolled discharge, the Proponent shall construct double geomembrane liner systems for the event ponds which include leak detection and recovery systems and allow for independent monitoring of each pond.

To reduce uncertainties associated with the water balance model as well as provide sufficient basis for future monitoring:

36. The Proponent shall extend the site water balance model (WBM) sufficiently downstream to support the water quality model. Consideration should be given to extend the model downstream to the confluence of Haggart Creek with Lynx Creek. This information shall be provided to the responsible regulators during the regulatory approval process.
37. The Proponent shall update the site WBM and Heap Leach Facility (HLF) WBM with updated stream flow and climatic input estimates based on additional data collected since the proposal was submitted. This information shall be provided to responsible regulators during the regulatory approval process.
38. The Proponent shall revise the site WBM and the HLF WBM to account for direct precipitation (i.e. rain and snow) and evaporation to model components (e.g. event ponds and HLF) and run scenarios using a shorter time-step (e.g. weekly or daily rather than monthly time-step). The Proponent shall update the water management plan to account for revised predictions.

To ensure stability of the HLF:

39. The Proponent shall ensure the HLF and embankment are designed to the Probable Maximum Flood for long-term stability.
40. The Proponent shall review the assumptions and confirm the appropriateness of the application of the proposed weir discharge coefficient of 3.0 for the HLF embankment spillway. The spillway shall be sized accordingly.

To ensure the HLF in-heap pond and the event ponds are sized appropriately to manage emergency or upset conditions:

41. In conjunction with responsible regulators, the Proponent shall develop an adaptive management plan to compare the actual on-site conditions to predicted conditions. The plan shall outline requirements for:
    a. monitoring (e.g. frequency, documentation, review procedures), defined thresholds, and management responses;
    b. refining the HLF WBM, site WBM, and water management plan based on results from on-site monitoring as well as any changes to the mine plan and site infrastructure during operations;
    c. reviewing the HLF WBM, site WBM, and water management plan prior to (i) the Phase 2 expansion of the HLF and (ii) the Phase 3 expansion of the HLF; and
    d. follow-up monitoring of management responses.
42. The Proponent shall ensure that the area identified for an emergency event pond (i.e. down gradient from the two proposed event ponds and north of the Dublin Gulch Diversion Channel) remains available in case a temporary or permanent event pond is required in the future.
43. The Proponent shall, prior to the regulatory approval process, conduct a sensitivity analysis to assess the effect of infiltration on the HLF in-heap pond and event ponds volumes. Pond volumes and sizes shall be reviewed based on the results of the sensitivity analysis.

To ensure stability of the event ponds:

44. The Proponent shall construct the event ponds with emergency overflow spillways which are able to safely convey the Inflow Design Flood predicted by the water balance model.

To ensure proper function of the sediment control ponds and minimize the potential for release of water with high concentrations of Total Suspended Solids:

45. The Proponent shall ensure that sediment control ponds are sized adequately to meet Total Suspended Solids concentration effluent criteria.

To reduce risks associated with the Dublin Gulch Diversion Channel:

46. Where portions of the Dublin Gulch Diversion Channel and Velocity Reduction Pond abut critical mine site infrastructure, the Proponent shall ensure armouring more durable than turf reinforced armouring is constructed to account for a 500-year, 24-hour storm event.
47. The Proponent shall design and construct the Dublin Gulch Diversion Channel using more natural features such as step pool features rather than concrete block armouring. If the construction of more natural features is not possible, prior to the regulatory approval process the Proponent shall provide responsible regulators with: appropriate rationale for the use of concrete block armouring; a detailed analysis of stability; and a monitoring and maintenance plan.
48. The Proponent shall use Type III Antecedent Moisture Content (AMC), rather than Type II AMC to compute the Inflow Design Flood of the Dublin Gulch Diversion Channel.

To ensure stability of diversion ditches and interceptor ditches:

49. The Proponent shall ensure temporary diversion or interceptor ditches are sized to account for infilling of sediments. This includes increasing the minimum depth from 300 mm where conditions warrant (e.g. ditches constructed with minimal to no grade).
50. The Proponent shall ensure that lined temporary and permanent diversion or interceptor ditches that are lined in a manner that is stable.
51. The Proponent shall ensure that temporary and permanent diversion or interceptor ditches that convey water away from key mine site infrastructure (e.g. the HLF, WRSAs, and event ponds) are sized to accommodate a 100-year, 24-hour design storm event.

To minimize the likelihood of inaccurate water quality model predictions leading to effects on the aquatic ecosystems

52. As proposed, the Proponent shall ensure that a revised groundwater model is submitted to responsible regulators during the regulatory approval process.
53. The Proponent shall, in discussions with responsible regulators, ensure groundwater monitoring occurs at appropriate locations down gradient from potential sources of contamination to enable early detection and timely intervention of potential groundwater contamination.

To decrease variability around geochemical characterization and validate hydrogeochemical predictions:

54. The Proponent shall complete geochemical characterization of the expanded open pit including representative rock units for the total amount of waste rock and ore being mined (132 million tonnes of waste rock and 92 million tonnes of ore). This characterization should include kinetic testing to predict metal leaching potential.
55. The Proponent shall incorporate results of the new geochemical characterization into the overall geochemical characterization of rock units to be excavated by the Project and revise the source term predictions accordingly. The Proponent shall ensure that this information is available prior to the regulatory approval process.
56. The Proponent shall update the water quality model and predictions using the revised geochemical characterization and source term predictions prior to the regulatory approval process.
57. The Proponent shall conduct appropriate testing of on-site materials to compare on-site materials to analog site materials. The Proponent shall consider additional on-site testing results as well as long-term trends at analog sites to provide confidence that the analog site data used to bound upper limits of source term concentrations accurately reflect the

characteristics of the Eagle Gold Mine material. The Proponent shall ensure that this information is available prior to the regulatory approval process.

58. The Proponent shall conduct monitoring of water quantity and quality from contact waters during operations, closure and post-closure to characterize contact waters from the different sources, verify assumptions and inform the site closure plan. The monitoring program should specify routine surface water monitoring from waste rock storage areas, the open pit, and the HLF. The data should be reviewed periodically to update loading assumptions for constituents of particular concern in the site water balance and water quality models.

59. To verify the assumptions and conclusions of geochemical predictions and the effectiveness of mitigation measures, the Proponent shall:

    a. establish the relationship between analog characteristics and those of site materials characteristics to verify the use of analogs in the derivation of source terms;

    b. initiate column tests using on-site materials prior to operations and follow up with field test cells during operations to support the site water quality model; and

    c. initiate field test plots or large scale field test cells to confirm that appropriate scale up factors have been applied.

To minimize potential effects due to metal leaching from waste rock used as construction material:

60. The Proponent shall ensure waste rock used to construct on-site infrastructure does not contribute to exceedance of water quality guidelines due to metal leaching. The Proponent shall actively segregate waste rock based on metal leaching potential so that it is used appropriately.

To inform the establishment of site-specific water quality objectives (SSWQO) during the regulatory review process:

61. As part of their Water Licence Application, the Proponent shall provide further analysis on the surface water quality dataset used to propose SSWQO, including:

    a. consideration and use of additional water quality baseline data collected since the proposal was submitted;

    b. consideration for the use or exclusion of data points associated with high Total Suspended Solids (i.e. data points collected during spring freshet); and

    c. determination whether pre-2007 data is within the natural variation of water quality and identify and quantify the influence of anthropogenically affected water quality data.

62. The Proponent shall consider and submit into the regulatory review process the results of alternative methods for deriving SSWQO using water quality data less likely to be anthropogenically affected. Specifically, the use of background conditions inferred from the review of water quality data for other nearby and un-affected watersheds (e.g. Lynx Creek) identified as a suitable reference.

63. The Proponent shall provide information on the derivation of a background water concentration for arsenic derived from an appropriate reference location, such as Lynx Creek, and provide information on a SSWQO for arsenic within Haggart Creek based on the results. This information shall be provided to responsible regulators to allow appropriate effluent discharge criteria to be set for arsenic to ensure the protection of downstream aquatic life.

To minimize the likelihood of effluent containing cyanide being released to the environment:

64. The Proponent shall ensure the cyanide detoxification plant is constructed and operational prior to start-up of the HLF operation so that it is readily available to treat excess cyanide contaminated water should the need arise.

65. The Proponent shall ensure that process leach solution transfer pipelines are constructed in a manner that ensures capture and containment of process leach solution in the event of uncontrolled discharge (e.g. double piping or lined trenches).

To minimize the likelihood of inaccurate water quality model predictions leading to effects on the aquatic ecosystems:

66. The Proponent shall ensure that the proposed water treatment systems are designed taking into account the uncertainty associated with the water quality predictions in advance of their Water Licence Application, including:
    a. confirmation that the water treatment system performance is adequate for the range of possible water quality model predictions; and
    b. water treatment approaches that are readily adaptable should the quality of effluent be different from that predicted.
67. As proposed, the Proponent shall ensure that a revised water quality model is submitted to responsible regulators during the regulatory review process. The revised water quality model shall include:
    a. consideration and use of additional water quality baseline data collected since the proposal was submitted;
    b. predictions for various cyanide species including total cyanide, weak acid dissociable cyanide, thiocyanate and cyanate;
    c. consideration for revised source term predictions;
    d. consideration and review of potential change from background conditions using suitable SSWQO. For example, if sufficient data are available, the SSWQO for arsenic should be derived from the review of the available water quality data for other nearby and un-impacted watersheds identified as suitable references;
    e. consideration for the updated water balance model, including review of potential contaminant loadings due to increases in ore and waste rock volumes; and
    f. support for the assumption that proposed water quality objectives for the receiving environment will be achievable with passive treatment during post-closure through the review of applicable technologies and a planned development program for the site.
68. The Proponent shall conduct monitoring of water quantity and quality from contact waters (e.g. waste rock storage areas) and non-contact waters (e.g. reference locations) during operations, closure and post-closure to verify assumptions and inform the site closure plan.

To ensure the effectiveness of passive treatment systems for the protection of aquatic ecosystems during post-closure

69. The Proponent shall provide responsible regulators with updated long-term, post-closure water quality predictions based on updated water quality modeling, water balance modeling, and groundwater modeling.
70. The Proponent shall provide responsible regulators with rationale for the assumption that proposed water quality objectives for the receiving environment will be achievable with passive treatment during post-closure through the review of applicable technologies and a planned development program for the site.
71. The Proponent shall ensure that the proposed approach for developing the passive treatment follow a phased approach that includes laboratory scale, bench scale, pilot scale, and full scale testing.

72. The Proponent shall ensure that the passive treatment system development and testing begins early enough in the Project development to ensure that detailed plans are submitted, reviewed and accepted by responsible regulators prior to decommissioning.
73. The Proponent shall ensure that the passive treatment system development includes a monitoring plan with follow-up on the performance and predicted longevity of the systems and a maintenance plan in the case that the performance and/or longevity of the systems are somehow compromised.

To ensure that contact water discharged during post-closure will not adversely affect aquatic ecosystems:

74. The Proponent shall ensure that contact water discharged by the Project during post-closure meets discharge criteria established by the responsible regulators.
75. The Proponent shall maintain active mine water treatment until contact water meets discharge criteria established by the responsible regulators or alternative treatment methods such as passive treatment systems are proven to be effective.
76. The Proponent shall ensure that means for active water treatment remain in place for a length of time, determined by the responsible regulators, as a contingency in the event of failure of the passive treatment systems.
77. The Proponent shall demonstrate of the potential benefits of the proposed water treatment system for the post-closure phase of the revised Project by providing quantitative modelling results and determining at what point further downstream water quality complies with water quality guidelines and/or site specific water quality objectives:
    a. without active or passive treatment;
    b. with active or passive treatment for the expected performance; and
    c. with active or passive treatment at regulatory release limits.

To mitigate significant adverse effects to fish and fish habitat:

78. The Proponent shall review and update the preliminary Fish Habitat Compensation Plan taking into account changes in the Project identified in the SIR and the effect of those changes on potential effects on fish habitat.
79. The Proponent shall construct the parking and staging areas along the access road in a manner that:
    a. where possible, avoids impacts to riparian vegetation within 30 m of the high water mark;
    b. where possible, avoids impacts to stream channels; and
    c. avoids the introduction of sediments into surface waters.
80. The overhead transmission line shall be constructed in a manner that:
    a. applies the mitigation measures described in the Fisheries and Oceans Canada Operational Statement for Overhead Line Construction;
    b. to the extent possible, ensures watercourse crossings to occur as close to the road crossing as possible to minimize the amount of riparian area clearing;
    c. to the extent possible, ensures short riparian shrubs and grasses are left undisturbed;
    d. ensures riparian trees and tall shrubs are topped as opposed to completely removed;
    e. ensures a qualified environmental professional (QEP) is on-site at the time of final pole location selection, and while the clearing is taking place for Haldane Creek,

North Star Creek, South McQuesten River, Bighorn Creek, Secret Creek and Haggart Creek; and

f. ensures the QEP is tasked with ensuring minimal disturbance of riparian vegetation and avoiding a harmful alteration, disruption or destruction to fish habitat as a result of the clearing.

To mitigate significant adverse effects related to permafrost degradation on environmental quality:

81. As proposed, the Proponent shall submit the consolidated results from its subsurface investigations in conjunction with their applications for a Quartz Mining License and Type A Water Use Licence.

82. The Proponent shall ensure sufficient storage is available for temporary containment, management, and thawing of excavated ice rich soils/permafrost.

To mitigate significant adverse effects related to terrain and HLF instability on environmental quality:

83. The Proponent shall implement the mitigations outlined in Section 6.0 of Appendix 4 to the Supplementary Information Report (VIT 2012a including additional information on Appendix 4 in VIT 2012b) regarding the stability of the HLF and embankment including:

    a. removal of loose or unsuitable materials from the HLF area;

    b. excavation of foundation to bedrock in area of HLF confining embankment and the diversion embankment; and

    c. installation of geotechnical instrumentation within and below the HLF to monitor and verify the that the facility components are performing as expected and to provide sufficient warning in the event of problematic conditions.

84. The Proponent shall identify and excavate ice rich soils/permafrost beneath the footprint of the HLF rather than use other methods to manage ice rich soils/permafrost (e.g. fill blankets as insulation).

85. The Proponent shall ensure that additional agglomeration test work is completed on sample ore representative of final crushing/processing output prior to loading the HLF.

86. The Proponent shall ensure long-term column tests are initiated to study the effects to stability and permeability of the HLF. Consideration should be given to the migration of fines and the behaviour of saturated of ore in the in-heap pond.

87. The Proponent shall ensure the HLF and permanent structures associated with the HLF are designed to withstand seismic ground motions from the maximum credible earthquake for long-term stability.

To mitigate significant adverse effects related to terrain and WRSA instability on environmental quality:

88. The Proponent shall use methods, other than fill blankets as insulation or preloading and draining permafrost areas, to manage areas of ice rich soils/permafrost below the WRSAs.

89. The Proponent shall implement the mitigations outlined in Section 7.0 of Appendix 7 to the Supplementary Information Report (VIT 2012a) regarding the stability of the WRSAs including:

    a. conducting additional investigations to determine the liquefaction potential; and

    b. buttressing the ice-rich lobe on Eagle Pup WRSA at an early stage in the work.

90. The Proponent shall conduct further investigations on less durable rock considered for use in the rock drains beneath the WRSAs. Should this rock be incapable of maintaining long-term drainage due to mechanical degradation, the Proponent shall ensure additional measures are implemented, such as construction of subdrains in addition to rock drains or

using alternative durable rock, to protect against reduced flow volumes and increased pore water pressure in the WRSAs.

To reduce uncertainties associated with the air quality model, as well as provide sufficient basis for future monitoring:

91. The Proponent shall update the air quality model to include emissions related to the gold recovery process (e.g. electrowinning and on-site smelting to gold doré). This includes emissions such as SO_2, PM, and metals such as arsenic, cadmium, chromium, mercury, and lead. This information shall be provided to responsible regulators during the regulatory approval process.

To mitigate significant adverse effects to air quality:

92. To minimize wind entrainment of contaminants as a result of build-up of deposits on the adsorption, desorption and recovery facility stack, the Proponent shall conduct regular inspections of the plant stack and take remedial action to remove deposits where necessary.
93. As proposed, the Proponent shall cover ore conveyance equipment.
94. The Proponent shall cover equipment where ore is loaded or discharged onto conveyors and other equipment. This is referenced in the Executive Summary to the proposal but not itemized in the Fugitive Dust Control Plan.
95. The Proponent shall implement an Ambient Air Quality Monitoring Plan developed with responsible regulators. The plan shall:
    a. consist of ambient monitoring and/or modeling for TSP, $PM_{2.5}$, metals (including arsenic, cadmium, chromium, mercury and lead) and other contaminants of potential concern (including ammonia and/or ammonia degradation products);
    b. identify all additional mitigation measures to be undertaken (e.g. enclosure of appropriate infrastructure, the construction of wind breaks, and watering);
    c. include all proposed triggers for the implementation of additional mitigation measures; and
    d. meet Yukon air quality guidelines and standards.

To eliminate, reduce or control significant adverse effects from the Project on vegetation, the following mitigative measures are required:

96. The Proponent shall develop and implement a plan for the monitoring of plant metal uptake and toxicity. The sampling locations should take into account prevailing winds and water flows. During closure and post-closure, sampling locations should include sites on the re-vegetated HLF and WRSAs.
97. As proposed, the Proponent shall implement a soil metal monitoring program in areas around the mine site. Should this program measure more than a ten percent increase in arsenic in soils around the mine site, the Proponent shall undertake additional studies to measure the arsenic uptake in plants growing in the soils with elevated arsenic and shall implement measures to decrease airborne transportation of arsenic off the mine site.
98. The Proponent shall ensure that caustic sludge is incorporated into the HLF and final closure cap in a manner to avoid or minimize vegetation uptake of contaminants.

To eliminate, reduce or control significant adverse effects from the Project on injury/mortality of moose, the following mitigative measures are required:

99. The Proponent shall, in cooperation with Government of Yukon, Department of Environment, design and conduct annual winter moose surveys consistent with methodology and study area (ten kilometres from infrastructure) used in 2011.

100. As proposed, the Proponent shall provide personnel transportation on the access road (i.e. between the Silver Trail and the mine site) and encourage its use to minimize incidental hunting opportunities and direct road mortalities.

101. As proposed, the Proponent shall implement the Wildlife Protection and Management Plan (Appendix 30 to the proposal, Conceptual Environmental Management Plans) and shall provide reports to the Government of Yukon Regional Biologist and the First Nation of Na-Cho Nyak Dun every three months.

To eliminate, reduce or control significant adverse effects from the Project on injury/mortality of grizzly and black bears, the following mitigative measures are required:

102. If den sites are discovered, the Proponent shall record these locations and avoid them until they are no longer in use by bears.

103. As per the Waste Management Plan, the Proponent shall regularly collect garbage and debris destined for disposal, and prior to incineration, shall store it in wildlife-proof containers in a manner that does not attract wildlife to the mine site.

104. The Proponent shall ensure the Wildlife Protection and Management Plan identifies measures to deter wildlife access to the mine site and facilities, including the kitchen/camp facilities, HLF, event ponds and processing areas. The Proponent shall implement specific measures to deter bear access (e.g. electric fencing, indoor storage of attractants).

To eliminate, reduce or control significant adverse effects from the Project on bird injury/mortality, the following mitigative measures are required:

105. If nests are discovered, the Proponent shall record these locations and avoid them until they are no longer in use by birds.

106. The Proponent shall avoid clearing vegetation during the migratory bird nesting season (approximately May 1st to July 31st). If clearing must occur during this period, the Proponent shall ensure nest surveys are conducted by qualified and experienced personnel prior to clearing. If active nests or migratory birds are discovered, the Proponent shall postpone activities in the nesting area until nesting is completed.

To involve the NND in the monitoring and identification of heritage resources during construction.

107. The Proponent shall hire and train cultural monitors from the NND for the initial construction phase of the Project. Cultural monitors will assist with heritage surveys in areas planned for development, monitor construction areas and assist in identifying heritage resources.

The following mitigation measure is specified to eliminate, reduce or control significant adverse effects of the Project relating to local services:

108. The Proponent shall advise the Mayo Health Centre, NND Health and Social Department, Yukon Emergency Medical Services, and the Mayo Fire Department of its health and safety protocols and emergency response plans, and collaborate with these agencies to clarify and delineate roles, responsibilities and communication among the parties.

To eliminate, reduce or control significant adverse effects from the Project on municipal waste management and treatment, the following mitigative measures are required:

109. The Proponent shall develop a plan to treat camp effluent that is suitable for the site (e.g. effective and regulatory-compliant septic field or sewage treatment plant). The plan shall include an appropriate sewage treatment design including all the necessary supporting information (e.g. sizing information, soil percolation, water table, topography, sludge disposal) and shall be provided to responsible regulators during the regulatory approval process.

110. The Proponent shall ensure that any effluent from a sewage treatment plant will meet discharge criteria acceptable to the responsible regulators.

111. If any wastes generated by the Project are to be disposed of at the Mayo landfill, the Proponent shall consult with the Village of Mayo and Government of Yukon in advance of any such disposal. The Proponent shall come to an agreement with the responsible governments such that landfill capacity or other waste management options are available to the current and future users of the Mayo landfill.

112. As committed by the Proponent, they shall develop a detailed waste management plan to address how all waste streams (including all types of solid and special waste) will be handled and disposed. This plan shall include other waste disposal options if the Mayo landfill cannot be used for the disposal of solid waste from the Project.

To ensure public and personnel safety using the South McQuesten Road and the Haggart Creek Road as access to the mine site:

113. The Proponent shall ensure that the one-lane two-way Haggart Creek Road is operated as outlined in the Eagle Gold Access Road Report (VIT 2011a, Appendix 19).

114. The Proponent shall ensure regular known users of the Haggart Creek Road (i.e. placer mining operators and the Registered Trapping Concession 81 holder) and NND have the means and knowledge to use the one-lane two-way radio controlled access road. This will include posting the radio frequency used for traffic control on signage at the South McQuesten River Bridge and where appropriate in communications with other road users.

115. During construction and operations, the Proponent shall follow-up with regular known users of the Haggart Creek Road (i.e. placer mining operators and the Registered Trapping Concession 81 holder) and NND to address concerns that may arise.

116. The Proponent shall provide regular known users of the Haggart Creek Road and NND regular updates on the schedule of transportation related activities to and from the mine site.

117. As proposed, the Proponent shall maintain a log of project vehicle-wildlife collisions. If collisions with moose are occurring more than twice a year near the South McQuesten River valley, the Proponent shall change their Traffic and Access Management to avoid these collisions (e.g. lower speed limits in this area).

118. The Proponent shall monitor the use and management of the South McQuesten Road and the Haggart Creek Road and update the Traffic and Access Management Plan, with input from the Government of Yukon, Department of Highways and Public Works, as necessary over the life of the Project.

To ensure the safety of members of the public traveling on the HCR:

119. The Proponent shall install signs on the HCR at points outside of the 1.5 km boundary identified in the Noise Assessment Report. Signs should include warnings and information relating to blasting activities including time of day and frequency.

120. The Proponent shall notify HCR users via radio in preparation of blasting events.

121. The Proponent shall monitor sound-levels related to blasting activities along that portion of the HCR that is within the 1.5 km boundary identified in the Noise Assessment Report. Should noise levels on the HCR exceed 120 dB the Proponent shall use personnel to control and inform traffic on this portion of the HCR during blasting events until such time as the noise monitoring demonstrates blasting noise is consistently below 120dB.

To ensure that appropriate reclamation and closure cost estimates are used for determining security and bonding requirements:

122. When finalizing the detailed closure and reclamation plan and estimating closure and reclamation costs, the Proponent shall consider:

a. uncertainties related to baseline data, water balance modeling predictions, geochemical characterization, derivation of SSWQO, and passive water treatment during post-closure;

b. the recommendation to conduct pilot and field scale testing for the proposed passive treatment systems; and

c. feasible closure and reclamation requirements if passive treatment systems are ineffective.

123. The Proponent shall conduct a sensitivity analysis to estimate a range of security and bonding requirements (closure and reclamation costs) at various stages of the Project.

20.0 SIGNATORY PAGE

	February 19, 2013
Stephen J. Mills	Date
Chair, Executive Committee	

	February 19, 2013
Ken McKinnon	Date
Executive Committee Member	

PART IV APPENDICES

Appendix A PROPONENT COMMITMENTS

The following table is reproduced from the proposal, Commitments Table, provided by the Proponent.

No.	Proponent Commitments	Section
Surficial Geology, Terrain, and Soils		6.4
1	VIT will complete geotechnical investigations as part of detailed mine planning during the permitting stage, prior to construction. Once exact locations for Project infrastructure have been identified, qualified professionals will carry out on-site terrain stability assessments in areas identified as having potential terrain stability issues.	6.4.6 6.4.7
2	VIT will establish a program to monitor permafrost conditions adjacent to cleared areas within the Project footprint once mine infrastructure is constructed. Downslope movement and soil moisture will be monitored. Monitoring frequency will be sufficient to assess the effects of freshet, large storm events, and other weather conditions that may affect terrain stability.	6.4.6 6.4.7
3	A qualified environmental professional/technician with appropriate knowledge and training will monitor Project construction and closure activities. The professional/technician will: 1) ensure that soil material suitable for reclamation is salvaged and stored; and 2) evaluate topsoil volumes, based on soil stockpile dimensions, to determine whether there is sufficient material for reclamation. If a shortage is calculated, additional areas of overburden salvage will be identified. If the quality of topsoil does not meet the requirements of the Conceptual Closure and Reclamation Plan (Appendix 24), additional areas of soil salvage will need to be identified.	6.4.6
4	Soil stockpiles will be checked regularly, after storm events, and during/following freshet to ensure vegetation cover is maintained and erosion control measures are effective.	6.4.6
5	VIT will monitor the effectiveness of soil mitigation to evaluate compaction, rutting, drainage and recontouring prior to revegetation.	6.4.6
6	VIT will conduct visual inspections of vegetation vigour and cover density to assess soil fertility once vegetation is established. If soil fertility has been diminished from baseline conditions, foliar analysis will be required to determine the	6.4.6 6.4.7

No.	Proponent Commitments	Section
	fertilizer amendments that may be required.	
7	VIT will implement a monitoring program (e.g., for vegetation vigour and growth, soil moisture and groundwater levels) in areas outside the mine footprint that are expected to be affected by changes in groundwater levels. These monitoring sites will be established prior to the commencement of construction activities (to establish baseline conditions) and continue through the post-closure monitoring phase.	6.4.6 6.4.7
8	VIT will establish long-term soil and vegetation monitoring sites, outside the Project footprint, to monitor for element concentrations, in particular arsenic, in soil and foliage. These monitoring sites will be established prior to construction activities (to establish baseline conditions) and continue until Year 8 of operations (when dusting is complete). Approximately 10 sites will be established throughout the area of predicted arsenic exceedance from metal loading.	6.4.6 6.4.7
9	VIT will implement an Erosion and Sediment Control Plan for the footprint area during construction, operations and closure and reclamation (Environmental Management Plans – Appendix 30).	6.4.7
Water Quality and Aquatic Biota		6.5
10	VIT's environmental managers will be familiar with relevant territorial and federal acts and regulations pertaining to protection of water quality and fish habitat in relation to mine activities.	6.5.9
11	During operations and closure, VIT will comply with Yukon and federal requirements for monitoring and reporting. This includes the requirements of the Metal Mining Effluent Regulations for effluent characterization (chemistry, acute and chronic toxicity tests) and receiving environment conditions (environmental effects monitoring programs).	6.5.9
12	If indicated by monitoring of heap seepage quality and quantity during closure, VIT will extend the use of the cyanide detoxification plant and mine water treatment plant for the time required to allow Water Quality Guidelines or Site Specific Water Quality Objectives to be met. This will provide an interim solution while the heap continues to drain and while other mitigation measures, if needed, are developed.	6.5.9 6.5.10

No.	Proponent Commitments	Section
13	VIT will assess the need for, and will select additional mitigations to meet regulatory water quality standards, based on an adaptive management approach. Possible options include: a) Using constructed or engineered wetland systems (e.g., a semi-passive anaerobic wetland) downgradient of the heap leach facility and waste rock storage areas to reduce arsenic, nitrogen and phosphorus levels. b) Developing a lower permeability reclamation cover for the waste rock storage areas. For example, decreasing net infiltration through the cover from 20% to 10% of Net P would provide a 50% reduction in seepage volumes and loads of arsenic, other metals, and nutrients. c) Further review of alternative approaches to heap detoxification used at other closed mines (e.g., at Brewery Creek nutrients were added to the heap to detoxify cyanide and reduce levels of metals and ammonia).	6.5.9
14	VIT will implement codified erosion prevention and sediment control practices and the Water Management Plan (Appendix 18) to prevent sediment release during construction (sediment control ponds).	6.5.10
15	A septic system will be designed, constructed, and operated per requirements set out in the Design Specifications for Sewage Disposal Systems May 2010 provided by Yukon Government Health and Social Services and required by the Yukon Sewage Disposal System Regulations.	5.4.2.3 of May 2012 SIR
16	VIT will construct and maintain diversion channels to keep non-contact water away from mine activities. These will be built with erosion protection measures and designed to convey large runoff volumes. Design criteria will be determined based on water license requirements.	6.5.10
17	Sediment control ponds will be constructed and maintained to allow fine sediments to settle out. Permanent sediment control ponds will be sized for a 1:200 year 24-hour flood event and temporary sediment control ponds will be sized for a 1:100 year 24-hour flood event.	5.4.4 of May 2012 SIR
18	VIT will construct a mine water treatment plant for use during operations and early closure. The plant effluent will meet Metal Mining Effluent Regulations (MMER) criteria (not acutely toxic to fish, well below MMER criteria concentrations) and effluent	6.5.10

No.	Proponent Commitments	Section
	quality criteria will be set so that metals and other parameters meet Water Quality Guidelines or Site Specific Water Quality Objectives in Haggart Creek. The criteria for nitrogen and phosphorus will be set to prevent eutrophication in Haggart Creek.	
19	Groundwater wells downstream of the waste rock storage areas will be monitored to assess accuracy of predictions of effects on groundwater quality.	6.5.10
Air Quality		6.6
20	VIT will develop and implement a Fugitive Dust Control Plan (Environmental Management Plans – Appendix 30). The plan will include the following measures: a) Manage all land clearings to minimize disturbances b) Construct haul roads with very low silt content material c) Enforce low speed limits for all mobile mine equipment d) Apply water to open surfaces and heavily used roads (in the summer months) e) Control active pit haul roads and active customer haul roads by periodically wetting surfaces using a water truck f) Water inactive roads to suppress dust if there is visible evidence of fugitive dust emissions (e.g., dust clouds resulting from wind) g) Water active roads, in hot, dry conditions, at least once every three hours unless meteorological conditions (e.g., rain, frozen surfaces, etc.) are adequate to suppress dust to a degree that is equivalent to 3-hour periodic watering h) Record fugitive dust suppression activities daily using a fugitive dust suppression log i) Establish a PM monitoring system with one monitor located in both the northwest and southeast perimeter of the mine site j) Make available the fugitive dust suppression log to authorized Yukon's representatives upon request.	6.6.2.2 6.6.5
21	VIT will develop and implement a Combustion Source Control Plan (Environmental Management Plans – Appendix 30). The	6.6.5

No.	Proponent Commitments	Section
	plan will include the following measures: a) Use diesel fuel with low sulphur content following Canadian Tier 4 regulation b) Enforce low speed limits for all mobile mine equipment c) Ensure all mine equipment is properly tuned and maintained d) Reduce vehicle idling times e) Maintain a criteria air contaminants emission inventory and make available to authorized Yukon's representatives.	
Fish and Fish Habitat		6.7
22	VIT will provide qualified environmental managers who will be familiar with relevant territorial and federal acts and regulations pertaining to instream construction activities related to fish and fish habitat protection.	6.7.7
23	The following are commitments of particular importance to fish and fish habitat: a) During construction, inspection and monitoring of suspended sediments will be required within Project area watercourses to ensure sediment and erosion control measures have been implemented effectively and are functioning in accordance with regulatory requirements and commitments in the Erosion and Sediment Control Plan (Environmental Management Plans – Appendix 30) b) During operations and closure, monitoring will be conducted periodically to confirm that reclamation efforts and environmental protection measures, such as sediment and erosion control provisions, are properly maintained and functioning until no longer required. c) Once mitigation measures are no longer required, the VIT environmental manager will ensure that non-biodegradable materials are removed and disposed of in an appropriate manner. d) During operations and closure, water quality monitoring programs will comply with Metal Mining Effluent Regulations' requirements for effluent characterization and receiving environment conditions.	6.7.7

No.	Proponent Commitments	Section
24	VIT will compensate for lost fish habitat where a harmful alteration, disruption or destruction (HADD) is unavoidable by: a) Developing a Fish Habitat Compensation Plan (Appendix 23) for Fisheries and Oceans Canada (DFO) approval b) Conducting post-construction follow-up studies on fish and fish habitat to assess effectiveness of compensation works as detailed in the Preliminary Fish Habitat Compensation Plan. c) Designing channel diversions to include streamside vegetation and functioning riparian areas.	6.7.7
25	VIT will implement the following measures to control soil erosion and leaks from equipment into fish habitat: a) Minimize the extent of clearing, grubbing, and grading adjacent to watercourses to that required for safe vehicle access and construction activities b) Restrict vehicle and construction traffic in the vicinity of water courses to existing roads, and restrict crossing to existing bridges where possible, using appropriate temporary crossing methods where needed (e.g., temporary bridges) c) Flag environmentally sensitive areas before clearing and construction begins near watercourses d) Re-vegetate where soil stabilization and erosion control is required e) Protect stockpiles from erosion with tarps, sumps, or berms f) Stage the timing of activities for construction within 16 m of all watercourses and retain buffer zones until construction activities begin to limit time of bank and soil exposure g) Maintain 30 m riparian buffer between mine components (including temporary work spaces and stockpiles) and fish-bearing watercourses h) Implement a rigorous erosion and sediment control program including sediment and erosion control ponds sized to 1:100 year 24-hour flood event i) Monitor total suspended solids and turbidity levels from sediment control ponds prior to release j) Ensure industrial equipment operating near fish-bearing watercourses is in good working order and free of leaks.	Table 6.7-6

No.	Proponent Commitments	Section
26	VIT will take the following actions to minimize effects of instream work: a) Isolate all instream works within fish-bearing water courses or non-fish-bearing water courses where instream works have the potential to affect fish-bearing waters downstream b) Time instream and riparian construction activities to avoid high risk weather and flow conditions c) Time construction activities to avoid key fish migration periods d) Construct new habitat, where appropriate, to facilitate fish passage e) Place material and instream structures in a manner that does not inhibit fish passage or impede migration, and prevent the formation of fish barriers when conducting instream works f) Minimize the time that instream works occur g) Conduct instream work on fish-bearing watercourses during established Least Risk Periods where practicable to avoid conflicts with critical life-history stages h) Ensure instream work does not occur in spawning areas if conducted outside of established Least Risk Periods i) Manage flow diversions and water extraction to ensure adequate flows are maintained for fish passage j) Conduct fish salvages before isolating channels for instream work or diversion and prior to infilling watercourses for mine development k) Re-introduce flows to isolated watercourses immediately downstream of isolated areas to avoid fish stranding l) Dissipate discharge water energy where flows are reintroduced to fish-bearing watercourses.	
27	Follow Fisheries and Oceans Canada (DFO)'s Freshwater Intake End-of-Pipe Fish Screen Guideline when placing intakes for pumps in fish-bearing water courses.	Table 6.7-7
28	Incorporate recommendations from DFO's Guidelines for the Use of Explosives in or near Canadian Fisheries Waters to the	Table 6.7-7

No.	Proponent Commitments	Section
	greatest extent possible where blasting in or near fish-bearing watercourses.	
29	VIT will not conduct blasting in any instream work areas that have not been dewatered. For fish bearing watercourses, VIT will not dewater the watercourse before the work area has been isolated and fish salvage completed.	VIT Comments on DSR
Vegetation Resources		6.8
30	VIT makes the following monitoring commitments: a) Include results of revegetation monitoring in Annual Reclamation Reports submitted to Yukon Energy, Mines, and Resources. b) Work with the First Nation of Na-Cho Nyäk Dun to incorporate traditional environmental knowledge in reclamation programs and investigate opportunities to involve community members in monitoring programs c) Conduct vegetation sampling in conjunction with soils sampling during all Project phases to monitor the extent and effects of metals loading as a result of dust deposition. d) Develop a monitoring plan (during the permitting process to monitor trace elements in vegetation and to further define the baseline trace element concentration in species used by First Nations and wildlife. Continue monitoring throughout the operations phase to validate the predictions for soils metals loading made by the dust dispersion model. e) Reclamation research and monitoring—a reclamation research program will be established during the operations phase with the purpose of establishing trials on the Platinum Gulch waste rock storage area. This program will investigate various planting and seeding practices appropriate to site-specific closure issues and end land-use objectives, including the use of native and traditional use species. Reclamation monitoring will be continued in the closure and post-closure phases with the purpose of assessing reclamation success.	6.8.7 6.8.8
31	VIT makes the following commitments to mitigate against invasive species: a) Vegetation communities adjacent to Project disturbance will be monitored throughout all Project phases to ensure that	6.8.8 6.8.4.2

No.	Proponent Commitments	Section
	populations of invasive plant species are promptly identified as they become established and that appropriate control measures are applied in a timely manner. b) Follow guidelines to prevent the introduction and spread of invasive plants as per the Invasive Plants Management Plan during all Project phases (Appendix 24 – Eagle Gold Conceptual Closure and Reclamation Plan) c) Minimize the extent of grubbing, soil stripping, and the removal of shrubs and herbaceous species, where possible, to reduce the area of bare ground potentially subject to invasive plant establishment d) Mitigate against the establishment of invasive species and reduce erosion potential by re-establishing native vegetation on disturbed areas as soon as possible e) Ensure that construction equipment is clean and free of soil and seeds before mobilizing to the Project site f) Use native species, to the greatest extent possible, during all Project phases, but most specifically during closure and reclamation phases to re-vegetate disturbed sites	
32	VIT makes the following commitments to minimize potential effects of clearing on vegetation resources: a) Flag and stake known rare plant locations near the maximum disturbance boundary and instruct equipment operators to avoid these areas. Conduct regular monitoring of these sites during construction and operations. b) Reduce vegetation loss in areas around the footprint perimeter by adhering closely to construction plans, and avoiding off-site machine use. c) Clear the necessary trees and tall shrubs within the transmission line RoW during periods when the ground is frozen and snow-covered to minimize the disturbance to low shrubs, the moss layer, and topsoil. d) Minimize the extent of grubbing, stripping, and the removal of shrubs and herbaceous species where possible. e) When clearing is required, retain the humus layer and vegetation root mat, when possible. f) Re-vegetation of disturbed soils where appropriate to encourage slope stability and minimize soil degradation and erosion.	6.8.2.2 6.8.4.2
33	VIT makes the following commitments to minimize potential effects on wetlands and riparian areas:	6.8.2.2

No.	Proponent Commitments	Section
	a) Minimize disturbance in sensitive areas by implementing best management practices including the creation and maintenance of buffer zones around riparian and wetland ecosystems. b) Maintain existing drainage patterns to and from wetlands in areas outside of the disturbance footprint. c) When clearing is required, retain the humus layer and vegetation root mat to the extent practical, to reduce the potential for soil erosion and deposition in riparian and wetland ecosystems. d) Employ hand cutting of vegetation near access road and transmission line stream crossings to reduce disturbance to riparian areas during construction of the transmission line.	6.8.4.2
34	VIT commits to the following to mitigate the potential of dust and consequent metal loading on vegetation resources: a) Adherence to the Fugitive Dust Control Plan (Environmental Management Plans – Appendix 30) b) Sampling of vegetation (plant tissue) within the area of predicted metals loading to the east of the mine site. Additional dust mitigation measures will be applied if soil monitoring confirms the predicted loading increase (>10% increase above the baseline).	6.8.3.2
Wildlife		6.9
35	VIT will implement annual aerial mapping of winter moose distribution within 5 km of the access road and mine site and in adjacent control areas. This will be conducted before construction (in 2011 and 2012), during construction, and during mine operations, to allow assessment of displacement and population reduction resulting from mine activities, and adaptive management measures if negative effects occur.	6.9.7
36	VIT commits to the following monitoring of wildlife resources: a) VIT will track and report all wildlife incidents to the authorities as appropriate (e.g., wildlife vehicle collisions, nuisance wildlife occurrences, bear encounters or problem bears). During construction and operations, the environmental manager will document observations of species at risk and the five focal species used in this assessment (moose, grizzly bear, American marten, Olive-sided Flycatcher, Rusty Blackbird) on the access road and immediately around the mine site. If requested by	6.9.7 Table 6.9-15

No.	Proponent Commitments	Section
	the Yukon Government, an annual report will be prepared to summarize any observed trends and any changes to the Wildlife Protection and Management Plan that have been implemented as a result of these observations (Environmental Management Plans – Appendix 30). b) Close collaboration with both the First Nation of Na-Cho Nyäk Dun and the Yukon Government to understand harvest rates of moose in Game Management Subzones adjacent to the mine site and proposed access route c) Monitor the implementation of all mitigation measures and make adjustments where necessary.	
37	VIT commits to the following measures to mitigate the potential effects of the access road and Project-related traffic on wildlife resources: a) Monitoring of volume and type of vehicle traffic along the access road b) Monthly monitoring of snow depths along the access route to the mine and at the mine site c) Share information to minimize the risk of vehicular collisions with wildlife. VIT will: a) promote proactive radio communication among users of the access road to convey safety information, including sightings of large wildlife species along the road; b) provide and maintain signage where problems are most likely to occur, reminding drivers to be vigilant for wildlife and give them the right of way; and c) verbally report collisions and/or carcasses of ungulates and other large animals observed on and in the vicinity of the Project site and along the access road to the Environmental Manager, Mine Manager or designate(s) as soon as possible to ensure prompt removal. Near misses and collisions that result in the death or injury of an ungulate or other large animal must be reported as soon as possible. Measures will be developed in coordination with overall road planning with Yukon Government Highways and Public Works. d) Implement speed limits to minimize dust and reduce wildlife collisions. The proposed maximum speed limit will be 60 km/h on the access road where speed limits are not designated by Highways and Public Works or a road design engineer e) Provide and encourage the use of personnel transportation (busing) to the mine site, minimizing opportunities for wildlife vehicular collisions.	6.9.7 Table 6.9-15
38	VIT will implement the following clearing practices to minimize potential effects on wildlife:	Table 6.9-

No.	Proponent Commitments	Section
	a) Minimize Project footprint. Site clearing will be minimized to only the area needed to safely construct and operate the Project. Before clearing, wildlife habitat features (e.g., mineral licks, dens, nest trees, snags, rocky outcrops, small ponds/seepages) will be identified and evaluated to determine if they can be maintained. Even if small, these patches will benefit wildlife and contribute to reclamation. b) Clear vegetation outside of the breeding bird windows. Where this is not possible, VIT will consult with the appropriate regulators (Yukon Government, CWS) and develop management strategies. These strategies are likely to include surveying the area to be cleared for nests a maximum of one week prior to clearing. Bird nests will be identified and protected until nesting has completed.	15
39	To minimize aircraft overflight disturbance, Project-related aircraft activity will follow flight restrictions agreed to with Yukon Government. This may include minimum flight altitudes and flight paths to avoid sensitive habitats during specific times of year.	Table 6.9-15
40	Implement a progressive Conceptual Closure and Reclamation Plan (Appendix 24). VIT will: a) re-vegetate reclamation areas with native species consistent with surrounding vegetation, except where regulatory agencies indicate that natural succession is preferable; and b) maximize use of direct placement techniques (minimizing stockpiling) to minimize the loss of biological activity in reclamation capping materials.	Table 6.9-15
41	VIT will enact a policy that restricts employees, management, and contractors from possessing firearms throughout the life of the Project. The policy will include additional restrictions pertaining to hunting and fishing, also to be in effect throughout the life of the Project.	Table 6.9-15
42	VIT will implement the following measures to minimize problem wildlife-human interactions: a) Develop a problem wildlife prevention and response plan as part of the Wildlife Protection and Management Plan (Environmental Management Plans – Appendix 30). This will include implementation of a Bear Aware Program as a standard part of the health and safety orientation and will make supporting materials (e.g., pamphlets, videos) readily available on site. The plan will be designed with guidance from Yukon Government and their “Guidelines for Industrial Activity in Bear Country”	Table 6.9-15

No.	Proponent Commitments	Section
	and will include food and waste storage protocols to avoid attracting wildlife (primarily bears) that could become a nuisance. b) Manage vegetation to reduce effects on wildlife. VIT will: a) minimize or eliminate the use of vegetation attractive to bears and ungulates (e.g., legumes) in seeding mixtures used along roadsides; b) cut brush early in the growing season, before it becomes an attractant to large wildlife species; and c) use manual clearing rather than herbicides in vegetation management activities.	
43	VIT will reduce bird mortality risk along the transmission line RoW by following existing design guidelines such as the Avian Protection Plan Guidelines and Suggested Practices for Avian Protection on Power Lines.	Table 6.9-15
44	To reduce wildlife mortality in the Heap Leach Facility area, events ponds and ditches, VIT will: a) fence and control (minimize) the growth of vegetative cover at any mine site location with compromised water quality (e.g., events ponds); b) not reclaim events pond shorelines; c) use BirdBalls or a reasonable alternative to deter waterfowl or other birds from landing on ponds that would pose a health risk to them (e.g., containing the heap leach pregnant solution); and d) design ditches and sediment ponds to reduce potential for entrapment of wildlife.	Table 6.9-15
45	Follow VIT procedures and regulatory requirements for the safe and prompt clean up of any chemical spills.	Table 6.9-15
Heritage Resources		6.10
46	VIT is committed to the protection of heritage resources and will implement a Heritage Resources Protection Plan (Environmental Management Plans – Appendix 30) and a Fossil and Artifact Discovery Record (Appendix 32) to recover and quickly report the chance discovery of heritage resources during Project activities.	6.10.3

No.	Proponent Commitments	Section
47	For those heritage resource sites that cannot be avoided during construction, VIT will follow mitigation measures as required by the Department of Tourism and Culture.	
Socio-economic		6.11
48	VIT will cooperatively develop a process with FNNND, VoM, the Yukon Government and others for confirming socio-economic indicators, reporting and responding to monitoring results. Key socio-economic indicators for the Project will be monitored by VIT. To support that process, VIT proposes establishing and convening a Committee of representatives of the FNNND, VIT and VoM. The Committee would be chaired by VIT. Representatives of the RCMP, Yukon College, and responsible government agencies would be invited to attend or input to information as appropriate.	6.11.7
49	VIT will strive to hire as many FNNND citizens, other local and Yukon residents as practical.	6.11.2
50	VIT will provide advice, expertise, mentorship and program development assistance to employment training programs, to be developed by Yukon College, the FNNND, and the Yukon Mine Training Association.	6.11.2
51	VIT will offer summer employment aimed at students who are returning to school.	6.11.2
52	VIT will develop a Business Opportunities pamphlet.	6.11.2
53	VIT will establish a database of local and Yukon businesses.	6.11.2
54	VIT will seek to ‘right-size’ contracts where practical to facilitate greater access for local contracting opportunities.	6.11.2
55	VIT will assist in facilitating the exchange of information between parties who are interested in possible joint ventures.	6.11.2
56	VIT will continue to communicate its plans and timing of proposed activities to other resource users (e.g., trappers, outfitters, quartz and placer miners, and known subsistence harvesters).	6.11.2

No.	Proponent Commitments	Section
57	VIT will commit to provide employment and business opportunities to qualified FNNND citizens, the Na-Cho Nyäk Dun Development Corporation, other local or Yukon businesses.	6.11.2
58	VIT will provide advice, expertise, mentorship and program development assistance as it relates to educational programs, to be developed by Yukon College, the FNNND, the Yukon Mine Training Association, and potentially other organizations.	
59	VIT will engage with FNNND, Yukon College, MTA, and the Yukon Government to promote mining-related training programs.	
60	VIT has committed to a range of safety and health measures to ensure the well-being of workers at the Project.	
61	Commitments related to Wildlife, Vegetation Resources, and Fish and Fish Habitat are relevant in terms of potential effects on ‘Other Local or Regional Economic Activities’ (e.g., outfitting, tourism, trapping and maintenance of traditional subsistence lifestyles).	6.11.3
62	Improvements and radio-controlled access for a portion of the South McQuesten Road in a fashion that minimizes the loss or disruption of access to subsistence harvesting areas.	6.11.3
63	VIT will provide Cultural Awareness Training for all employees.	6.11.3
64	VIT will provide opportunities for FNNND citizens to participate in ongoing environmental monitoring activities.	6.11.3
65	VIT will hire a community liaison person.	6.11.5
66	VIT will provide support for programs and initiatives at both J.V. Clark School and the Mayo campus of Yukon College.	6.11.5
67	VIT will have employees transported directly to the Project and housed on-site to restrict unwanted access to Mayo.	6.11.5

No.	Proponent Commitments	Section
68	VIT will encourage its employees, who are residents of Mayo, to continue or initiate involvement in community activities or organizations.	6.11.5
69	VIT will have on-site first-aid and trained emergency personnel to provide primary care.	6.11.5
70	VIT will establish an Emergency Response Plan for the Project.	6.11.5
71	Employees and their families will have access to benefits programs.	6.11.5
72	VIT will make known the government and community agencies that are taking the lead on prevention, awareness, and treatment programs for mental health and addictions.	6.11.5
73	VIT will work with the Mayo Health Centre to provide drug testing services.	6.11.5
74	VIT has committed to a range of safety and health measures to ensure the well-being of workers at the Project.	6.11.5
75	VIT will work with Mayo Health Centre to discuss all necessary staffing and equipment to meet Project needs.	6.11.5
76	VIT will have an employment policy that will ensure the health and safety requirements of the company.	6.11.5
77	VIT will provide life and employment skills (e.g., budgeting and finances; dealing with rotational shifts and family challenges) opportunities for Project employees.	6.11.5
78	VIT will work with FNNND and VoM to develop contingency plans to address accommodation needs of Project employees due to weather or other emergencies.	6.11.5
79	VIT will work with emergency service providers (RCMP, fire department, ambulance service) to identify training and equipment required.	6.11.6

No.	Proponent Commitments	Section
80	VIT will implement best practices and policies with respect to health and safety and for transportation (e.g., speed, safe driving practices).	6.11.6
81	VIT will provide on-site security to alleviate potential demand for RCMP services.	6.11.6
82	VIT will engage with the VoM and Yukon Government to discuss anticipated waste volumes and determine the availability of appropriate waste management facilities and programs.	6.11.6
83	No public vehicle access will be allowed at the mine site—Emergency response organizations that service the access road will be trained in terms of the types of materials transported and appropriate response.	6.11.6
84	Prior to commencement of radio control use on the HCR, a Radio Use Policy will be established.	6.11.6
85	VIT will perform regular maintenance on the HCR to ensure safety, maintain road condition.	6.11.6
86	VIT will utilize the International Cyanide Management Code to guide the use and management of cyanide at the Project.	6.11.6
87	VIT plans to transport employees travelling from Whitehorse to Mayo using chartered aircraft and bus services.	6.11.6
88	VIT will investigate opportunities for ‘flight sharing’ that would allow local residents, on a user pays basis.	6.11.6
89	VIT will engage with FNNND, VoM, YG and others to determine if upgrades to the Mayo airport facilities or services are needed.	6.11.6
90	VIT will meet the design criteria of Yukon Energy Corp. in design of the transmission line to supply the Project.	6.11.6
91	VIT will discuss any specific needs that may result from the Project with program and service delivery agencies, both the FNNND, and VoM. Collectively VIT, FNNND, and VoM may engage in discussions with the Yukon Government as	6.11.6

No.	Proponent Commitments	Section
	appropriate on matters of shared interest	
92	VIT will ensure that the presence and use of firearms are restricted on the Project site. The restrictions will extend to employees, management and contractors. In addition VIT will develop a policy restricting Project-related employees and contractors from hunting and fishing while on the job at any time throughout the life of the Project.	6.11.3
93	VIT will implement a substance control policy for mine employees. This policy may include mandatory pre-employment testing and random drug testing during employment for all mine employees. The substance control policy will include protocols for how VIT will deal with employees found consuming alcohol or drugs on site, found to be under the influence of alcohol or drugs, or otherwise failing a drug test.	6.11.5
Carbon Management		7
94	VIT will work with the federal and territorial governments to meet the greenhouse gas targets contained within their respective plans. To achieve this VIT commits to: a) Using best available technology economically achievable to meet or exceed relevant regulatory emission standards for all mine equipment b) Enforcing low speed limits for all mobile mine equipment c) Ensuring all mine equipment is properly tuned and maintained d) Reducing vehicle idling times e) Supporting territorial initiatives to minimize greenhouse gas emissions during the construction and operations phase of the Project.	7
Accidents and Malfunctions		8
95	VIT is committed to worker and public health and safety. Through compliance with the *Worker's Compensation Act* and Regulations, the *Occupational Health and Safety Act*, and the *Public Health and Safety Act,* VIT will ensure its operations	8.1.1.2

No.	Proponent Commitments	Section
	are conducted to minimize risk through training, awareness, and continuous improvement. VIT works to instil a culture of safety throughout all levels of the organization and will make safety the top priority at the mine site. Worker health and safety will form a component of the detailed Occupational Health and Safety Plan developed as part of the Quartz Mining License application (Environmental Management Plans – Appendix 30).	
96	VIT will have on-site personnel with emergency first-aid training to provide primary care in the event of an accident, and will establish an Emergency Response Plan for the Project (Appendix 33). VIT will ensure first responders with training specific to hazardous materials used for the Project (e.g., cyanide) are on hand at the mine site at all times. All employees will be WHMIS (Workplace Hazardous Materials Information System) trained.	8.2.1.1 8.2.2.1
97	VIT will implement the following to maximize road and transport safety: a) Work with the Department of Highways and Public Works to ensure both public and private portions of the access road are properly maintained and upgraded as required b) Enforce speed limits for all Project vehicles c) Ensure trucking/hauling contractors have appropriate driver training, radio contact capabilities, vehicle maintenance requirements, and spill response capabilities d) Ensure all hazardous materials are transported and handled in accordance with the Transportation of Dangerous Goods Act and Regulations e) Require bulk carriers to carry two-way radios to communicate with the mine site f) Post signage along Haggart Creek Road (a two-way, one-lane radio controlled access road with regular vehicle pull-outs to allow passing) and ensure non-Project traffic is aware of radio protocols g) Identify wildlife migration corridors and crossings along the road and provide signage in high risk areas h) Plow wildlife crossing and escape points in the access road snow banks (i.e., 0.5 m or less at regular intervals).	8.2.1.1
98	VIT commits to the following spill prevention and response measures:	8.2.2.1

No.	Proponent Commitments	Section
	a) If there is any doubt regarding the size of a spill, material involved, and whether it is reportable, VIT will err on the side of caution and report the spill. b) Caches of spill response materials will be placed along the access road as required by the Spill Contingency Plan (Appendix 30), including at the Haggart Creek crossing. c) Project staff will have appropriate emergency response and spill contingency training and knowledge. Equipment, materials, and procedures will be maintained to limit the consequences of releases to the environment through prompt containment and clean-up. d) Fuels, hydrogen peroxide, and other hazardous liquids will be transferred from tanker trucks to storage tanks by enclosed lines, hoses, and pumps equipped with pressure transducers and volume counters to ensure tanks cannot be overfilled. e) No lubrication, refueling or maintenance of equipment will occur within 30 m of wetlands or watercourses. f) All fuelling and lubrication of construction equipment will be carried out in a manner that minimizes the possibility of spills. All containers, hoses, and nozzles will be free of leaks and all fuel nozzles equipped with functional automatic shut-offs. g) Where stationary equipment cannot be relocated more than 30 m from a watercourse, it will be situated in a designated area that has been bermed and lined with an impermeable barrier with a holding capacity equal to 125% of the largest tank within the berm. h) Equipment operators will be appropriately trained in spill response procedures and carry spill kits capable of handling spills on land and water.	Table 8.1-1
99	VIT commits to the following cyanide-specific measures for preventing vehicle accidents and spills in the transport and handling of cyanide: a) Cyanide briquettes will be transported in bulk super sacs designed to protect the product from moisture. Super sacs will be contained within wooden boxes to protect them during transport. b) A pilot vehicle will lead cyanide shipments from Mayo to the mine site.	8.2.2.1

No.	Proponent Commitments	Section
	c) Cyanide shipments will be tracked using GPS. d) A certified cyanide transporter will be used and appropriate driver training, radio contact capabilities, vehicle maintenance, and emergency cleanup kits will be ensured. e) A Cyanide Transportation Management Plan will be developed as part of the Environmental Management Plans (Appendix 30) outlining contractor responsibilities, emergency response procedures, and training requirements. f) Sodium cyanide will be mixed with water in a well-ventilated area and maintained at a high pH to prevent the evolution of hydrogen cyanide gas. g) Cyanide solution will be applied to the heap using buried drip emitters, minimizing the potential for solution to escape to the environment.	
100	VIT will store and handle explosives in accordance with a magazine license issued by Natural Resources Canada. Explosives and blast caps will be stored in separate facilities, away from operational areas.	8.2.2.1
Noise		Appendix 10
101	VIT is committed to managing noise issues and to promptly responding to any reasonable noise complaint. To meet its commitment, VIT will: a) Develop a Noise Abatement Plan (Environmental Management Plans – Appendix 30) b) Minimize the effects of blasting noise on people by applying British Columbia Occupational Health and Safety Regulations (Part 7) for employees and restricting public access to the mine site c) Limit noisy activities (including blasting) to the least noise-sensitive times of day (between 7:00am and 10:00pm) d) Locate all stationary construction or mining equipment (i.e., crushers, compressors, and generators) as far as practicable	Appendix 10; 4.2

No.	Proponent Commitments	Section
	within Project boundary e) Locate major crushing equipment and other noise-generating equipment (e.g., blowers and air compressors, etc.) inside buildings wherever possible f) Perform regular inspection and maintenance of vehicles and equipment to ensure that they have high quality mufflers installed and that worn parts are replaced g) Follow posted vehicle speed limits h) Maintain Project roads to minimize vehicle noise associated with vibration i) Turn off equipment when not in use and when practical to do so j) Ensure, by restricting access to the mine site, that recreational land users are not present in the vicinity of the mine during blasting operations .	
Conceptual Closure and Reclamation Plan		Appendix 24
102	In developing the Conceptual Closure and Reclamation Plan, VIT will: a) Use Guidelines for Reclamation/Revegetation in Yukon as a guide for selecting appropriate candidate reclamation species to be assessed by seeding/planting trials. b) Take measures that will reduce the likelihood of plant infestations from occurring and actively manage infestations that may become established on mine operations areas. c) Address invasive plant establishment through the development and implementation of an Invasive Plant Management Program that will be conducted over the mine Project life.	Appendix 24; 2.2 2.6 2.6.1
103	In the event that invasive plant populations do become established on the mine site or associated disturbances, VIT will utilize one or a combination of methods (pulling, mowing or cutting, burning, herbicide spraying, biological control) to control these infestations. VIT will liaise with Yukon Invasive Species Council (YISC), Environment Yukon (EY) and other proponents to keep informed of invasive plant species and management strategies in the region. VIT will focus its invasive	Appendix 24; 2.6.4

No.	Proponent Commitments	Section
	plant management activities on species that have been categorized by YISC and EY as species of concern, species that are listed for Yukon as noxious weeds, and invasive plant species that pose a threat to humans, animals, or ecosystems.	
104	VIT will maintain responsibility for the operation of the Project and all environmental programs and reclamation activities on site. The Environmental Manager will maintain overall responsibility for all environmental issues on site. The Chief Environmental Scientist will be responsible for ensuring that all environmental monitoring and reclamation programs are carried out during construction, operations and closure. These programs will be implemented with the use of additional staff, consultants, and contractors where necessary.	Appendix 24; 2.7
105	During construction, an environmental monitor will be on site to monitor activities and to verify compliance with the provisions of all applicable permits, licenses and approvals. The environmental monitor will: a) Conduct monitoring programs as required under the respective permits, licenses, and approvals, and report the results of such programs, as required b) Ensure that soil salvage and replacement activities are completed appropriately to meet reclamation objectives c) Ensure that vegetative erosion control cover is established on soil stockpiles and on any other areas of disturbance, as appropriate d) Provide direction and recommend implementation measures aimed at avoiding or minimizing adverse environmental effects e) Implement erosion control measures such as installation of riprap, erosion control blankets, silt fences and filter fabrics.	Appendix 24; 2.7
106	As soon as reclamation areas become available, VIT will establish trials testing plant species suitable for reclamation in the Project footprint and trials testing vegetation establishment/growth on various topsoil depths and waste rock material. Information obtained from the trials/monitoring programs will be used to adjust reclamation activities or methods that will be best suited for reclaiming remaining mine disturbance areas.	Appendix 24; 2.8
107	VIT will maintain financial security acceptable to the Yukon government during temporary closure.	Appendix

No.	Proponent Commitments	Section
		24; 2.10.3
108	The Haggart Creek Road will remain in place at closure. Following closure of the HLF and site facilities, the main access road within the Project footprint will be permanently closed and reclaimed. However, it is proposed that a single lane road will remain to provide access to the Potato Hills. The road will be left in a semi-permanent, deactivated condition which will allow the road to remain passable and be environmentally stable.	Appendix 24; 3.6
109	VIT will monitor wildlife use/response to reclaimed areas within the mine site footprint	Appendix 24; 5.6
Environmental Management Plans		Appendix 30
110	VIT is committed to developing and implementing Environmental Management Plans (Appendix 30) with the following components: a) Erosion and Sediment Control Plan b) Fugitive Dust Control Plan c) Combustion Source Control Plan d) Vegetation Management Plan e) Wildlife Protection and Management Plan f) Environmental Monitoring Plan g) Schedule of Environmentally Sensitive Activity h) Heritage Resources Protection Plan i) Traffic and Access Management Plan	Appendix 30

No.	Proponent Commitments	Section
	j) Occupational Health and Safety Plan k) Cyanide Transportation Management Plan l) Spill Contingency Plan m) Noise Abatement Plan n) Waste Management Plan o) Water Management Plan p) Closure and Reclamation Plan.	
Qualitative Human and Ecological Health Assessment		Appendix 31
111	VIT will monitor metals in surface water and soils during mine operations, and in surface water post-closure, to ensure that concentrations do not pose a health risk to humans or fish and wildlife. Mitigation measures will also be required to prevent potential exposure of humans or wildlife to contaminated surface water in the pit lake post-closure.	Appendix 31; 7
Emergency Response Plan		Appendix 33
112	VIT is committed to developing and implementing an Emergency Response Plan (ERP). The ERP will provide risk management planning and contingency response measures to address accidents, malfunctions, and emergencies that may arise at the mine site during any Project phase. The ERP will also establish notification responsibilities and response procedures in the event of an emergency. The ERP will include the following commitments: a) VIT will require that all personnel and contractors be familiar with the ERP and emergency response procedures. Personnel will also be made aware of the location of equipment to be used in emergency response, and will be asked to report any concerns regarding emergency response preparedness to their supervisor.	Appendix 33; 1 Appendix 33; 1.2 Appendix 33; 1.2 Appendix 33; 1.3

No.	Proponent Commitments	Section
	b) VIT will review and revise the ERP regularly and following any incident to ensure the relevant information remains current, comprehensive, and effective (e.g., contact information of responders, Materials Safety Data Sheets [MSDSs] etc.) c) VIT will periodically test the ERP to ensure its effectiveness during an emergency. The nature and timing of tests, along with the outcomes, will be recorded and used to inform modifications to the ERP. Random, unannounced emergency drills may be carried out from time to time to ensure preparedness of response crews. d) Members of the Emergency Response Team (ERT) will have access to and be familiar with MSDSs and workplace hazardous materials information system (WHMIS) sheets for all chemicals and hazardous substances transported, stored, and used on-site. e) Resource inventories of personnel, equipment, first aid kits, spill kits, and clean-up materials will be maintained on-site and updated regularly. These inventories will also contain information on external resources available off-site (e.g., RCMP, fire department, other mining establishments in the vicinity). f) All staff on site will receive basic training, including environmental awareness, general emergency response, spill contingency measures, and communication procedures. Truck drivers transporting hazardous materials will also receive additional training on spill response, hazardous material handling, and emergency driving techniques. All security personnel will be trained in first aid. g) Periodic inspections will be carried out to verify that all emergency response equipment is available and in good repair. The inspections will check that records of maintenance and repairs for each piece of equipment are current, repairs are complete, and that appropriate recommendations have been made. Inspections will also be carried out at all facilities involved in the handling or storage of hazardous materials or waste streams. An inspection reporting schedule and location checklist will be provided by a designated manager at the mine site.	Appendix 33; 1.4 Appendix 33; 1.6

The following table are proponent mitigations outlined in Section 6 of the proposal

No.	Proponent Mitigation	Section (page #)
Surficial Geology, Terrain and Soils		
1	Follow and adapt, as necessary, the Soil Material and Handling Plan and Conceptual Closure and Reclamation Plan during construction and progressive reclamation and at final reclamation as that is the primary mitigation for soils.	6.4.6 (6-57)
2	There are 179.9 ha of permafrost within the Project footprint, the majority of which (132.7 ha) will be removed as a result of soil and overburden stripping from the mine features area.	6.4.1.4 (6-29)
3	Best Management Practices outlined by Yukon Occupational Health and Safety Regulations (YWCHSB 2006) set out minimum design criteria for safety considerations. Mine haul road design guidelines developed by the University of Alberta (Tannant and Regensburg 2001) will also be reviewed to determine BMPs.	6.4.1.4 (6-29)
4	Dublin Creek will be diverted. This will mitigate against flooding potential in northern part of Dublin Gulch and on Haggart Creek floodplain.	Table 6.4-4
5	Under-drainage to collect seepage visible in disturbed areas has been designed, especially in centre of Eagle Pup along creek.	Table 6.4-4
6	Safety margin has been built in to account for potential reduction in stability due to removal of frozen layers, especially in northeastern portion of Eagle Pup and steep west-facing slope, and secondary crushing area.	Table 6.4-4
7	At rockfall areas, particularly near the base of Ann Gulch where it meets Dublin Gulch, stabilization will be designed.	Table 6.4-4
8	Stabilization of rockfall areas have been considered in the construction method (i.e. placement of material in an upslope direction will provide a buttressing/stabilizing effect to the steep slopes). Gullies on the north slope of Platnium Gulch likely require scrapping down to bedrock before waste rock is placed. This removal of colluviums should mitigate any potential	Table 6.4-4

	erosion of waste rock within the existing gullies.	
9	Large fault to southeast of open pit will be considered in mine design.	Table 6.4-4
10	In areas of gullying and solifuction with no overlap of permafrost with geohazards, monitoring of permafrost thaw will occur.	Table 6.4-9
11	Avoiding areas of known unstable and potentially unstable terrain through Project design where feasible, and locating Project infrastructure and activities on stable slopes (Terrain Stability Class I to III)	6.4.2.2 (6-43)
12	Reducing geohazards using engineered solutions such as stripping or excavating of unstable materials, grading to reduce slope gradients, scaling off overhanging rock and diverting water from steep slope faces	6.4.2.2 (6-43)
13	Installing of groundwater monitoring equipment to identify and measure subsurface water in and upslope of confirmed unstable terrain	6.4.2.2 (6-43)
14	Installing stain gauges to detect slope movement in confirmed unstable areas and areas of permafrost thaw.	6.4.2.2 (6-43)
15	Controlling drainage to direct surface and groundwater away from geohazards.	6.4.2.2 (6-43)
16	Stabilizing, restoring, and re-vegetating slopes after construction to increase stability and minimize the rates of surface water runoff or groundwater infiltration.	6.4.2.2 (6-43)
17	Reducing loads on slopes, particularly those identified as unstable and potentially unstable.	6.4.2.2 (6-43)
18	Implementing a rainfall shutdown guideline for ground crews working within and down slope of unstable or potentially unstable terrain.	6.4.2.2 (6-43)
19	Preventing undercuts or overloads on dangerous slopes.	6.4.2.2 (6-43)
20	Preventing redirection of surface or groundwater flow that could result in decreased terrain stability.	6.4.2.2 (6-43)

21	Rip-rapping and /or diversion of streams that can undercut slopes (e.g. the Dublin Gulch realignment is designed to prevent undercutting of the HLF).	6.4.2.2 (6-43)
22	Removing potential debris from a site using grading or excavating procedures, or diverting water from debris by means of surface drains and/or subsurface galleries or sub-drains so that it cannot mobilize.	6.4.2.2 (6-43)
23	Designing structures such as sediment ponds and/or catchment structures to contain debris flows and other mass movements, using protective structures such as walls and embankments, and/or diverting the flow away from the down slope areas using diversion barriers or channels.	6.4.2.2 (6-43)
24	Control erosion on salvaged stockpiles and reseed areas cleared by not salvaged (Erosion and Sediment Control Plan).	Table 6.4-10
25	Salvaging appropriate volumes that will allow reclamation objectives to be met (Soil Material and Handling Plan).	Table 6.4-10
26	Prevent and respond to all potential spills.	Table 6.4-10
27	Avoid salvaging and mixing unsuitable reclamation material with suitable reclamation material (Soil Material and Handling Plan).	Table 6.4-10
28	Environmental supervisor with knowledge of soil will be assigned to the site during construction, operations and closure. The supervisor will ensure that sufficient volumes, appropriate depth and soil material suitable for reclamation is salvaged and stored.	Table 6.4-10 6.4.6 (6-56)
29	The mitigation for soil cover loss is to ensure that reclamation is completed on all remaining mine features and, wherever feasible, carry out soil replacement/reclamation on permanent disturbance features (Soil Material and Handling Plan).	Table 6.4-10
30	Place soil stockpiles an appropriate distance from operations that may result in contamination including high levels of dusting.	Table 6.4-10
31	Supervision of topsoil stripping and stockpiling by qualified personnel, most likely the environmental supervisor. The supervisor will re-evaluate topsoil volumes based on stockpile dimensions after soil salvage is complete to ensure there is	Table 6.4-10

	sufficient material for reclamation. If there is a shortage based on the requirements of the Conceptual Closure and Reclamation Plan, additional areas of overburden salvage will be identified.	6.4.6 (6-56)
32	Detailed tracking of topsoil salvage volumes and storage locations.	Table 6.4-10
33	Environmental supervisor will ensure that suitable soil is available for reclamation. If quality of topsoil does not meet the requirements of the Conceptual Closure and Reclamation Plan, additional areas of soil salvage will need to be identified. If undesirable overburden material has inadvertently been incorporated into topsoil, physical and chemical analysis may be required to determine soil quality.	6.4.6 (6-56)
34	Soil stockpiles will be checked regularly and after storm events or rapid snow melt to ensure vegetation cover is maintained and erosion control measures are effective.	6.4.6 (6-56)
35	Prior to re-vegetation, the effectiveness of soil mitigation should be evaluated with respect to compaction, rutting, drainage and recontouring.	6.4.6 (6-56)
36	Check areas where hazardous material were located for ground contamination prior to topsoil replacement at reclamation and remediate as necessary	Table 6.4-10
37	Decompact WRSAs, mine infrastructure locations (parking lots, camp sites) prior to topsoil replacement	Table 6.4-10
38	Recontour landscape to facilitate proper drainage (e.g., WRSAs, sediment control pond locations before and after topsoil placement)	Table 6.4-10
39	Once vegetation is established, visual inspections of vegetation vigour and cover density will provide an indication of soil fertility. If soil fertility has been diminished from baseline conditions, foliar analysis will be required	6.4.6 (6-56)
40	An application of a standard nitrogen-phosphorus-potassium fertilizer may be required after soil replacement to assist in re-vegetation efforts.	Table 6.4-10
41	Care must be taken in the timing and amount of fertilizer applied so as to not contaminate nearby aquatic systems and to	Table 6.4-10

	allow for effective uptake of the added nutrients. The application rates should be based on soil testing recommendations.	
42	Monitoring for soil moisture changes can coincide with monitoring areas used to refine the groundwater model for the operations and post-closure phases. Soil moisture measurements can be designed as an add-on to the groundwater monitoring wells in these areas. These sites should be established prior to the commencement of construction activities to establish baseline conditions.	6.4.6 (6-56)
43	Long-term soil and vegetation monitoring sites outside the Project footprint will be established to monitor for elemental concentrations, in particular arsenic, in soil and foliage. These monitoring sites will be established prior to construction activities to establish baseline conditions and continue until Year 8 of operations (when dusting is complete). Approximately 10 sites should be established throughout the area of predicted arsenic exceedance from metal loading.	6.4.6 (6-56)
44	Fugitive Dust Control Plan	
Water Quality and Aquatic Biota		
45	The detoxification plant for removal of cyanide from heap leach solution will be built for the operations phase to handle any potential releases of solution containing cyanide.	6.5.3.2 (6-118)
46	The mine water treatment plant for use in operation and early in closure. This will have a maximum design capacity of 600 m^3/hr, and treatment for metals, nutrients and pH. The effluent will meet MMER criteria (not acutely toxic to fish, well below MMER criteria concentrations). The effluent quality is designed to allow metals and other parameters to meet WQG or SS WQO in Haggart Creek or Dublin Gulch diversion channel (generally to be two times the CCME or other applicable guideline in effluent). The criteria for nitrogen and phosphorus are set to prevent eutrophication in the streams.	6.5.10 (6-171) Updated in May 2012 Supplementary Information Report
47	Extending the use of the mine water treatment plant beyond 15 years if indicated by monitoring of heap seepage quality and quantity.	6.5.10 (6-171)
48	Contact water from the open pit and waste rock storage areas will be sent to the heap leach facility; excess water will be	6.5.3.2 (6-118)

	tested and sent to the mine water treatment plant, if needed	
49	The HLF is designed with a double liner in the upper area, triple liner in the lower area, leak detection and recovery system, seepage collection, and collection of groundwater from below the HLF.	6.5.3.2 (6-118)
50	Running the cyanide detoxification and mine water treatment plant for more years in closure, which would allow WQG or SS WQG to be met, and provide a short-term solution while the HLF continues to drain and other mitigation measures are developed.	6.9.5 (6-170)
51	Using an engineered wetland system (including a semi-passive anaerobic wetland) at the base of the HLF and waste rock storage areas; these are known to be effective in substantially reducing arsenic, nitrogen and phosphorus levels.	6.9.5 (6-170)
52	Developing a tighter cover for reclamation of the waste rock storage areas; a cap that allows 10% infiltration of net precipitation, rather than the 20% used in modeling the post-closure water quality, would provide about a 50% reduction in seepage volumes and loads of arsenic, other metals and nutrients.	6.9.5 (6-170)
53	Inception of groundwater in contact with waste rock storage areas in rock drains; will be sent with the rest of the contact water to the heap leach facility or the mine water treatment plant.	6.5.10 (6-171)
54	Reclamation of heap leach facility and waste rock storage areas, using covers that reduce infiltration to about 10% and 20% of net precipitation, respectively for the HLF and waste rock storage areas, with the alternative of developing waste rock storage area covers that reduce infiltration to 10%.	6.5.10 (6-171)
Air Quality		
55	Use Best Available Technology Economically Achievable (BATEA) measures and best practices to meet or exceed relevant regulatory emission standards for all mine equipment and practices	6.6.2.2 (6-210)
Fish and Fish Habitat		
56	Potable water will be drawn from a groundwater well near the camp, held in a storage tank, treated to meet Canadian	6.7.1.4 (6-222)

	Drinking Water Standards, and distributed through the camp.	
57	Open pit mining, waste rock disposal and quarry pit operations will generally take place a minimum of 30 m from area watercourses.	6.7.1.4 (6-222)
58	Road runoff and dust control related to vehicle traffic use and RoW maintenance will be minimized through the design of road and RoW of way stream crossings. All stream crossings will follow DFO operational statements or will comply with the requirements of DFO and relevant territorial standards for protection of fish and fish habitat. On approaches to vehicle crossing structures, road ditches designed for drainage control will incorporate the necessary sedimentation control measures (e.g., silt fence, check dams) to prevent sediment from entering the watercourse.	6.7.1.4 (6-223)
59	Fuel, hazardous material and explosives will be managed according to industry standards including: storage in appropriate containers; containment areas sized to hold the larger of 110% of the largest tank or 10% of the total maximum volume of all tanks in the facility; and storage of explosives in separate buildings away from the rest of the mine activities.	6.7.1.4 (6-223) 5.4.2.6 (5-43)
60	Design of Project to include fish habitat creation (complexing, features, critical habitat types)	Table 6.7-6
61	Minimize extent of clearing, grubbing and grading adjacent to watercourses to that required for safe vehicle access and construction activities.	Table 6.7-6
62	Existing road use where possible and appropriate temporary crossing methods where needed (e.g., temporary bridges)	Table 6.7-6
63	Flag environmentally sensitive areas before clearing and construction begins near watercourses.	Table 6.7-6
64	Re-vegetate where soil stabilization and erosion control is required.	Table 6.7-6
65	Locate temporary work spaces and stockpiles at least 30 m from top-of-bank of fish-bearing watercourses.	Table 6.7-6
66	Compensate for lost fish habitat where a HADD is unavoidable.	Table 6.7-6
67	Design of channel diversions to include streamside vegetation and functioning riparian areas	Table 6.7-6

68	Isolate all instream works within fish-bearing watercourses or non-fish-bearing watercourses where instream works have the potential to affect fish-bearing waters downstream.	Table 6.7-6
69	Stage construction within 16 m of all watercourses and retain buffer zones until construction activities begin to limit time of bank and soil exposure	Table 6.7-6
70	Monitor TSS and turbidity levels prior to release from sediment control ponds	Table 6.7-6
71	Manage flow diversions and water extraction to ensure adequate flows are maintained for fish passage.	Table 6.7-6
72	Place material and instream structures in a manner that does not inhabit fish passage. Prevent the formation of fish barriers when conducting instream works.	Table 6.7-6
Vegetation Resources		
73	Invasive species monitoring—Vegetation communities adjacent to Project disturbance will be monitored throughout the construction, operations and closure phases of the Project. This will ensure that populations of invasive plant species are promptly identified as they become established and that appropriate control measures are applied in a timely manner to ensure the best possible chances of successful eradication. This approach will ensure that vegetation indicators and associated values are protected from the effects of invasive species establishment and dispersal and will mitigate against the mine site acting as a source area for dispersal of invasive species to other areas of the Yukon. It is assumed that invasive plant monitoring will be included as a component of the reclamation monitoring.	6.8.8 (6-294)
74	Minimize the removal of shrubby vegetation (brushing) in wetland and riparian areas	6.8.4.2 (6-285)
75	Schedule construction activities so that activities in or adjacent to wetlands and riparian areas occur when ground is frozen to minimize soil compaction and damage to shrubby and herbaceous vegetation	6.8.4.2 (6-286)
76	Deliver transmission line poles to wetland areas using the existing access road	6.8.4.2 (6-286)

77	Minimize the footprint pole foundations and associated side cast material.	6.8.4.2 (6-286)
Wildlife		
78	Facilitate wildlife movement by: a) providing wildlife crossing and escape points in the plowed snow banks along access road (i.e., low areas 0.5 m or less in snow banks at regular intervals); b) providing wildlife crossing points along extensive open ditches; and c) provide direction to Project staff and contractors on methods to avoid interference with the movement of wildlife across roads.	Table 6.9-10
79	Monitor the implementation of all mitigation measures and make adjustments where necessary.	Table 6.9-10
80	Implement a progressive reclamation plan. VIT will: a) re-vegetate reclamation areas with native species consistent with surrounding vegetation, except where regulatory agencies indicate that natural succession is preferable; and b) maximize use of direct placement techniques (minimizing stockpiling) to minimize the loss of biological activity in reclamation capping materials.	Table 6.9-15
Socio-economic		
81	VIT has contacted potentially affected operators of placer mines, RTCs, and outfitters, both to advise them of the Project activities and to discuss any questions or potential concerns they may have with the proposed Project so that VIT can better understand the effects the Project might have on these operations. To the extent the Project will adversely interact with these operations, VIT will try to avoid or accommodate those effects by way of Project design and where that is not possible will provide appropriate compensation.	6.11.2.21 (6-384)
82	With respect to commercial trapping, a compensation process is set out under the *Wildlife Act*. There are provisions under the VFA and FNNND Final Agreement to develop and implement a compensation policy for trappers affected by development pressure.	6.11.2.21 (6-384)
83	Access to lands that were used for harvesting of berries and wildlife will be unavailable to traditional harvesters during Project Construction and Operations through to Closure when disturbed land is re-vegetated and the road to the Potato	6.11.3.4 (6-395)

	Hills is re-opened to the public, VIT will accommodate that loss of access through the comprehensive Cooperation and Benefits Agreement that is currently under negotiation.	
84	VIT will use indigenous vegetation during reclamation and closure to increase the likelihood that valued wildlife will be attracted to and will remain in the reclaimed area. A re-vegetation program using indigenous flora will be implemented for disturbed sites where native vegetation has been removed. This will promote re-vegetation success and sustainability. The re-vegetation program will also follow guidelines for prevention of invasive plants introduction and spread as per the Invasive Plants Management Plan during the reclamation and closure phases	6.11.3.19 (6-401)
85	There will be a zero tolerance policy with respect to drugs and alcohol on the Project site.	6.11.4.10 (6-406)
86	VIT will have on-site first-aid and trained emergency personnel to provide primary care, and will establish an Emergency Response Plan for the Project. This will be done in consultation with service providers in Mayo (i.e., the Health Centre), and the hospitals in Dawson and Whitehorse.	6.11.5.4 (6-411)
87	VIT will work with emergency service providers (RCMP, fire department, ambulance service) to identify training and equipment required to respond to potential incidents related to the Project. Similarly, a cooperative approach to the development of emergency response plans is needed.	6.11.6.11 (6-421)
88	The Project will be a camp operation. All employees will be housed on-site. Employees and contractors will generally be transported to and from Whitehorse to restrict unwanted access to Mayo between on-site rotations.	6.11.4.10 (6-406)
89	A pull-off or parking area is proposed to accommodate parking needs of FNNND citizens and others at South McQuesten bridge fishing area.	6.11.6.31 (6-428)
90	Human well-being is influenced by many factors that range from the internal rationale of a single individual making a choice, to external factors that are beyond the control of a project or an entire government. To that end, VIT proposes establishing and convening a committee of representatives of parties that are directly affected by the Project (the Committee).	6.11.7 (6-436)

	VIT would commit to: a) Compile information within its control that is appropriate to monitoring the indicators determined appropriate through discussion with the Committee b) Provide an annual report to the Committee that contains the information identified in a) above. This report would be shared with the Yukon Major Mines Coordinating Committee (MMCC) and regulatory agencies as appropriate c) Participate actively and meaningfully in the work of the Committee.	
91	VIT is also pursuing the possibility of incinerating solid waste at the site.	6.11.6.19 (6-423)

Appendix B COMMENTS ON THE PROPOSAL DURING ADEQUACY

Comments received during adequacy (begun on January 21, 2011)

Name of Person or Party	YOR Document Number	Date Posted
Benoit Godin, Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-069-1	March 25, 2011
Ryan L. Parry, Development Assessment Process Manager, Development Assessment Branch, Executive Council Office, Government of Yukon	2010-0267-170-1	March 25, 2011

Appendix C COMMENTS ON THE PROPOSAL

Comments received during first comment period (begun on July 22, 2011) and the Draft Screening Report stage

Name of Person or Party	YOR Document Number	Date Posted
Glen Stephen, YESAA Coordinator, White River First Nation	2010-0267-179-1	August 3, 2011
Diane Reed, Director, Development Assessment Branch, Executive Council Office, Government of Yukon	2010-0267-180-1	August 4, 2011
Jerry Kruse and Alex Joe, Co-Chairs, Selkirk Renewable Resources Council	2010-0267-181-1	August 4, 2011
Shelley Ball, Senior Environmental Assessment Officer, Environmental Assessment Coordination, Science and Policy Integration, Natural Resources Canada	2010-0267-188-1	August 19, 2011
Norman Eady	2010-0267-189-1	August 19, 2011
Laura Jones, Environmental Officer, Prairie and Northern Region, Transport Canada	2010-0267-190-1	August 22, 2011
Jeska Gagnon, Habitat Biologist, Environmental Assessment and Major Projects Unit, Fisheries and Oceans Canada	2010-191-1	August 22, 2011
Benoit Godin, Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-192-1	August 30, 2011
Frank Patterson, Chair, Mayo District Renewable Resources Council	2010-0267-196-1	August 26, 2011
Government of Yukon: Heather Barnfield, Community Services Jamie Coles, Senior Economist, Economic	2010-0267-197-1	August 30, 2011

Name of Person or Party	YOR Document Number	Date Posted
Development Bill Leary, Energy, Mines and Resources Erin Dowd, Energy, Mines and Resources Julia Ahlgren, Environment Valerie Young, Policy and Program Development, Health and Social Services Ruth Gotthardt, Tourism and Culture Cathryn Paish, Tourism and Culture Workers Compensation Health and Safety Board (WCHSB)		
Benoit Godin, Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-198-1	August 30, 2011
Alan Young, Midnight Sun Outfitting	2010-0267-199-1	August 31, 2011
Kathy Scott, Heather Bears, Bill Slater, and Kim Winnicky on behalf of the First Nation of Na-Cho Nyak Dun	2010-0267-200-1	August 31, 2011
Lewis Rifkind, Mining Coordinator, Yukon Conservation Society	2010-0267-201-1	August 31, 2011
Anna Pugh on behalf of RTC-81 holder	2010-0267-289-1	June 1, 2012
Lewis Rifkind, Mining Coordinator, Yukon Conservation Society	2010-0267-291-1	June 4, 2012
Benoit Godin, Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-292-1	June 4, 2012
John King, Senior Policy Analyst, Environmental	2010-0267-294-1	June 6, 2012

Name of Person or Party	YOR Document Number	Date Posted
Assessment Division, Natural Resources Canada		
Steven Buyck, A/Lands Manager, First Nation of Na-Cho Nyak Dun	2010-0267-295-1	June 6, 2012
Benoit Godin, Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-328-1	August 8, 2012
David Morrison, CEO, Yukon Energy Corporation	2010-0267-327-2	June 4, 2012

Appendix D COMMENTS ON THE DRAFT SCREENING REPORT

Comments received during comment period on the Draft Screening Report (begun on July 22, 2011) and the Developing Recommendation stage

Name of Person or Party	YOR Document Number	Date Posted
Norman Eady	2010-0267-335-1	September 12, 2012
Jeska Gagnon, Habitat Biologist, Environmental Assessment and Major Projects Unit, Fisheries and Oceans Canada	2010-0267-336-1	October 2, 2012
Government of Yukon: Erin Dowd, Energy, Mines and Resources Julia Ahlgren, Environment Coleman Sinclair, Workers Compensation Health and Safety Board (WCHSB) Cathryn Paish, Tourism and Culture Christian Thomas, Tourism and Culture	2010-0267-337-1	October 2, 2012
David Morrison, CEO, Yukon Energy Corporation	2010-0267-338-1	October 2, 2012
Denis Lacroix, A/Head, Assessment and Contaminants, Environmental Protection Operations Directorate, Environmental Stewardship Branch, Pacific & Yukon Region, Environment Canada	2010-0267-339-1	October 2, 2012
Anna Pugh on behalf of RTC-81 holder	2010-0267-340-1	October 3, 2012
Lewis Rifkind, Mining Coordinator, Yukon Conservation Society	2010-0267-341-1	October 3, 2012
John King, Senior Policy Analyst, Environmental Assessment Division, Natural Resources Canada	2010-0267-342-1	October 3, 2012
Meighan Andrews, Superintendent, Environmental Affairs North, Prairie and Northern Region, Transport Canada	2010-0267-343-1	October 3, 2012

Name of Person or Party	YOR Document Number	Date Posted
Stephen Buyck, A/Lands Manager, First Nation of Na-Cho Nyak Dun	2010-0267-346-1	October 3, 2012

Appendix E PROPOSED AND EXISTING PROJECTS

Projects assessed by YESAB in a 50 km radius around the mine site during the last five years (January 1, 2007 to April 4, 2012) are listed in the table below.

YESAB Project Number	Project Title
Mining Quartz	
2012-0158	Nabob & Harper Class 3/4 Quartz Mining Land Use
2012-0141	Water Use Licence Renewal (QZ06-074), Keno Hill Mine
2012-0085	Quartz Exploration - Mahtin Property
2012-0055	Quartz Exploration - Tell Property
2011-0315	Keno Hill Silver District Operations - Lucky Queen and Onek Deposit Production
2011-0277	Minto Creek Water Licence Application
2010-0267	Eagle Gold Mine
2010-0226	Dublin Gulch - Advanced Exploration Camp
2010-0146	Closure Plan for Keno Hill: Physical Hazard Reduction of Buildings
2010-0132	Gold (Scheelite) Dome
2010-0130	Quartz claims exploration program in the 60 Mile River Area
2010-0119	Placer Mining on Swede Creek
2010-0121	Rau Access
2010-0069	Quartz Exploration - Keystone Property
2010-0096	Red Mountain ICE Project
2009- 0183	Jarvis Creek - tributary of Minto Creek
2009-00092	Red Mountain Quarz Exploration
2009-0089	Rau
2009-0048	Eagle Project
2009-0030	Alexco Keno Hill Mining Corp., Type A Water Use/QML Apps., Bellekeno Mine
2008-0291	Aurex Property
2008-0129	Mout Hinton - Yukon Gold
2008-0039	Bellekeno Advanced Underground Exploration & Development, Keno Hill Silver District
2007-0143	Exploration on Keno-Lightning Property
2007-0087	Clark/Cameron Mine Exploration Project
2007-0089	Minto
Mining Placer	
2012-0223	Placer Mining – Secret Creek
2012-0143	Placer Mine on Lightning Creek
2012-0072	Placer mine at Upper Goodman Ck , Quad 115,P/16, Mayo MD
2012-0065	Minto Creek Placer Mine
2012-0039	Placer Mining on Secret Creek
2012-0041	Placer Mine at Granite Creek
2012-0048	Placer mining and exploration on Dublin Gulch
2011-0310	Erickson Gulch Placer
2011-0231	Placer Mine on Secret Creek
2011-0123	Placer Mining in the Minto Creek area
2011-0092	Placer Water Licence
2010-0236	Placer Mine on Swede Creek
2010-0220	Placer mining - 15 Pup (tributary to Haggart Creek)
2010-0197	Placer Exploration - Rodin Creek
2010-0190	South McQuesten Road Upgrades
2010-0165	Haggart Creek exploration
2010-0171	Placer exploration on Fisher Gulch
2010-0010	Secret Creek Placer
2009-0221	Placer Mining - No Name Creek

2009- 0094	Highet Creek Placer Mining/Exploration
2009-0055	Placer Mine on Roaring Forks Creek
2009-0050	Placer Mine at Dawn Gulch
2008-0283	Placer Mine on No Name Creek (tributary of Highet Creek)
2008-0290	Placer Prospecting Leases
2008-0225	Roaring Forks Creek
2008-0171	Duncan Creek, Lightning Creek and Forty Pup prospecting
2008-0163	Gill Gulch
2008-0145	Harvey Gulch
2008-0074	Placer Mining - Renewal - Seattle Creek
2007-0204	Duncan Creek Placer Mining
2007-0227	Placer Mine at Curly Creek
2007-0172	Steven Johnson Placer Mine Project
2007-0186	Placer Mine at Hope Gulch
2007-0198	Duncan Creek Access Road
2007-0199	Wareham Lake Access Road
2007-0068	Placer Mining on Duncan Creek
Residential Development	
2011-0300	Rural Residential near Halfway Lakes
2011-0277	Rural Residential - Black Lake
2011- 0208	Enlargement Lot 1096 - Mayo
2010-0270	Residential Land Application
2011-0087	Driveway to Residential Property
2009-0005	Lot Extension Lot 77-3 Mayo/Keno Road
2007-0037	Rural Residential
Infrastructure & Roads	
2012-0217	Haldane Creek Bridge Rehabilitation
2012-0210	Fuel Wood Harvest Road
2012-0126	Mount Haldane Communications Site
2012-0054	NorthwesTel – Fibre Optic Connector
2011-0290	Solid Waste Management Facility - Mayo
2011-0299	Solid Waste Disposal Facility (SWDF) - Keno City
2011-0242	Air Emissions Permit Renewal - Mayo
2011-0203	Construction of a Power Line - Wareham Lake Dam Access Road
2011-0194	Mayo Municipal Drinking Water System Type A Water Use Licence Amendment
2011-0174	Mayo River Flood Response, Restoration Access
2010-0264	Geotech. Investigation Mayo Area A Urban Infill, Mayo Airport Subdivision Zone 1 Expansion
2009-0040	Mayo Hydro Enhancement Project (Mayo B)
2008-0292	Commercial Land Treatment Facility
2008-0254	Keno City - Solid Waste Facility
2008-0275	Solid Waste Management Facility - Mayo
2008-0228	Air Emissions Permit Renewal - Mayo
2008-0174	Mayo Area Geotechnical Investigation
2012-0079	Proposed granular pit - km 77 Silver Trail
2010-0210	Test pits for gravel quarry
2010-0180	Silver Trail km 77 Gravel Pit Development
2010-0052	Temporary Camps for Bridge Painting Projects in the Mayo Region
2009-0008	South McQuesten River Bridge Repair Project, km 23.6 South McQuesten Road, Yukon
2008-0239	Clay & Silt Quarry
2008- 0156	Rip Rap Removal from Lide Hill Quarry
2007-0103	Test for gravel / Develop a Quarry
Other	
2007-0076	BSES Yukon Expedition 2007

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