



Designated Office Evaluation Report

Minto Mine Phase IV Expansion Project Assessment 2010-0198

Proponent: Minto Explorations Ltd.

Assessment Completion Date: February 18, 2011

Mayo Designated Office

P.O. Box 297

Mayo, YT Y0B 1M0

Tel: (867) 996-4040

Fax: (867) 996-4049

www.yesab.ca

ACKNOWLEDGEMENTS

I believe it is important to acknowledge the efforts of the team of assessors from YESAB that worked with the Designated Office on this report. The lack of conclusive information regarding the movement of the Dry Stack Tailings Storage Facility as well as the Southwest Waste Dump posed some challenges in determining the adequacy of the proposed mitigations to address significant adverse effects. The absence of a Water License issuance for the Water Management Plan assessed in YESAB project 2009-0206 (Decision Document in YOR document # 2009-0206-087-1) posed challenges in determining development of adequate mitigations to address significant adverse effects related to this project.

Thanks to Patrick Sack, Steve Caram, Michael Muller, Stephen Mills and our consultants EcoMetrix Incorporated and Terraprobe Incorporated represented by:

EcoMetrix Inc.

Bruce Rodgers, P. Eng., M.Sc.

Lynnae Dudley, M. Env.

Salah Sharif, Ph.D., P.Geo.

Goran Ivanis, M.Sc.

Michael Benhuis, M.Sc., P.Geo.

Terraprobe Inc.

Paul Bowen

Jason Crowder, Ph.D., P.Eng.

This team spent tireless hours considering the potential adverse effects, determining significance and identifying appropriate mitigations. This was challenging given that the available timelines were relatively short. An impressive amount of work done to complete this report.

EXECUTIVE SUMMARY

The proponent, Minto Explorations Ltd. (MintoEx) is a wholly owned subsidiary of Capstone Mining Corp. MintoEx operates the Minto Mine, a high-grade copper mine located within Selkirk First Nation lands, approximately 240 kilometres (km) northwest of Whitehorse, Yukon Territory. The Minto Mine is situated in the Minto Creek watershed on the west side of the Yukon River, approximately 41 km southwest of the community of Pelly Crossing. Operations currently include a Main Pit with associated waste dumps and ore stockpile areas, an ore processing facility with a mill water pond, a concentrate storage shed, a tailings filter building, a dry stack tailings storage facility (DSTSF), a water retention dam with associated Water Storage Pond, administrative offices, an airstrip, and a camp. The relevant regulatory instruments for the Minto Mine operation include, but are not limited to:

- Quartz Mining Licence (QML-0001) issued in October 1999 with subsequent amendments, valid until June 30, 2016;
- Type A Water Use Licence (WUL QZ96-006), issued in April 1998 and including subsequent amendments, valid until June 30, 2016.

The current project proposal is for amendments to QML-0001 and WUL QZ96-006 related to the expansion of mining operations at the Minto Mine. The amendments associated with the planned activities that are assessable under *Yukon Environmental and Social Assessment Act* (YESAA) includes:

- Expansion of the mining area to include new ore zones (Area 2 and Area 118);
- Implementation of underground mining methods in addition to continued open pit mining;
- Implementation of new waste management practices including:
 - Shift from dry stack tailings system to an in-pit tailings disposal program including deposition into the existing Main Pit and proposed Area 2 Pit, and associated modifications to the Main Pit to accommodate deposition of tailings;
- Expansion of the reclamation overburden dumps;
- Expansion of waste rock dumps; and
- Expansion of the camp to accommodate up to a total of 300 persons (increase of 100 persons)

MintoEx anticipates the expansion will extend the current mine life by approximately four years with an additional 2.1 years of mining and 2.5 years of milling. In the past, exploration activities have run concurrently with mining and have resulted in regular amendments to QML-0001. Currently exploration activities focus on the Minto East, Wildfire and Wildfire/Copper Keel deposits. MintoEx has been in Pelly Crossing to present potential Phase V conceptual plans, for mining these deposits, to the community and Selkirk First Nation.

The previous assessment of Minto Mine Water Management and Milling Rate Amendments (YOR project # 2009-0206) concluded March 3, 2010 and considered revisions to the Water Management Plan to better manage site water quality and water quantity; the application to amend WUL QZ96-006 is currently

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

before the Yukon Water Board and is awaiting a decision. In the absence of the amended WUL, this assessment is relying heavily on the Decision Document from YOR project # 2009-0206 (YOR document # 2009-0206-087-1) which accepted all the mitigations proposed by the Mayo Designated Office associated with the new Water Management Plan. This plan, based on a “keep clean water clean” philosophy, encompasses diversion of stormwater and conveyance, treatment and discharge of impacted water.

MintoEx submitted the project proposal to the Mayo Designated Office of the Yukon Environmental and Socio-economic Assessment Board in accordance with Paragraph 50(1)(b) of YESAA on August 13, 2010. The project underwent an adequacy review that resulted in an information request on September 14, 2010 with the response from MintoEx received on October 6, 2010. A second information request was issued October 8, 2010 and a third information request was issued November 26, 2010 with the corresponding response on November 30, 2010. The proposal was subsequently deemed adequate and the period for seeking views and information began December 2, 2010. A fourth information request was issued on January 12, 2011 with the response coming on January 14, 2011. On January 20, 2011, the Mayo Designated Office began preparing the Evaluation Report.

Reviewers who submitted comments throughout the assessment include: Selkirk First Nation; Yukon Government Mineral Resources, Selkirk Renewable Resources Council, Environment Canada, Yukon Government Environment, Yukon Workers' Compensation Health and Safety Board, Yukon Government Community Services, Yukon Government Heritage Resources, Yukon Conservation Society and Yukon Government Water Resources.

Reviewers of the proposal raised concerns primarily related to water management, water quality and infrastructure stability. Early in the assessment, the stability of the DSTSF and Southwest Waste Dump were of great concern to interested parties specifically, the ability of the Mill Valley Fill to arrest movement of the DSTSF; through information requests and meetings with interested parties these concerns were considered and integrated into the assessment. Towards the end of the seeking views and information period, issues related to worker health and safety and socio-economic and cultural conditions were raised and were integrated into the assessment. As in previous assessments of the Minto Mine (i.e. YOR project # 2009-0206) water quality and quantity were of interest throughout the assessment and consequently have been integrated into this report. Specifically, concern was raised regarding the protection of fisheries habitat in lower Minto Creek especially Chinook salmon. The above concerns demonstrate that significant uncertainty is associated with the proposed mine expansion and show that the protection of aquatic life within lower Minto Creek and general environmental quality are not assured solely by the proponent's mitigation measures.

For the reasons stated above, this assessment recommends to the decision bodies that the project be allowed to proceed, subject to specified terms and conditions intended to mitigate the potential significant adverse effects.

OUTCOME

The Mayo Designated Office, pursuant to section 56(1)(b) of the *Yukon Environmental and Socio-economic Assessment Act*, recommends to the decision bodies that the project be allowed to proceed,

subject to specified terms and conditions, as it has determined that the significant adverse environmental or socio-economic effects in or outside Yukon can be mitigated by these terms and conditions. The terms and conditions are to be considered and implemented collectively since the absence of one will undermine the purpose and effectiveness of the others.

THE TERMS AND CONDITIONS OF THE RECOMMENDATIONS ARE AS FOLLOWS:

1. MintoEx shall construct and maintain an enclosure around temporary garbage storage area where garbage is stored prior to being transported to the landfill.
2. MintoEx shall install an industrial sized incinerator of sufficient capacity for camp size.
3. MintoEx shall construct an electric fence around the landfill and incinerator. The electric fence must be maintained on a regular basis so that it functions continuously.
4. MintoEx shall clean camp BBQs daily to reduce food smells.
5. MintoEx shall install an electric fence around the sleeping and kitchen units. This is important because the kitchen area is in the middle of camp and bears following food scents to the kitchen must walk through the parts of camp used for accommodation.
6. Minto Ex shall ensure existing mitigations are regularly updated and that the following is achieved with respect to the health and safety of workers: 1) that Mine Rescue Training and equipment are in place; 2) a back-up plan for mine rescue assistance, such as an agreement with other U/G mines for assistance in event of an emergency is in place; and 3) the Return to Work Program for injured workers is updated.
7. MintoEx shall apply recommendations 1 to 27, inclusively, as stated in the Joint Yukon Government-Selkirk First Nation Decision Document of March 29, 2010, for the Minto Mine Water Management and Milling Rate Amendments (YOR document # 2009-0206-087-1).

Rationale: This current evaluation strongly supports the recommendations stated in the Joint Yukon Government-Selkirk First Nation Decision Document as the most effective measure to ensure that there are no significant adverse effects to aquatic resources in the receiving environment of Minto Creek.

The approach does not exclude seasonal compliance requirements to allow for flexibility within the Water Management Plan to direct decisions, based on water quality, regarding the capture, storage, treatment and/or release of on-site waters. Current understanding of aquatic resources in lower Minto Creek indicates that Chinook salmon are not present during the freshet period, and other sensitive components of the aquatic environment are generally protected by ice during this period. It may be reasonable in this case to define separate compliance requirements for the freshet and non-freshet periods to account for the differing environmental sensitivities.

8. MintoEx shall report annually to the advisory committee recommended in Mitigation 13 on model predictions compared to field monitoring (model validation), including determination of cause for significant differences between observed and predicted water quality, and corrections.

Rationale: MintoEx's water quality model predicts water quality in the receiving environment (W1/W2) as a function of waters released from the site (W3). It is an integral part of the Water Management Plan, as it will direct on-site decisions concerning the timing of and volumes of releases of mine waters from the site. The Minto Mine site water balance and water quality model must be properly validated with measured data. This concern was stated by interveners during the screening stage.

Given the importance of water quality model as a tool to predict compliance of effluent releases in the receiving environment, it is essential that MintoEx proceed as soon as possible with the validation of the model and commit to on going updates in response to significant differences between observed and predicted data.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

9. MintoEx shall establish a suitable receiving environment water quality objective for copper for compliance at the receiving environment monitoring station that is protective of the most sensitive aquatic receptor during its most sensitive life stage.

Rationale: This is understood to be a value that is protective of the development of olfactory sense in juvenile Chinook salmon during rearing. This review recognizes MintoEx's efforts to characterize fish usage of the system (timing, duration and extent) by juvenile Chinook salmon and other species, to monitor possible use of lower Minto Creek by adult Chinook during their spawning period and to support an effects level study to determine what concentration of copper in Minto Creek water may affect olfaction in juvenile Chinook salmon. Given the importance of this aquatic resource, the uncertainty surrounding the determination of background copper concentration in Minto Creek and the uncertainty surrounding olfaction effects levels, it is recommended that the water quality standard for the receiving environment be based on conservative assumptions.

10. MintoEx shall establish a suitable receiving environment water quality objective for chloride for compliance at the receiving environment monitoring station.

Rationale: Chloride is expected to be a constituent of concern in site water as a direct result of the proposed use of brine in underground mining operations.

11. MintoEx shall monitor and report to the advisory committee recommended in Mitigation 13 on chloride and nutrients (ammonia, nitrate and nitrite) as part of the Adaptive Monitoring and Management Plan at appropriate water management monitoring stations and in the receiving environment, and establish clear thresholds for these constituents that initiate responses before exceedences occur.

Rationale: Nutrients and chloride are not specifically addressed by the Adaptive Management Plan and are also not addressed indirectly through management of other contaminants. In order to avoid effects that may arise from these constituents, an adaptive management plan with specific response thresholds should be prepared. The water treatment plant is not currently designed to treat either ammonia or chloride in impacted site water. Since specific treatment measures will be required, it is important that MintoEx clearly indicate the protocol for initiating these treatment processes.

12. Require routine inspection, reporting, repair and upgrade of permanent environmental monitoring installations, including structures and instrumentation for monitoring groundwater, surface water and climate.

Rationale: Review of the project description has identified groundwater and climate station instruments that are not fully functional and have not been replaced or repaired in a timely manner. This measure has been proposed to remediate this situation.

13. An advisory committee that includes representatives from MintoEx, Selkirk and government agencies shall be established. In terms of mining activities, this advisory committee will receive and evaluate progress and compliance reports including cumulative effects of existing Minto Mine activities and future proposed activities.

Rationale: This measure responds to specific requests from interveners during the screening stage.

14. MintoEx shall develop and implement an Explosives Management Plan based on best management practices to reduce and control ammonia losses to the environment.

15. MintoEx shall report on routine monitoring, upgrading and periodical inspection of all water collection and conveyance works to the advisory committee recommended in Mitigation 13. This should apply to the construction, operation and closure phases, in accordance with commitments and plans that have been (or have yet to be) submitted, reviewed and approved.

Rationale: This measure is meant to respond to concerns that MintoEx collect all impacted site water as outlined in the Water Management Plan.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

16. MintoEx shall establish a groundwater management plan to characterize the hydrogeological conditions including, but not limited to, groundwater quality and quantity, soil physical characteristics, vertical and horizontal gradients. The monitoring network should include stations downgradient of the Water Storage Pond and provide long-term monitoring of groundwater during operations, closure and post-closure.

Rationale: This measure is meant to respond to the observed deficiencies in the current groundwater monitoring network, to allow more precise estimates of potential groundwater inflows to open pits and underground workings, and to assure that any impacted groundwater is collected and treated at the site as outlined in the Water Management Plan.

17. MintoEx shall implement new and appropriate monitoring points for seepage from existing and future waste piles.
18. MintoEx shall ensure commitment to effective drainage collection from the MVF and permanent instrumentation to monitor groundwater and seepage from the DSTSF.
19. MintoEx shall expand the existing groundwater monitoring network to include wells that will allow monitoring of water levels and evaluate the potential effect of pit and underground dewatering, as well as support predictions related to possible effects on the local water table from subaqueous disposal in the Main Pit.
20. The advisory committee recommended in Mitigation 13 shall also conduct comprehensive reviews of reclamation and closure plans. The committee shall convene each time a plan is revised and shall inform the development and refinement of each plan.

Rationale: This recommendation supports the views expressed by Yukon Government, Energy, Mines and Resources, Minerals Branch and the Selkirk First Nation during the Project Screening phase and is in line with principles set out in the Yukon Mine Site Reclamation and Closure Policy (YG, 2006). Such a group could address contentious issues such as long-term water quality objectives and evaluate environmental and technical performance of reclamation options.

21. The principle stated in the site Water Management Plan that all contaminated site waters should be collected, must also apply to closure and post-closure phases. The Minto Mine collection and conveyance network should continue to be monitored, reported and upgraded as needed during the post-operational phase;
22. The decommissioning plan should provide clear water quality objectives for the long-term protection of aquatic resources in the downstream environment of Minto Creek and the Yukon River.

Rationale: This measure addresses concerns stated by several interveners that the proposed operational site-specific water quality guideline might not be sufficiently protective post-mining without active water management.

23. The proposed Reclamation and Closure Plan must be expected to meet objectives that are protective of aquatic resources without reliance on long-term active treatment.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

24. MintoEx shall commit to progressive reclamation of wasterock storage facilities and other disturbed sites prior to final closure as stated in the Decommissioning and Reclamation Plan.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

25. MintoEx shall commit to and proceed with, environmental and technical studies of preferred reclamation options that have clear objectives, completion dates and reporting requirements. These studies shall be statistically robust and provide enough information to assess the success, or lack thereof, of the different reclamation tools proposed in the Closure and Reclamation Plan and redirect reclamation and closure plans, if need be, in a timely manner. The study objectives and

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

design shall be viewed and informed by the advisory committee recommended in Mitigation 13 prior to implementation. Results shall be included in an annual reclamation status report. Studies shall include but not be limited to: 1) in-situ water behaviour (quantity and quality) through different engineered soil covers on selected reclaimed areas and 2) laboratory and scaled experimental passive treatment wetlands.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

26. The advisory committee recommended in Mitigation 13 shall also receive regular monitoring, progress and compliance reports associated with site waste management. Water monitoring during the closure, reclamation, and post-closure phases of mining, should allow for the following: 1) comparison of predicted and actual water quality, 2) continued sampling of quality and quantity of water resources, including seepage and groundwater from tailings and wasterock storage facilities, surface water at “end-of-pipe” and in the receiving environment and 3) monitoring of effectiveness of mitigation measures and comparison to predicted performance.
27. MintoEx shall visually inspect the South Wall Buttress in the Main Pit on a regular basis to assess surface movement and shall provide detailed inspection and monitoring reports to the decision bodies.
28. MintoEx shall grade and/or place additional wasterock as required to maintain the surface profile and function of the buttress and shall provide detailed inspection and monitoring reports to the decision bodies.
29. A detailed program shall be provided by MintoEx for monitoring the downslope movement of the DSTSF and underlying soil. The program shall include the location and nature of all instrumentation and frequency of monitoring.
30. MintoEx shall provide a detailed contingency plan in the event that future monitoring indicates continued movement of the DSTSF and MVF. The plan shall include consideration of alternatives such as placement of additional fill or construction of additional stabilizing structures.
31. MintoEx shall commit to any additional works that may be necessary to ensure long-term stabilization of the DSTSF. This is necessary to ensure that the facility can be stabilized with respect to long-term placement of cover and reduction of erosion potential.
32. MintoEx shall visually inspect the fill in the Main Pit on a regular basis to assess surface movement and shall provide detailed inspection and monitoring reports to the decision bodies.
33. MintoEx shall grade and/or place additional wasterock as required maintaining the surface profile and function of the South Wall Buttress in the Main Pit and shall provide detailed inspection and monitoring reports to the decision bodies.
34. MintoEx shall perform further detailed analysis of the stability of the Southwest Waste Dump facility. Particularly, the analysis must consider long-term creep.

Rationale: This measure is meant to fill in the data gaps identified during the screening stage of the evaluation and the need for a thorough assessment of stability concerns.

35. Based on the results of the analysis in Mitigation 34, appropriate contingency measures must be developed.
36. MintoEx shall develop a detailed monitoring program with respect to monitoring the movement of the fill and underlying overburden materials within the Southwest Waste Dump area. The program shall be integrated with other monitoring programs at the site and shall report to the advisory committee recommended in Mitigation 13. The program shall provide details regarding the location and nature of all instrumentation and frequency of monitoring.
37. MintoEx shall provide detailed information regarding design of contingency measures in the event that monitoring indicates continued long-term creep. The contingency measures shall address the

long-term stability of the Southwest Waste Dump area, to ensure the area can be adequately capped and vegetated.

SECTION 110(1) RECOMMENDATION

Under Section 110(1) of YESAA, I am recommending that monitoring of the project effects be conducted. The effects monitoring should consider the following two programs:

- A project specific monitoring program: the project-specific socio-economic and socio-cultural effects monitoring program shall result in an annual report. Ideally the first report would include all the data available at the time of writing and preferably all project phases (construction, operation and closure). The development of the monitoring program should consider what are currently known effects but should also remain flexible so that unforeseen effects can be incorporated. The following list of indicators of direct and indirect socio-economic and socio-cultural effects is provided for illustrative purposes; it should not be considered definitive: Employment and income data and information for Minto Mine; Contracting and business expenditures and distribution; Workforce development data and information; Cultural and community well-being; and Cumulative summaries for all project phases and years.

Rationale: MintoEx is currently planning additional mining phases for newly discovered deposits on the Minto Mine property (SFN letter in YOR document # 2010-0198-120-1). The mine has been continually expanding its resource base with new discoveries and this pattern of discovery concurrent with mining is likely to continue. My recommendation relies on the assumption that this monitoring program will operate throughout the remaining life of the mine, ensuring the reduction of potential significant adverse effects through utilization of the results. Therefore, the collection of the project specific and cumulative effects data is considered a key component of the cumulative effects assessment of socio-economic effects of future projects.

- Cumulative Effects Monitoring: It is recommended that a cumulative effects assessment and monitoring framework be developed and implemented by the tripartite working group referred to in YOR document # 2010-0198-137-1. This working group is expected to develop an integrated comprehensive cumulative effects program that will include ecological, socio-economic and socio-cultural components. The working group should define the monitoring program so that specific categories are directly quantifiable and that these variables will measure change over time. Information gathered under the project specific monitoring program should be provided for inclusion in the cumulative effects monitoring program.

Rationale: Given that there is significant mining and exploration activity occurring in Central Yukon, monitoring of cumulative effects including projects other than the Minto Mine would be invaluable to ensure accurate baseline information. For example, three major projects within 250 km of Minto Mine are currently active: Alexco Resources at the Bellekeno Mine, Western Copper activities and Victoria Gold at the Eagle Gold project. This boom is resulting in uncertainties as to the availability of the local workforce and the capacity of businesses to

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

meet these demands. Cumulative effects monitoring will allow the effectiveness of MintoEx's current mitigation measures to be tracked and evaluated in a larger socio-economic context.

Issued by the Mayo Designated Office on February 18, 2011.

For more information please contact:

Name: Lorelee Johnstone

Title: Manager, Designated Office

Tel: (867) 996-4040

Email: loralee.johnstone@yesab.ca

Table of Contents

Part A.	Introduction	2
1.0	PROJECT DESCRIPTION	2
1.1	Proponent Information	2
1.2	Geographical Context.....	2
1.3	Project History	5
1.4	Project Details	6
1.5	Project Scope	13
2.0	ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING	14
2.1	Physical Environment.....	14
2.2	Biological Environment.....	19
2.3	Socio-economic Environment.....	23
3.0	REQUIREMENT FOR AN ASSESSMENT	24
4.0	SCOPE OF THE ASSESSMENT	25
4.1	Consideration of Heritage and Historic Resources	25
4.2	Consideration of Wildlife and Wildlife Habitat	26
4.3	Consideration of Mining.....	27
4.4	Consideration of Water Monitoring and Quality	27
4.5	Consideration of Nutrient Loading.....	28
4.6	Consideration of the Closure Plan.....	28
4.7	Consideration of Stability.....	29
4.8	Consideration of Cultural and Community Well-being	29
4.9	Summary of Values Considered.....	29
Part B.	Effects Assessment and Reasons for Recommendation	30
5.0	WILDLIFE AND WILDLIFE HABITAT	30
5.1	Overview.....	30
5.2	Project Effects	30
5.3	Cumulative Effects	31
6.0	HEALTH AND SAFETY	32
6.1	Overview.....	32
6.2	Project Effects	32
7.0	AQUATIC RESOURCES	38

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

7.1	Overview	38
7.2	Project Effects	38
7.3	Cumulative Effects	60
8.0	ENVIRONMENTAL QUALITY.....	61
8.1	Overview.....	61
8.2	Project Effects	61
8.3	Cumulative Effects	66
9.0	CULTURAL AND COMMUNITY WELL-BEING	66
9.1	Overview.....	66
9.2	Project Effects	67
9.3	Cumulative Effects	69
10.0	CONCLUSION OF THE ASSESSMENT	69
Appendix A	LIST OF KEY MITIGATIONS THE PROPONENT HAS COMMITTED TO UNDERTAKE	70
Appendix B	LIST OF RELEVANT NON-DISCRETIONARY LEGISLATION APPLICABLE TO THE PROJECT.....	77
Appendix C	LIST OF SUBMISSIONS MADE BY INTERESTED PERSONS AND OTHERS DURING THE ASSESSMENT	79
Appendix D	REFERENCES.....	82

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Acronyms and commonly used terms

CCME - Canadian Council of Ministers of the Environment

CWQG - Canadian Water Quality Guidelines

DSTSF - Dry Stack Tailings Storage Facility

EEM - Environmental Effects Monitoring program

GBDA – Grade Bin Disposal Area

LOM – Life of Mine

MintoEx (proponent) – Minto Explorations Ltd.

MMER - Metal Mining Effluent Regulations

MVF – Mill Valley Fill

QML - Quartz Mining Licence

SFN – Selkirk First Nation

SSWQO - Site Specific Water Quality Objective

SW Waste Dump – Southwest Waste Dump

WMP - Water Management Plan

WSP - Water Storage Pond

WUL - Water Use Licence

YESAA - *Yukon Environmental and Socio-economic Assessment Act*

YESAB - Yukon Environmental and Socio-economic Assessment Board

PART A. INTRODUCTION

The following sections present background information for this project and the assessment. This information includes details of the project; the environmental and socio-economic setting of the project area, and a description of the requirement for an assessment. Part A also has a discussion on the scope of the assessment, which includes the identification of values potentially affected by the project.

1.0 PROJECT DESCRIPTION

1.1 PROPONENT INFORMATION

Minto Explorations Ltd. (MintoEx), a subsidiary of Capstone Mining Corp., is the proponent for this project. The contact person for this project is Anne Labelle, Manager of Sustainability and Legal Affairs, and she can be contacted at the following address:

Suite 900-999 West Hastings Street

Vancouver, BC V6C 2W2

604-684-8894

alabelle@capstonemining.com

1.2 GEOGRAPHICAL CONTEXT

The Minto Mine is located approximately 240 km northwest of Whitehorse and 41 km southwest of Pelly Crossing (Figure 1). The Minto Mine area consists of 164 claims on the west side of the Yukon River within Selkirk First Nation (SFN) Category A Settlement Land Parcel R-6A (Survey 2000-0112LTO Plan 83638 CSR) (Figure 2). The North Klondike Highway is located on the east side of the Yukon River and the mine-site is accessed by crossing the Yukon River at Minto Landing. After crossing the Yukon River, either by summer barge or winter ice bridge, access to the mine-site is via a 29 km access road up the Minto Creek drainage. Crews and supplies are transported by air during the spring thaw and fall freeze-up.

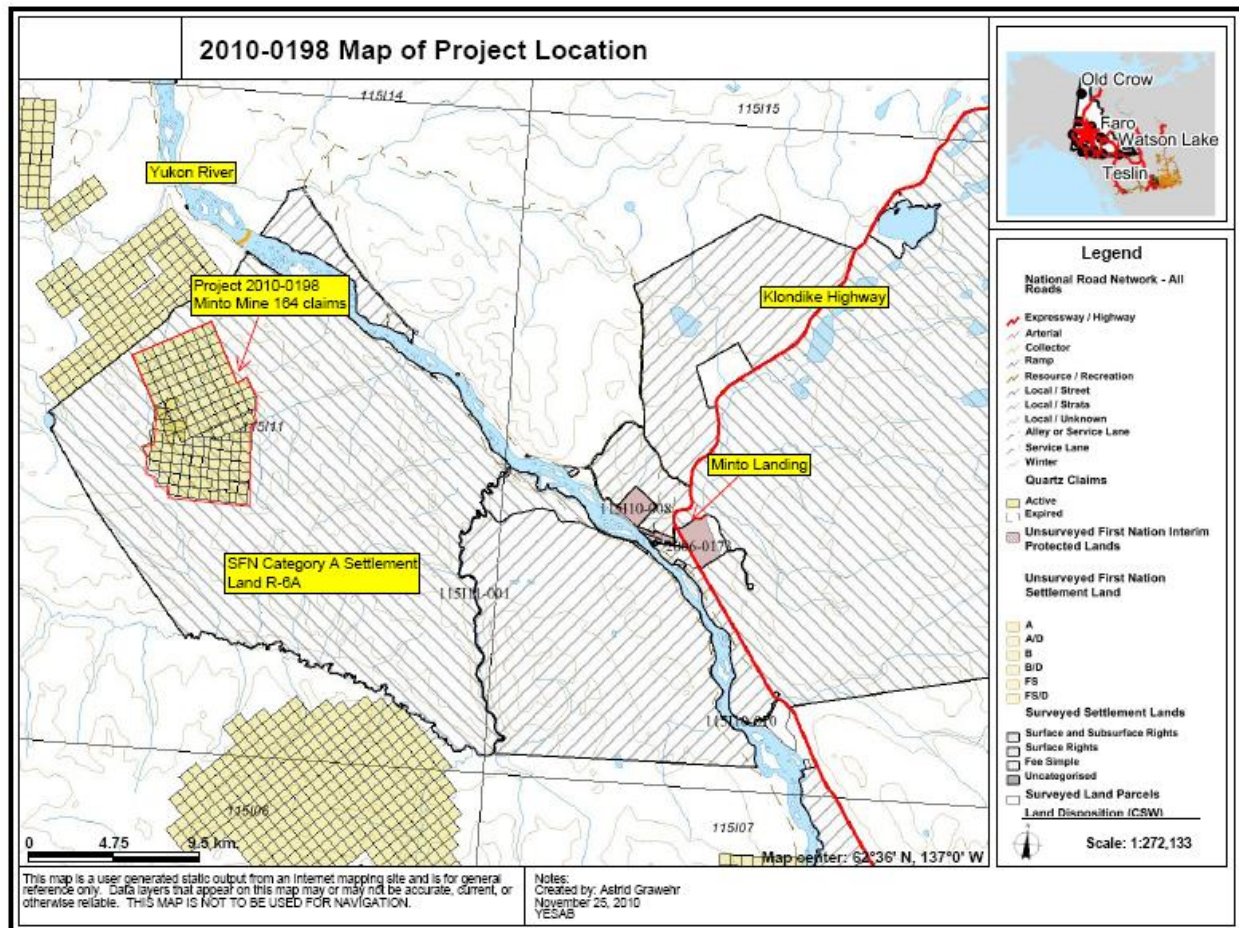
Minto Mine Phase IV Expansion – 2010-0198

Map of the Yukon region in Canada showing the project location. The map includes the Yukon River, its tributaries, and various towns. A red star marks the project location near Pelly Crossing. A line points from the text "PROJECT LOCATION" to the star. The map also shows the borders of Alaska (United States of America) to the west and Northwest Territories to the east, and British Columbia to the south. A compass rose is in the top left corner.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Figure 2 Local area around the Minto Mine.



YESAA Assessment District: Central Yukon

Coordinates:

NW Corner 62.6500°N/Lat, 137.2667°W/Long

NE Corner 62.6500°N/Lat, 136.8667°W/Long

SE Corner 62.5833°N/Lat, 136.8667°W/Long

SW Corner 62.5833°N/Lat, 137.2667°W/Long

Watershed(s) and Drainage Region of the Project Area as Indicated on the Geo-Locator:

Major Drainage Area: Yukon River

Sub Drainage: Central Yukon

Sub-Sub Drainage: Minto Creek

Tradition Territory or Settlement Region of the Project Area:

Selkirk First Nation

1.3 PROJECT HISTORY

The Minto Mine, operated by MintoEx, is an existing and fully operational copper and gold mine. The property has been explored since the initial workings on the claims in 1971. In 2005, Sherwood Copper (the predecessor of Capstone Mining Corp.) acquired the property and focussed on confirming the resource in the Main Pit while they completed construction of the mine infrastructure. The Minto Mine has been producing concentrate under various licences and permits since 2007.

The Minto Mine operation currently includes: the Main Pit with associated waste dumps and ore stockpile areas; an ore processing facility with a mill water pond; a concentrate storage shed; a tailings filter building and dry stack tailings storage facility (DSTSF); a water retention dam with associated Water Storage Pond (WSP); and administrative offices, camp and airstrip. The Minto Mine is currently expected to produce an estimated total of 6.1 million tonnes (Mt) of ore and 30.5 Mt of waste over a 4-year mine operating life. Pre-production, the total metal recoverable from the Main Pit was estimated to be 281.9 million pounds of copper (Cu), 144,000 ounces of gold (Au) and 1.7 million ounces of silver (Ag). The Main Pit was originally divided into five stages in order to achieve the Minto Life of Mine (LOM) plan targets. This plan was optimized to access the high-grade ore first followed by the lower-grade and partially oxidized material. The completely oxidized material is stored in a discrete area of the waste dump and could possibly be recovered and processed in the future.

The Mayo Designated Office, under the *Yukon Environmental and Socio-economic Assessment Act* (YESAA), has completed two evaluations of proposals concerning operations at the Minto Mine. The first report, issued in May of 2008, resulted in the Government of Yukon amending Yukon Quartz Mining License QML-0001 to reflect the increased milling rate of 3,200 tonnes per day (tpd). The second report, issued in March of 2010, further increased the mill rate to 3,600 tpd and revised the Water Management Plan (WMP). The present proposal is for Phase IV operations with the Phase V proposal submission to the Yukon Environmental and Socio-economic Assessment Board (YESAB) expected in 2011.

Since commercial production began in 2007, it has become apparent that the Minto Creek watershed environment is very different from the modeled environment that formed the basis of the original WMP and Water Use License (WUL) QZ96-006. Due to large amounts of un-anticipated precipitation, MintoEx required three separate discharges of water under the emergency provisions in the *Waters Act* (up to 350,000 m³ of water was discharged in August 2008; 300,000 m³ in June 2009 and 705,000 m³ in August 2009). The current WMP for the site is transitioning from the original to the plan currently before the Yukon Water Board for review as Water Use License Application QZ09-094.

Current mining activities are expected to finish by the end of 2011. Activities in this proposal increase the mining life by 2.1 years and the milling life by 2.5 years by adding two open pits and an underground component as sources of ore. The additional mining will be done under amendments to the current licenses which expire June 30, 2016. Reclamation and closure activities are proposed to finish in 2020 with post-closure monitoring continuing until 2030.

1.4 PROJECT DETAILS

MintoEx proposes amendments to its Quartz Mining License QML-0001 and Type A Water Use License QZ96-006 in order to expand its current mining operations at the Minto Mine. The following sections outline the activities, which collectively comprise the “project”.

1.4.1 Surface mining

MintoEx plans to mine the Phase IV ore zones (Area 2 and Area 118), using conventional open pit mining methods. Associated with this is an expanded network of site access and haul roads to accommodate the mining activities.

1.4.1.1 Stripping

Overburden – as part of the mining operations, MintoEx excavates overburden and stockpiles it in the designated Ice-Rich Overburden Dump (if ice-rich) or Reclamation Overburden Dump (if not ice-rich) for use in progressive reclamation initiatives or final closure. During the summer of 2010 MintoEx deposited overburden in the wasterock dumps as an interim measure pending completion of a design and subsequent approval under QML-0001 of an expansion to the Reclamation Overburden Dump, which was received on August 3, 2010.

Wasterock – Area 2 contains approximately 26 Mt of wasterock and Area 118 0.6 Mt. This wasterock will go to the MVF and to the Main Pit as buttresses. There is no wasterock associated with the remaining excavations in the Main Pit.

1.4.1.2 Mining

The mining sequence begins with completion of the Main Pit (2.5 Mt ore). Once this is done the south wall will be buttressed with wasterock prior to the placement of processed tailings from the Phase IV operations that will be backfilled into the Main Pit. Mining of the Main Pit will be followed by mining of the Area 118 Pit (0.09 Mt ore) then Stage 1 of the Area 2 Pit and finally Stage 2 of the Area 2 Pit (2.9 Mt ore - Stage 1 & 2 combined).

1.4.1.3 Water

The development of the Phase IV open pits and the placement of wastes from the mining activities will require minor realignments of existing water management infrastructure. This includes diversion ditches and stormwater conveyance piping. No new infrastructure for the collection, conveyance or treatment of water is proposed. The primary changes in water storage for the Phase IV expansion are related to the excess runoff or surge storage capacity. With the proposed placement of waste in the Main Pit (wasterock and tailings from the mining of the Phase IV deposits), the storage capacity will decrease as the life of mine progresses. This will be offset by the excavation of the Area 2 Pit, which could also be used for short-term storage of excess runoff that cannot be immediately treated and/or discharged.

1.4.2 Underground mining and exploration

Underground mining of Area 2 and Area 118 will use conventional room and pillar mining methods. Underground development includes portal development, dewatering infrastructure and development of laydown, cutouts, muck bays and temporary waste handling areas.

1.4.2.1 Additional underground mining equipment required for underground operations includes:

- 2x Jumbo – T23wo-boom (60 kW)
- 2x LHD - 10t (220 kW)
- 2-3 Truck – 30t (200 kW)
- 1x McClean Bolter (60 kW)
- 2x Scissor Lift (60 kW)
- 1x Forklift/tractor (50 kW)
- 1-2 Charging Tractor (60 kW)
- 2x Personnel Carriers (60 kW)
- 3-4 Tractor (50 kW)
- 1x Grader (130 kW)

1.4.2.2 Power

Existing overhead power lines will be extended, including to the underground portal. Total monthly energy consumption for the mine is estimated to be 712,000 kilowatt hours (kWh).

1.4.2.3 Portal development

The portal location was selected based on minimal overburden, competent rock conditions, proximity to ore and the long-term suitability of the site.

1.4.2.4 Safety

The decline will not have a secondary egress until the main ventilation raise is complete; a manway in the ventilation raise will provide secondary egress once completed. Additional surface ventilation raises may be required in the future should additional mineable resources be discovered; these could also potentially be used as secondary egresses. For the mining of the Area 2 underground mineralization (Stope 6), a ventilation drift will be established to a new portal at the Stage 2 Area 2 Pit bottom, which would then also be available as a secondary egress. A mobile refuge chamber will be established adjacent to the ramp and will be moved periodically to maintain reasonable proximity to the working face.

Salt water – as MintoEx is proposing to not heat the underground workings, a brine system will be used to keep drilling water from freezing. It is proposed that the underground workings utilize 20% concentration brine with a freezing point of -19 °C. Approximately 85% of the brine will be recycled and 15% of the brine

will be pumped out of the mine with the groundwater whereupon it will be treated by the water management system.

Ventilation – a ventilation factor of 0.06 m³/second/kW of operating diesel engine power was used to provide guidance for ventilation required for both the exploration decline and full production periods. For the decline it is estimated that 30 m³/s of fresh air will be needed. During full production, a minimum of 100 m³/s will be required, approximately 30 m³/s per active stope and another 30 m³/s for development ends and access ways. Auxiliary fans will provide ventilation to each dead-end working face. For the initial decline development, a 100 kW vane axial fan will be used and located outside the portal. The fan will be set up as part of a forced-air system that feeds air into flexible ventilation duct that discharges at the mining face(s). Approximately 30 m³/s of ventilation air will be used depending on the size of the underground diesel equipment fleet.

Diesel particulate matter – all mobile equipment will be equipped with exhaust scrubbers.

Raise bores – approximately halfway down the decline, a ventilation raise will be driven to surface and fresh air provided. The extension of the decline beyond the ventilation raise will continue to be ventilated with an auxiliary fan located “up-stream” of the vent raise and ventilation duct to the working face(s). During production, the stopes will be connected by a series of ventilation drifts and raises that will complete the ventilation circuit, providing flow-through ventilation of the stoping areas and the decline up to the final access crosscut.

Water – it is anticipated that underground mining and diamond drilling will require approximately 50-200 m³/day of water. Water will be reused as much as possible once underground sumps are established off the ramp. A water tank will be installed in a cross-cut near the top of the decline and will be the final holding and discharge point for any excess underground water. Water for drilling and wash-down purposes will be recycled water.

As underground development proceeds, there may be a need to dewater mine workings by pumping water to surface. Minimal inflow is anticipated (hydraulic conductivity estimated to be in the range of $K = 10^{-8}$ cm/s) however, a mine dewatering piping system will be established to accommodate a rate of up to 500 m³/day as a contingency measure. A series of settling and water storage sumps will be placed every 300 meters along the decline. Discharging of excess water from the underground will be to either the processing plant or to the Main Pit sump.

1.4.2.5 Underground development schedule

Table 1 outlines the underground development schedule.

Table 1 Underground development schedule (Table 3-15 from YOR document # 2010-0198-062-1)

Name	Units	2011	2012	2013	2014
Decline development	Metres (m)	1,792	1,328		
Lateral development (excluding decline)	Metres (m)	1,361	913	-	-
Raise development	Metres (m)	203	26	9	-
Total development	Metres (m)	3,356	2,267	9	0
Development wasterock	Kilotonnes (Kt)	203,892	110,564	84	0

1.4.2.6 Development drilling

Decline development and stope drilling will be done with a 2-boom electric-hydraulic jumbo.

1.4.2.7 Explosives

Blasting – consumption of explosives for development and stoping is estimated to be 0.6 to 0.9 kg/tonne of broken rock. Ammonium nitrate/fuel oil (“ANFO”) and emulsion explosives will be the primary explosives used and will be supplemented with packaged dynamite for initiation of ANFO, for trim blasting and for areas that are too wet for the use of ANFO. Standard long-period delay non-electric blasting caps initiated by detonating cord will be used for the timing of explosive. Each blast or “round” will produce about 200 to 300 tonnes of broken rock and consume about 200-300 kg of explosives.

Storage – the Dyno-Nobel explosive magazines located on site will provide a central storage facility for the underground explosives. Smaller magazines may be established underground or near the portal for short-term low quantity storage.

1.4.2.8 Mucking and hauling

After the rock has been blasted and the blasting fumes cleared from the face, the muck pile will be watered down to control dust and the area will be made safe by scaling loose rock from the face, walls and back. The muck will be removed from the face and placed either into the nearest muckbay up the ramp or directly into a truck. Underground production will supplement the open pit ore to a maximum of 2,000 tpd and will operate from 2011 to early-2014.

1.4.2.9 Bolting (ground support)

As soon as the face has been cleaned, a rock bolter will install the necessary ground support using rock bolts and mesh. The rock bolts will be resin-anchored re-bar that provides long life and excellent strength characteristics.

1.4.2.10 Services

Compressed air lines, drill water pipes, dewatering pipes, electrical cable and ventilation duct will be carried down the underground ramp after the drift is protected.

1.4.2.11 Wasterock

Acid Base Accounting (ABA) – a test program under the current WUL is in place with regular reporting requirements in addition to the percent-Cu monitoring of waste, which guides segregation and placement of waste materials in dumps and/or use as construction material.

Wasterock disposal – wasterock from the initial mine access ramp will be hauled to surface and mixed with open pit waste on the currently planned waste dumps. The total tonnage of wasterock from the underground mine will be about 315 Kt and about 110 Kt of that is planned to be kept underground and deposited in mined-out stopes. Additional wasterock from surface will also be hauled underground for use as backfill, as about 434 Kt of backfill are anticipated to be required.

1.4.2.12 Exploration

MintoEx plans to develop an exploration decline to Minto East and Wildfire/Copper Keel from the production ramp using the same portal and facilities.

1.4.3 Waste management

The new waste management practices for the Phase IV mining wastes include: tailings deposition in Main Pit (requires buttressing the south pit wall with wasterock) and Area 2 Pit; expansion of the reclamation overburden dump; and expansion of the Southwest Waste Dump.

1.4.3.1 Mill Valley Fill

Stability – inclinometer monitoring data from February 2010 suggested movement of the foundation soils beneath the Dry Stack Tailings Storage Facility (DSTSF). The monitoring suggests a relationship between a deep clay layer 30 to 50 meters below the surface. The clay layer appears to be of the same origin as the clay that is underlying the south pit wall and affecting the SW Waste Dump stability. Studies are currently underway to collect additional information that will improve and refine understanding of the factors controlling ground movements beneath the DSTSF. The Mill Valley Fill (MVF) is the principal mitigation concept and is intended to terminate movement along the deep clay layer beneath the DSTSF. The purpose is to reduce the shear stress along the sliding plane to a value that is below the creep strength. The MVF will buttress the lower slope and will increase the passive resistance to further movements.

Water quality – the MVF will be designed with the site Water Management Plan in mind. The design will include a system to collect any seepage from the DSTSF. This collection system will likely consist of one or more wells and will be located at the toe of the DSTSF in the general location of current water quality monitoring stations W8 and W8A.

1.4.3.2 Southwest Waste Dump

Stability – movement at the toe of the Southwest (SW) Waste Dump is likely a result of creep in the permafrost/clay layer located at the bedrock contact due to the exposure of this layer by the excavation of the Main Pit. The deformations under a portion of the toe of the SW Waste Dump are believed to be related to the unloading excavation at the south pit wall. A detailed mitigation plan for the SW Waste Dump will be developed once modeling of the movement is completed; however it is anticipated that buttressing the south wall of the Main Pit will serve to stop movement in the SW Waste Dump. Another option to enhance long-term stability is overall slope flattening by construction of benches. This can be accomplished by either placement of additional rockfill or by reworking the slope-forming material currently on site. Potential effects of the movement on closure cover options will be reviewed during the detailed design phase of closure planning. If changes are to be made to the conceptual design of the covers, characterizing the underlying material using a drilling investigation program will determine the expected placement angle that will be required for the cover material.

1.4.3.3 Material characterization

MintoEx plans to characterize materials using blasthole sampling conducted as per grade control practices, with assay for percent-Cu. The frequency of waste blastholes tested will be determined during permitting. The MVF and SW Waste Dump will be audited to confirm that materials meet percent-Cu specifications. Auditing frequency and protocols and the response to any auditing failures will be determined during permitting. Metal leaching will be monitored by seepage sampling, and Main Pit characterization protocol will be adopted for the Phase IV mine areas to monitor acid rock drainage potential.

1.4.3.4 Water quality

Weekly effluent quality monitoring and reporting will be determined under Water Use Application QZ09-094 according to the federal Metal Mining Effluent Regulations (MMER) with monitoring of deleterious substances listed in Schedule 4 of the MMER.

1.4.3.5 Tailings

The filtering and dry stacking of tailings is planned to continue through 2010 and early 2011, until the Main Pit is fully mined out, and the South Wall Buttress is started. Approximately 5.88 million cubic metres (Mm³) of tailings are scheduled to be produced during Phase IV operations. The Main Pit will be used to store 3.40 Mm³ of tailings from April 2011 to April 2014. From April 2014 to end of mine life, 2.48 Mm³ of tailings will be deposited in the Area 2 Pit.

1.4.4 Infrastructure construction

1.4.4.1 Camp expansion and construction of office space within the mill and a heavy duty mechanical shop

MintoEx plans to expand the camp towards the south, on top of the MVF. The camp expansion is for an additional 100 persons (for a total capacity of 300 persons) and will lead to an estimated increased water use of 20 m³/day for a maximum of approximately 45.4 m³/day.

1.4.5 Closure

Closure and reclamation of all Phase IV project components will be done following completion of Phase IV mining and milling. The proposed mitigation to reduce metal leaching and/or nutrient loading for the Main Waste Dump, SW Waste Dump, DSTSF and MVF is compaction and cover by an engineered soil cover system. The proposed mitigation for the Area 1 and Area 2 and pits is backfilling with tailings and/or wasterock with subsequent flooding. The proposed mitigation for the Area 118 Pit is backfilling with wasterock and subsequent coverage with a vegetated soil cover. It is proposed that site drainage will be actively treated for 4 years followed by a switch to passive treatment. The contingency for site drainage is active water treatment.

1.4.6 Existing/continued activities

The following activities and infrastructure is already permitted with no changes anticipated related to the Phase IV expansion. The following therefore do not form part of the project details.

1.4.6.1 Access

Access to the site is via the North Klondike Highway to Minto Crossing across the Yukon River by barge or ice bridge and then via a 29 km gravel road to the mine-site. There are no proposed changes to site access.

1.4.6.2 Open pit and haul roads

The Main Pit and existing haul roads used to bring ore from the Main Pit to the ore stockpiles or processing facility.

1.4.6.3 Ore stockpiles

Several ore stockpiles exist on the property with each stockpile defined in terms of copper content. The stockpiled ore is used to supplement mill feed ore and allow for some increase in flexibility in the mine plan, while providing the highest mill head grade possible.

1.4.6.4 Ore processing

Milling of ore from the above mining areas will be done using the existing plant at currently approved milling rate of 3,600 tpd with no change to the chemicals used or the storage of those chemicals. Water use for ore processing is not expected to change. During the initial pre-stripping of the Phase IV pits, the mill feed will be supplemented with stockpiled ore from the Main Pit (approximately 1 Mt ore).

1.4.6.5 Blasting

Blasting frequencies, explosive use, noise level and air quality associated with surface mining are already permitted with no changes planned.

1.4.6.6 Water management

There are no proposed changes to the adaptive monitoring and management programs, mine water discharge decision making processes, or effluent discharge standards for the Phase IV development.

1.5 PROJECT SCOPE

The principal activity of this project is the expansion of mining areas at the existing Minto Mine in central Yukon. Minto Explorations Ltd. (a subsidiary of Capstone Mining Corp.) operates the Minto Mine which is located approximately 41 km southwest of Pelly Crossing on the west side of the Yukon River. Current mining activities are expected to finish by the end of 2011; activities in this proposal increase the mining life by 2.1 years and the milling life by 2.5 years. Current licenses expire June 30, 2016. Reclamation and closure activities are proposed to finish in 2020 with post-closure monitoring continuing until 2030.

The principal activities of the project are as follows:

- Surface mining of Phase IV ore zones (Area 2 and Area 118), using conventional open pit mining methods;
- Underground mining of Area 2 and Area 118 using room and pillar underground mining methods, including activities such as portal development, dewatering infrastructure, and development of laydown and temporary waste handling areas;
- Development of an exploration decline to Minto East and Wildfire/Copper Keel from the production ramp using the same portal and facilities;
- Milling of ore from above mining areas using existing facilities at the currently approved milling rate;
- New waste management practices for the Phase IV mining wastes including tailings deposition in Main Pit (requires buttressing the south pit wall with wasterock) and Area 2 Pit; expansion of the reclamation overburden dump and expansion of the Southwest Waste Dump; and
- Construction of Mill Valley Fill.

The accessory activities of the project are as follows:

- Camp expansion to the south, on top of the Mill Valley Fill for an additional 100 persons (for a total capacity of 300 persons);
- Minor realignments of surface water diversions and upgrades to existing diversions;
- Construction of office space within the mill;
- Construction of a heavy duty mechanical shop;
- Extension of existing power lines, including to underground;
- Compressed air lines, drill water pipes, dewatering pipes, electrical cable and ventilation duct to be carried down the underground ramp as it advances;

- Consumption of explosives for development and stoping estimated at 0.6 to 0.9 kg/tonne of broken rock. The total amount of material to be blasted is approximately 46 million tonnes;
- Addition of underground mining equipment; and
- Closure and reclamation of all Phase IV project components following completion of Phase IV mining and milling.

2.0 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

2.1 PHYSICAL ENVIRONMENT

2.1.1 Surface waters

Morphology and hydrology

From the Yukon River to the furthest reaches in its headwaters, Minto Creek is approximately 17 kilometres in length. Minto Creek is composed of two distinct reaches divided by a steep canyon, with a grade of 21%, situated approximately 1.5 km upstream of the confluence with the Yukon River. Minto Creek is about 2 to 3 meters in width and approximately 0.5 to 1.5 meters in depth during medium flow conditions. The creek is generally deeper and wider near the confluence with the Yukon River with a grade of 1.5 to 2%, which increases to 6% at the base of the canyon. The mouth of Minto Creek at the confluence with the Yukon River largely has a silt and sand substrate. Minto Creek has peak flows during spring freshet and low flows in the summer. The creek freezes to the bottom in the winter. Minto Creek is responsive to precipitation events that result in high flood conditions during heavy rainfall events. On occasion, surface flow in the lower reach is interrupted during low flow conditions.

For the purpose of water management, Minto Creek is divided into two distinct watersheds. Catchment A, which includes the Minto Creek headwaters and the mining operation, is slightly over 1,000 hectares in area. All surface water that collects in Catchment A currently reports to the WSP prior to discharge into Catchment B. Catchment B includes the main stem of Minto Creek and its tributaries from the outflow of the water storage pond to the confluence with the Yukon River. It includes the downstream section of the upper reach and fish barrier described previously. Catchment B is a little over 3,000 hectares or approximately 75% of the Minto Creek drainage area.

Surface water quality

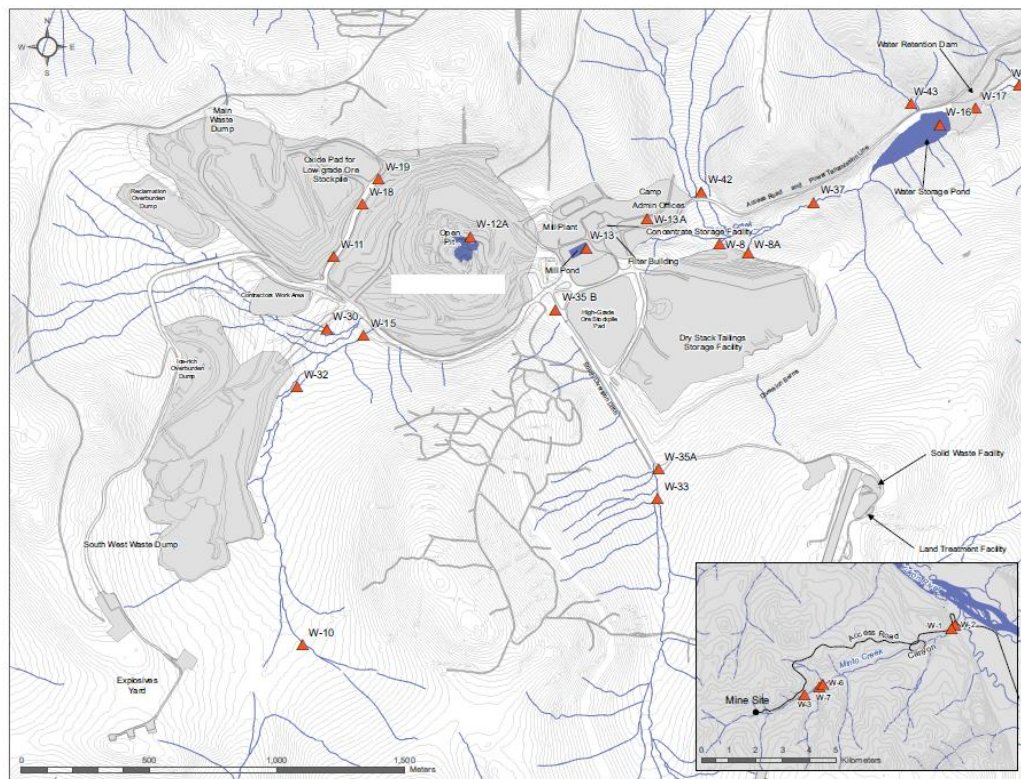
Pre-operational surface water quality in Minto Creek was established as part of the development of site-specific water quality objectives (SSWQO) for Minto Creek by Minnow Environmental Inc. who calculated 'background' concentration (95th percentile) of reference stations using data from pre-2006 (YOR document # 2010-0198-075-1). In this document they also updated the Minto Creek water quality characterization with data to the end of 2009 for three distinct phases:

1. Pre-operation (prior to April 1, 2006),
2. Operational (April 1, 2006 – December 31, 2009) with no discharge, and

3. Operational with discharge (Discharge periods were from August 26 – September 30, 2008, June 26 – August 6, 2009, and August 13 – October 30, 2009).

The characterization was based on data for reference locations situated in Minto Creek tributaries (Stations W6 and W7) unaffected by mining operations, for effluent measured at Station W3 directly downstream of the water storage pond, and for the fish-bearing receiving environment at Station W2. Figure 3 shows the location of sampling stations on the Minto Mine site.

Figure 3 Water quality sampling locations (p.3 of YOR document # 2010-0198-075-1).



The Minto Creek background water quality has been characterized as follows: a mean pH of 7.8, a mean conductivity of 217 $\mu\text{S}/\text{cm}$, a mean hardness of 112 mg/L, and a mean alkalinity of 106 mg/L. Total suspended solids (TSS) were occasionally elevated in Minto Creek and ranged as high as 705 mg/L although the mean TSS was 7.2 mg/L (maximum 28 mg/L) outside of peak TSS periods such as heavy rains (when data points greater than 50 mg/L were excluded from the data set) (YOR document # 2010-0198-075-1). The mean value for dissolved organic carbon is 15.1 mg/L with a maximum of 17.7 mg/L (YOR document # 2010-0198-075-1).

Background metal concentrations in Minto Creek, based on data points with less than 50 mg/L TSS, resulted in mean concentrations of total aluminum, total and dissolved copper, and total iron that exceed their respective Canadian Water Quality Guidelines (CWQG) (YOR document # 2010-0198-075-1). More than 40% of individual data points for these parameters were greater than the CWQG (see Table 2). Mean concentrations of all other parameters were below applicable CWQGs. However, individual samples exceeded the CWQG for total and dissolved chromium at frequencies of approximately 20% and

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

7% respectively. Total and dissolved cadmium, total lead, total silver and dissolved selenium also exceeded at very low frequencies. Overall, the evaluation in YOR document # 2010-0198-075-1 suggested that aluminum, chromium, copper and iron are naturally elevated in the Minto Creek drainage.

Table 2 Baseline and Average Water Quality in Lower Minto Creek (Station W2) (Table 3.1 and Appendix Table A.1 of YOR document # 2010-0198-075-1).

Parameter	unit	Baseline 95th Percentile ¹	SSWQO ¹	CWQG	Pre-operation		Operation no discharge		Operation discharge	
					Averages	% exceeding Guideline	Averages	% exceeding Guideline	Averages	% exceeding Guideline
Total Metals										
Aluminum	mg/L	0.618	0.62	0.1	0.258	14	0.506	21	0.706	27
Arsenic	mg/L	0.0008	—	0.005	0.0007	0	0.0007	0	0.0008	4
Cadmium	mg/L	0.00004	—	0.000051 ²	0.00002	0	0.00003	11	0.00006	25
Chromium	mg/L	0.002	0.002	0.001	0.0009	14	0.0012	18	0.0017	25
Copper	mg/L	0.013	0.017	0.002-0.004 ³	0.003	0	0.006	9	0.022	62
Iron	mg/L	1.08	1.1	0.3	0.555	14	0.803	21	1.188	31
Lead	mg/L	0.00041	—	0.002-0.007 ³	0.0002	0	0.0003	0	0.0006	4
Mercury	mg/L	0.00005	—	0.0001	0.00001	0	0.00003	0	0.00002	0
Molybdenum	mg/L	0.002	—	0.073	0.001	0	0.001	0	0.008	0
Nickel	mg/L	0.003	—	0.065-0.15 ³	0.002	0	0.002	0	0.003	0
Selenium	mg/L	0.0005	—	0.001	0.0005	0	0.0004	0	0.001	69
Silver	mg/L	0.0001	—	0.0001	0.00001	0	0.00004	4	0.00002	4
Thallium	mg/L	0.0001	—	0.0008	0.00005	0	0.00004	0	0.00002	0
Zinc	mg/L	0.0105	—	0.03	0.002	0	0.006	1	0.007	4
Non-metallic Parameters										
Ammonia	mg/L	—	—	2.33-0.256 ⁴	0.015	—	0.015	—	0.04	—
Nitrite	mg/L	0.03	—	0.06	0.0007	0	0.0063	0	0.0246	3
Nitrate	mg/L	0.193	—	2.9	0.1	0	0.1	0	3.0	53
Chloride	mg/L	—	—	—	1	—	1	—	8.0	—
pH- lab	pH unite	8.22	—	6.5-9.0	8.1	0	8.0	0	8.1	0
TSS	mg/L	24.58	—	—	17	—	23	—	16	—

BOLD water quality guidelines/objectives denote the standard by which water quality at this station was compared.

Shaded areas indicate average concentration of all samples is greater than respective water quality guideline/objective.

Dash indicates no data available.

¹ 95th percentile and site specific water quality guideline developed by Minnow (2009).

² Cadmium guideline dependant on average water hardness for W2 of 165 mg/L CaCO₃.

³ Copper, lead and nickel guidelines dependant on water hardness.

⁴ pH of 8.0 and temperature of 30 and 0°C, respectively.

Taking into account water quality data during Minto Mine operations, concentrations of aluminum, cadmium, chromium, copper, iron, molybdenum, lead, selenium, zinc, nitrite, and nitrate at the receiving environment station (W2) in Lower Minto Creek have generally increased between pre-operation and operation periods, and between operation periods with no discharge to operation periods with discharge (YOR document # 2010-0198-075-1). This is concurrent with higher concentrations of these same parameters measured in effluent (W3), and demonstrates the effect of mine operations on water quality within the receiving environment. As shown in Table 2, average concentrations of aluminum, cadmium, chromium, copper, iron and nitrate exceed the applicable water quality guidelines and SSWQOs that have been proposed for the receiving environment. Conversely, few parameters exceeded water quality guidelines/SSWQOs in the reference stations.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Sediments

Baseline sediments were characterized in 1994 as shown in Table 3, and have been sampled annually from 2006 to 2009. Prior to the commencement of mine operations, sediments in Minto creek were composed mostly of sand, with some gravel and minimal fractions of silt and clay. Levels of antimony, cadmium, mercury, molybdenum and silver were low at all sites. Levels of arsenic were high, with a maximum level detected at site S4 (W2), in lower Minto Creek. Levels of chromium and zinc were highest at site S3 (approx. 100 m downstream of W6), with average values of 23.3 mg/kg and 48.53 mg/kg, respectively. Copper levels were elevated at site S1 (W9), which is on the mine-site near the deposit, likely attributed to the mineralized rock.

Table 3 Baseline Stream Sediment Results (Table 8 of YOR document # 2010-0198-077-1).

Analysis	Unit	Range of Average Results ¹		CCME SQG	
		Minimum	Maximum	ISQG ²	PEL ³
Physical Tests					
Moisture	%	18.47	25.23	—	—
Total Metals					
Antimony	mg/kg dry weight	0.29	0.44	—	—
Arsenic	mg/kg dry weight	4.07	4.44	5.9	17
Cadmium	mg/kg dry weight	0	0.13	0.6	3.5
Chromium	mg/kg dry weight	14.03	23.30	37.3	90
Copper	mg/kg dry weight	13.80	102.8	35.7	197
Lead	mg/kg dry weight	1.60	3.93	35	91.3
Mercury	mg/kg dry weight	0.01	0.02	0.17	0.486
Molybdenum	mg/kg dry weight	0	0	—	—
Silver	mg/kg dry weight	0	0	—	—
Zinc	mg/kg dry weight	29.43	48.53	123	315
Particle size					
Gravel	%> 2mm	1.75	28.83	—	—
Sand	2 mm>%>0.063	62.63	77.87	—	—
Silt	0.063>%> 4µm	6.63	14.10	—	—
Clay	%< 4µm	1.89	6.31	—	—

Bold indicates value is above the ISQG

¹ For Stations S1(W9), S2(W3), S3(~100m d/s W6) and S4(W2); from Table 8, Appendix N (EBA, 2010).

² Interim Sediment Quality Guideline, Canadian Environmental Quality Guidelines, CCME 1999.

³ Probable Effects Level, Canadian Environmental Quality Guidelines, CCME 1999.

Data from 2006 to 2009 indicate that copper and zinc concentrations in sediment have increased over baseline at Station W3 in upper Minto Creek, immediately downstream of the WSP (YOR document # 2010-0198-077-1). Concentrations of chromium, copper, and zinc were greater in every year from 2006 to 2009 than in 1994 downstream at Station W2. As stated in Appendix N (YOR document # 2010-0198-077-1):

Comparison of mean sediment quality against Canadian Environmental Quality Guidelines (CEQG; CCME 1999) indicated that arsenic, chromium and copper were the only parameters with concentrations greater than national Interim Sediment Quality Guidelines (...). The ISQG are “threshold effect levels” below which adverse effects are expected to rarely occur (CCME 1999). In the case of both chromium and copper, rare exceedences of Probable Effect Levels (PEL; CCME 1999) were also observed (...). The PEL defines the level above which adverse effects are expected to occur frequently (CCME 1999).

(...) In the case of arsenic, there is no evidence that mine activities have influenced sediment concentrations. In the case of chromium, there is evidence of greater concentration at exposed areas than at reference areas and of an increase over time. In the case of copper, the evidence was less definitive, with some indication of greater concentration at exposed areas than at reference areas tempered by the fact that the highest concentration observed was at a reference area (in 2009) and that there is no evidence of a consistent trend of increasing concentrations of sediment copper over time.

2.1.2 Groundwater

Figure 3 shows the location of groundwater monitoring wells for the Minto Mine operation. To date, groundwater monitoring at the DSTF has not been able to measure pore water in the piezometers, as ground conditions have remained frozen. The results of the temperature and piezometer monitoring near the SW Waste Dump through June 2008 suggest that unfrozen layers at depth may be limited or non-existent, and that shallow perched water tables within the seasonally thawed active layer may provide the only mechanism for transport within this region of the basin. Therefore, groundwater at the Minto site is seemingly concentrated in the shallow, active surface materials during summer thaw period and in the deeper, sub-permafrost aquifer system. SRK Consulting Engineers and Scientists (SRK) (YOR document # 2010-0198-076-1) concluded, “[b]ased on the piezometric data and topography observed, the deeper groundwater flow is expected to discharge within the mine-site, prior to the W3 compliance point.”.

The groundwater regime is anticipated to resemble the following:

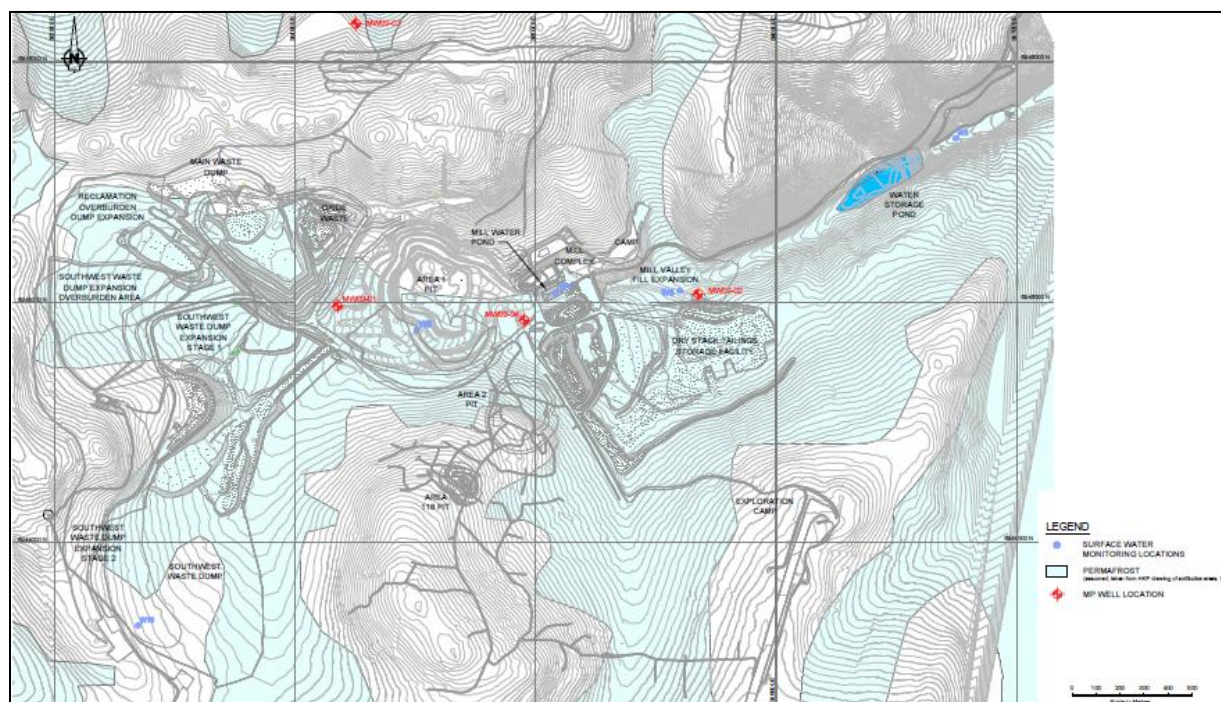
- Permafrost:
 - will dominate groundwater flow system below the active zone to depths of up to 45m
- Shallow flow:
 - will be dominated by permafrost conditions;
 - will occur in the seasonally thawed layer; and
 - will be controlled by overburden composition in the unfrozen areas.
- Deeper flow:
 - will occur below the permafrost within the bedrock; and
 - will concentrate in the shallow, weathered zone if unfrozen.

Generally, baseline groundwater quality is consistent in quality throughout the site and similar to the surface water quality mean annual concentrations.

2.1.3 Permafrost conditions

Appendix M provides a description of permafrost conditions at the Minto Mine operation site (YOR document # 2010-0198-076-1). Permafrost on the site is extensive and deep, Figure 4 shows the spatial distribution of permafrost. Data from drilling at several locations has shown permafrost ranging from depths from within 1 m of ground surface to depths of up to 10 m.

Figure 4 Extent of permafrost at the Minto Mine-site (Figure 1 of YOR document # 2010-0198-076-1).



2.2 BIOLOGICAL ENVIRONMENT

2.2.1 Aquatic biology

Fish and fish habitat

Minto Creek discharges into the Yukon River, which is a major drainage for much of the Yukon Territory, originating in south central Yukon and flowing to the northwest to Alaska. Previous studies on the Yukon River within the vicinity of the Minto Mine have identified both spawning and rearing areas for salmon. Spawning shoals are present in the Ingersoll Islands (downstream of the project area) as well as around islands upstream of Minto Creek, near Big Creek. These offer an extensive network of side channels and sloughs that provide good spawning gravel. Fish species present in the Yukon River include chinook,

coho, and chum salmon, rainbow trout, lake trout, least cisco, bering cisco, round whitefish, lake whitefish, inconnu, arctic grayling, northern pike, burbot, longnose sucker and slimy sculpin.

In terms of fish habitat, Minto Creek is a small erosional creek, with no natural upstream water storage. A natural fish barrier is located about 1.2 kilometres upstream from the Yukon River; no fish samples have been obtained upstream of the barrier during any sampling event. The silt and sand substrate that characterizes the creek mouth area is not suitable spawning habitat for Chinook salmon. The creek freezes to ground during the winter and therefore does not provide over-wintering habitat or viable spawning habitat for fall spawning species. Water temperature and high flows in Minto Creek are potential limitations to fish use during the spring season.

Fish studies were conducted in 1994 (HNP Ltd., 1994) and then yearly from 2006 through 2010. Species captured include slimy sculpin, arctic grayling, round whitefish, burbot and Chinook salmon. Chinook salmon, though only in the young of year and juvenile life stages, is the most dominant species observed in Minto Creek. Generally, fish are present in low numbers in Minto Creek and were only captured during sampling later than June and mid-July.

Benthic community

Baseline sampling was undertaken in Minto Creek in 1994 (HNP Ltd., 1994), and follow-up studies as required by the WUL and the Metal Mining Effluent Regulations (MMER) Environmental Effects Monitoring (EEM) program were conducted in Minto Creek and two tributaries in 2006 and 2008.

Generally, the taxon richness of benthic invertebrates at WUL monitoring stations is low, possibly because of the rather homogenous sandy substrate conditions found at sampling locations and/or the occurrence of intermittent flow. In 2008, under current operating conditions, the analysis of benthic metrics showed that there were clear differences between the Minto Creek exposure area and the McQuinty Creek reference area. These differences appear related to subtle habitat differences and effluent exposure (as evident in higher temperature, conductivity and water quality parameters). Comparison between the 1994 baseline data and the 2008 data demonstrated slightly lower taxonomic richness at both exposure and reference locations, lower invertebrate density and lower relative abundance of mayfly and stonefly taxa during operations. These taxa are generally indicators of more pristine conditions.

Periphyton

Periphytic algae are simple aquatic plants that inhabit the substrate of water bodies. Baseline data characterizing the periphyton community in Minto Creek were collected in 1994 (HNP Ltd., 1994).

The data that is available for the site suggest a moderately low level of productivity in Minto Creek, as indicated by Chlorophyll-a analyses, but with a moderate degree of variability amongst different sites (potentially related to the degree of overhead cover). The distribution and relative abundance of various periphyton taxa also suggested a high degree of variability but generally low productivity. Species composition was similar to other creeks observed in the southwest Yukon. A high proportion of the diatoms noted in samples from sites in the middle and lower reaches of Minto Creek were *Nitzschia* spp., a species often associated with organic or nutrient enrichment. Although the overall periphyton

abundance was low, the predominance of *Nitzschia* suggested that some locations might possess sensitivity to nutrient enrichment.

2.2.2 Wildlife

The project area is home to numerous species of mammals including shrews, bats, wolves, wolverine, coyotes, foxes, black and grizzly bears, weasels, lynx, moose, woodland caribou, dall sheep, mule deer, rabbits, pikas, and several rodents. Different species utilize the project area at different times of the year, some year-round and others seasonally.

Several species of birds are found in the area including grouse, ptarmigan, numerous songbirds, migratory waterfowl. Although raptors such as nighthawk and red-tailed hawk have been noted at the mine-site, the Minto Mine site does not provide key habitat for these birds. It has been noted that the Yukon River main valley provides exceptional riparian cliff habitat for birds of prey and peregrine falcons are known to breed at the mouth of the Pelly River. One pair of peregrine falcons is also known to use the Yukon River near the Minto Mine area.

Seasonally the project area may be used by migratory birds during migration and breeding seasons. Several species—Canada goose, mallard duck, pintail duck, green-winged teal and American widgeon—pass through the area on their way further north to Arctic breeding grounds. Waterfowl are not known to use the Minto Mine area for extended periods.

Baseline wildlife conditions for the Minto Mine area were collected in 1994 for the original mine permitting process (HNP Ltd., 1994). Wildlife baseline conditions have not been re-assessed during mine operation. In the project proposal, MintoEx expects “that some usage and population dynamics in the direct Minto Mine area (including the access road) may have been altered slightly.” (YOR document # 2010-0198-062-1).

2.2.2.1 Moose

Although the project area does not provide key moose habitat, such as late winter range, moose do use the surrounding areas at all times of the year. Areas downstream of the Minto Creek confluence with the Yukon River are known to be spring calving grounds and are used for rearing during the summer months; moose also use the Yukon River banks and wetland areas in these areas. The Minto Creek valley burn provides good summer and winter habitat and moose and signs of moose have been observed in the upper Minto Creek watershed.

As indicated in the project proposal, past studies conducted by the Yukon Territorial Government (HNP Ltd., 1994) have estimated approximately 40 moose/1,000 km² in the MintoEx area. Studies completed for moose populations from 1980 to 1989 for the Casino Trail have the same result; however, due to small numbers, the proportion of bulls and calves to cows was not determined.

2.2.2.2 Caribou

Winter range, migration corridors and rutting areas have been qualified as key habitat for woodland caribou (HNP Ltd., 1994). In response to winter conditions caribou concentrate in forest and subalpine shrub areas where snow has not accumulated and where lichens, their primary food, are more readily

available. Caribou have not been recorded to occur in the immediate project area, but key winter range habitat has been identified for the Klaza herd in the headwaters of Big Creek, approximately 15 km west of the project.

Work on the caribou in this region was conducted in the early to mid-1990s (HNP Ltd., 1994). In 1987, the Yukon Government began studying the Klaza Caribou Herd in the area of the proposed Casino Trail south to the Nisling River, north to the Yukon River from Carmacks to the Casino mine-site. This area also included the Minto Creek area. Through radio collaring, relocation and stratified random sampling, the Klaza herd has been estimated at 955 animals. A review of habitat maps reveals that the herd's range does not overlap with the Minto Project.

2.2.2.3 Species at Risk

A review of the species at risk in Yukon was considered in accordance with the *Species at Risk Act* (SARA) (2002) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (2009). Species at risk in the Yukon and all of Canada, as listed on the Yukon Government, Department of Environment web site (<http://environmentyukon.gov.yk.ca/wildlifebiodiversity/speciesrisk.php>) and whose ranges could conceivably overlap with the study area include:

- peregrine falcon *Anatum* subspecies (Threatened);
- grizzly bear, wolverine, short-eared owl (Special Concern); and
- mule deer, elk, cougar (At Risk in Yukon but not elsewhere).

The proponent has indicated that no wildlife species at risk have been observed within the area nor were any key habitats for these species at risk encountered.

2.2.3 Vegetation

Baseline vegetation conditions for the Minto Mine area were collected in 1994 for the original mine permitting process (HNP Ltd., 1994). Vegetation baseline conditions have not been re-assessed since the mine began operations. In the project proposal, MintoEx has indicated that other than the mine development disturbance to vegetation in certain areas, it expects that vegetation communities in the area have not changed.

The Minto Mine lies within the Pelly River Ecoregion (Oswald and Senyck, 1976). Black and white spruces are the most common types of trees with paper birch occurring on cooler sites and aspen and balsam poplar occupying disturbed areas. Lodgepole pine frequently invades burnt areas, often in competition with deciduous trees on moist to wet sites. The tree line occurs at elevations of 1,350 to 1,500 m. Feathermoss dominates the understory vegetation of nearly closed coniferous stands, but as the trees thin, willows and ericaceous shrubs become prevalent. Sedge or sphagnum tussocks are common in wetlands and under black spruce. Sagewort grasslands, with several forbs, and sometimes aspen, occur on steep south facing slopes. Shrub birch and willow occur in the subalpine and extend well

above the treeline. Ericaceous shrubs and prostrate willows dominate the alpine vegetation, except on rocky terrain, where lichens are more prevalent.

The Minto Project area has been burned by four separate forest fires over the last 40 years. Consequently, much of the vegetation in this region is in varying stages of regenerative growth. In 1980 a wildfire burnt 4,550 ha, including the top of the Minto Creek drainage and this past summer another wildfire burnt 5,260 ha along the southwest flank of the Yukon River (GYWFM, 2010)

2.3 SOCIO-ECONOMIC ENVIRONMENT

The Minto Mine and MintoEx DEF mineral claims are entirely within SFN Category A Settlement Lands (Parcel R-6A). The mine access road is within SFN Parcel R-6A and Parcel R-44A while the east barge landing access point is within Parcel R-43B.

Although the Minto Mine area is within SFN Settlement Lands, the MintoEx and the DEF claims were staked three years prior to the start of land claims negotiations. Under the Selkirk First Nation Final Agreement and the Selkirk First Nation Self Government Agreement, certain rights are reserved, such as:

- All rights to mines (opened and unopened) and minerals (including precious and base metals) within settlement land are ceded to the Crown except on Category A lands, where mines and minerals are owned fee simple by SFN excepting pre-existing rights such as those that form the MintoEx property (SFN Final Agreement, Chapter 5.4.2);
- Where pre-existing rights lie within Category A land, such as the Minto Mineral claims, the government will continue to administer those rights as though they were still Crown Land (SFN Final Agreement, Chapter 5.6.2) except that any royalties collected from those mineral rights will be paid to SFN (SFN Final Agreement, Chapter 5.6.3);
- A 30m right of way within land parcels R-6A, R-40B and R-44A covering the existing access road from Minto Landing to the project, with the right to construct, maintain, upgrade and use the right of way and road for as long as MintoEx holds its mineral rights (SFN Final Agreement Chapter 5, descriptions in Appendix A);
- The right of YTG to grant a surface lease over the mineral rights, subject to the consent of SFN, not to be unreasonably withheld (SFN Final Agreement, Appendix A).

On September 16, 1997, MintoEx and SFN entered a Cooperation Agreement concerning the Minto Project with respect to the development of the Minto Mine. The Cooperation Agreement was amended on November 4, 2009. In addition to establishing cooperation with respect to permitting and environmental monitoring, the confidential agreement deals with other economic and social measures and communication between SFN and MintoEx.

SFN continues to use the Minto Mine area for various traditional uses. MintoEx has indicated that, through interviews with SFN elders and citizens, they have determined that SFN members use the area for subsistence and other cultural activities and desire that the area remain a site of continued cultural land use.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Several Registered Trapping Concessions are held in the project area. These include RTC #136: Heinz Sauer, RTC#139: Danny Joe, RTC #142: OPEN, RTC #143: Johnny Sam, RTC #145: Glen and Jim Bullied, RTC #146: Geo and Ken McGinty, RTC #147: Kathleen Sam. Only RTC #145 and #146 are located within the immediate mine area. Trapper access to the Minto Mine area has been identified and will be maintained in accordance with the Cooperation Agreement. Compensation agreements have been negotiated with the RTC #146 & #147 trap line holders of the trapping areas impacted by the mine and access road. Only two outfitting concessions fall within the project area, Registered Outfitting Concessions #13 – Held by Tim Mervyn (Mervyn Outfitting) and #14 – Held by Curt Thompson (Trophystone Safaris).

Annual salmon fishing occurs at Minto Landing and other sites along the Yukon River. The Minto Landing area is used for various cultural activities throughout the year, including SFN's General Assembly, berry picking, trapping, hunting, and spiritual activities.

The Yukon River, near Minto Landing and the Minto Mine access route, currently hosts recreational activities, such as fishing, hunting, hiking and canoeing/rafting. The nearby Minto Resorts, owned by SFN, provides camping and other outdoor adventure excursions for visitors to the area. Minto Landing is a starting point for tourist excursions down-river to historic Fort Selkirk. The Yukon River is also used as a transportation corridor for freight and other cargo. Land use on the western shores of the Yukon River is limited, as vehicle access to the western shore is available only in winter over river ice, or during open water by barge.

3.0 REQUIREMENT FOR AN ASSESSMENT

An assessment by the Designated Office is required under the following circumstances:

- An activity is proposed to be undertaken that is listed in Schedule 1 of the Assessable Activities, Exceptions and Executive Committee Projects Regulations (Activity Regulations) and not excepted. The proponent proposes to undertake activities listed in part 1 item 3 and part 9 item 12 of the Activity Regulations, specifically:

“Modification of a quartz mine”

“Direct use of water, and deposit of treated waste water”

- The project is being undertaken in the 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.

Decision bodies and authorizations have been identified based on information in the project proposal and information submitted to the Mayo Designated Office during the assessment. A list of the decision body(s) and authorizations required for the project can be found in Table 4 below.

Decision Body	Authorization(s) Required	Act or Regulation
YG, EMR – Mineral Resources Branch	Quartz Mining License – Amendment	<i>Quartz Mining Act</i>
	Type A Water Use License – Amendment	<i>Yukon Waters Act</i> <u>Waters Regulations</u>
Selkirk First Nation		Selkirk First Nation Final Agreement Selkirk First Nation Self Government Agreement

Table 4 Decision bodies and authorizations required.

4.0 SCOPE OF THE ASSESSMENT

4.1 CONSIDERATION OF HERITAGE AND HISTORIC RESOURCES

In determining the effects of the project on heritage/historic resources, the assessment focuses on activities that disturb the surface or enlarge the overall mine footprint, specifically these are the construction of the two new open pits (Areas 2 and 118) and the expansion of the Southwest Waste Dump. First Nations people are known to have utilized the area historically and heritage resources can be discovered at any time. The proposal indicates that there is archaeological interest at Trouble Hill located near the mouth of Minto Creek; however, this is outside of the project footprint. Prior assessments (e.g. YOR project # 2009-0206), received comments from Yukon Government Tourism and Culture Branch indicating that the area has limited potential for heritage resources but is known to contain rich Pleistocene fossil deposits. Therefore disturbance of the surface associated with excavating the open pits and expanding the dump may have an adverse effect by destroying or disrupting heritage/historic resources. Once disturbed or removed, the value of these resources, from cultural or scientific perspectives, may be diminished. Damage to heritage resources is considered a significant and adverse effect.

This assessment has considered these potential effects in the context of the following legislation:

- The *Yukon Historic Resources Act*, specifically:
 - Sections 64 and 71, which discusses the destruction of historic objects or human remains and report of findings of historic resources;
- The Archaeological Site Regulation (O.I.C. 2003-73) specifically:
 - Section 4, which discusses respecting historic resources
- The Selkirk and Little Salmon Carmacks First Nation Final Agreements specifically:

- Chapter 13, Sections 13.3.0, 13.8.0 and 13.9.0 which speaks to *Ownership and Management, Heritage Sites and Yukon First Nation Burial Sites*.

This assessment has also considered mitigation proposed by the proponent:

- Ongoing community consultations and communication to ensure awareness of project extent and operations, with opportunity for public discussion or raising of concerns;
- Ongoing Traditional Knowledge studies with SFN elders to guide project and closure planning;
- A previous Heritage Assessment was completed, including consultation with SFN regarding these sites that resulted in further investigation of one site. In the summer of 2007 an archaeological project was completed at the Northern Tutchone Cultural landmark known as Trouble Hill. This site was a salmon fishing camp and the location of a historic feud between the Tutchone and the Chilkat Tlingit. The project field crew included SFN Members, Parks Canada Cultural Resource staff and a YG staff archaeologist. Funding for the project was provided by MintoEx, SFN, and YG. This site is located outside the Phase IV expansion area, and also outside the main project footprint; and
- All discoveries of heritage and paleontological resources are reported to SFN government's heritage department and YG Heritage Branch.

This assessment has determined that compliance with this proposed mitigation, and the above listed legislation and provisions in the final agreement, will eliminate, reduce or control the effects related to the accidental discovery and subsequent damage of heritage/historic resources. Therefore it has been determined that the project will not result in significant adverse effects to heritage/historic resources.

4.2 CONSIDERATION OF WILDLIFE AND WILDLIFE HABITAT

Phase IV of the Minto Mine development is proposed to occur within the same watershed as previous development and largely within the same footprint (c.f. Figure 4-7 of YOR document # 2010-0198-062-1). Therefore, the spatial component of interaction between the project and wildlife and wildlife habitat remains largely unchanged from existing authorizations. However, the project is estimated to extend the operational life of the mine-site by approximately 4 years (p. 1 of YOR document # 2010-0198-062-1) and therefore extends the duration of potential interaction between the project and wildlife. Furthermore, it is noted that the number of people in the camp is proposed to increase (p. 1 of YOR document # 2010-0198-062-1) thereby increasing the amount of garbage on-site. As there has recently been an instance where human – bear interactions have resulted in the death of a bear (YOR document # 2010-0198-113-1) the proposed increase in on-site garbage and the extended duration of the project bring wildlife and wildlife habitat into the scope of assessment. The effects of the project on wildlife and wildlife habitat are discussed further in the Wildlife and Wildlife Habitat section.

4.3 CONSIDERATION OF MINING

4.3.1 Open pit mining

The Minto Mine is a currently operating open pit mine that plans to utilize two new open pits as part of Phase IV Expansion (Area 2 and 118 pits). The activities associated with the surface mining of these two pits will be conducted under amendments to existing permits and authorizations. As MintoEx has demonstrated their ability to safely operate an open pit mine and the new open pit mining will occur under amendments to existing authorizations, health and safety issues around open pit mining are not included in the scope of this assessment.

4.3.2 Underground mining

Underground mining and exploration is new to the Minto Mine and represents a major undertaking. MintoEx plans to put in more than 5.5 km of underground development in three years (Table 3-15 on p. 70 of YOR document # 2010-0198-062-1) and the underground mining cycle (drilling, blasting, mucking, ground support, services and hauling) exposes workers to new health and safety conditions. One such issue highlighted by the Yukon Workers' Compensation Health and Safety Board (YWCHSB) is the use of brine with a CaCl_2 concentration of approximately 20% (YOR document # 2010-0198-126-1) which can have detrimental effects on worker health.

The initiation of underground mining is arguably the primary activity of the Phase IV expansion of the Minto Mine. Because of this and because underground mining has not previously been assessed for the Minto Mine, all activities associated with underground mining and exploration are considered to be part of the scope of this assessment. The effects of underground mining are discussed further in the Health and Safety section.

4.4 CONSIDERATION OF WATER MONITORING AND QUALITY

Two principal activities in the project proposal, construction of the MVF and underground mining, directly influence water monitoring and quality. The MVF design will include a system of wells to collect, and therefore monitor, any seepage from the DSTSF because the existing monitoring wells (W8 and W8A) will be buried (p. 31 of YOR document # 2010-0198-062-1).

MintoEx is proposing to use brine in the underground mining and exploration programs to prevent freezing of water during the winter months (October to February) (p. 65 of YOR document # 2010-0198-062-1). As MintoEx anticipates that some weak brine solution will be conveyed to the water treatment plant, SFN has expressed concern that the "[p]otential effects of chlorine on aquatic environments have not been addressed in the proposal." and goes on to state "[a]ppropriate chlorine discharge standards should be established to ensure that no adverse effects occur." (p. 6 of B. Slater's letter in YOR document # 2010-0198-120-1).

Given that these two principal activities directly influence the water monitoring program and the quality of water coming off the site, water monitoring and quality are part of the scope of this assessment. The effects of water monitoring and quality are discussed further in the Aquatic Resources section.

4.5 CONSIDERATION OF NUTRIENT LOADING

MintoEx currently employs best practices management concerning nutrient loading in Minto Creek. Historically, levels of nitrogen species have generally been below effluent limits and are monitored as a part of the existing water quality monitoring program. SFN expressed concern that “[t]he data show a significant increasing trend in nitrate at W3, with concentrations in the summer of 2010 generally exceeding the proposed effluent standard.” (p. 7 of B. Slater’s letter in YOR document # 2010-0198-120-1). This document then goes on to point out that “[n]utrients are not specifically addressed by the adaptive management plan and are also not addressed indirectly through management of other contaminants.”. The water treatment plan for the Minto Mine site is currently under review by the Yukon Water Board and will likely be undergoing extensive alteration because of Application for Amendments to WUL QZ09-094. Even though “[n]o new infrastructure for the collection, conveyance or treatment of water is proposed in the Phase IV project” (p. 16 of YOR document # 2010-0198-062-1), Phase IV will significantly increase the amount of wasterock, and therefore the potential nutrient loading of the Minto Creek system is considered part of the scope of this assessment. The effects of nutrient loading are discussed further in the Aquatic Resources section.

4.6 CONSIDERATION OF THE CLOSURE PLAN

The project proposal lists “[c]losure and reclamation of all Phase IV project components following completion of Phase IV mining and milling” (p. 10 of YOR document # 2010-0198-062-1) as accessory activities with the following list summarizing the proposed closure mitigations (modified from p. 89 of YOR document # 2010-0198-062-1):

- The proposed mitigation to reduce metal leaching and/or nutrient loading for the Main Waste Dump, SW Waste Dump, DSTSF and MVF is compaction and cover by an engineered soil cover system;
- The proposed mitigation for the Area 1 and Area 2 and pits is backfilling with tailings and/or wasterock with subsequent flooding;
- The proposed mitigation for the Area 118 Pit is backfilling with wasterock and subsequent coverage with a vegetated soil cover; and
- It is proposed that site drainage will be actively treated for 4 years followed by a switch to passive treatment. The contingency for site drainage is active water treatment.

SFN states, “there is not enough supporting information provided to corroborate the effectiveness” of key closure components such as tailings and wasterock soil covers (p. 8 of SFN letter in YOR document # 2010-0198-120-1). Because of the importance of the Closure Plan to minimize the long-term environmental impacts and because it is an accessory activity, it is included in the scope of this assessment. The Closure Plan is discussed further in the Health and Safety, Aquatic Resources and Environmental Quality sections.

4.7 CONSIDERATION OF STABILITY

Dry Stack Tailings Storage Facility (DSTSF) – the project proposal describes movement in the sediments beneath the DSTSF (p. 25-30 of YOR document # 2010-0198-062-1). This creep is attributed to an ice-rich clay layer located just above the sediment-bedrock contact at depths of approximately 30 m to 50 m below the surface. The rate of movement is between 0.6 mm/day and 4.2 mm/day (p. 4 of YOR document # 2010-0198-080-1). The MVF is intended to terminate the movement along the deep clay layer by reducing the shear stress along the sliding plane to a value that is below the creep strength. The MVF will buttress the lower slope and will increase the passive resistance to further movements.

Southwest Waste Dump – movement has also been noted under a portion of the SW Waste Dump and is likely a result of creep in the same permafrost clay layer, located at the bedrock contact, below the DSTSF (p. 23 of YOR document # 2010-0198-062-1). The movement under a portion of the toe of the southwest waste dump is believed to be related to unloading by excavation along the south wall of the Main Pit. A detailed mitigation plan for the SW Waste Dump is to be developed once modeling of the movement is completed, however it is anticipated that buttressing the south wall of the Main Pit will stop movement in the SW Waste Dump. Another option to enhance long-term stability includes overall slope flattening by construction of benches. This can be accomplished by either placement of additional rockfill or by reworking the slope-forming material currently on-site.

The stability of the DSTSF is included in the scope of this assessment because the MVF is the primary mitigation to stop the movement of the DSTSF and the construction of the MVF is a principal activity in the project proposal. The expansion of the SW Waste Dump is a proposed activity and therefore the stability of the entire SW Waste Dump is within the scope of this assessment. The effects of the stability of these two structures are discussed further in the Aquatic Resources and Environmental Quality sections.

4.8 CONSIDERATION OF CULTURAL AND COMMUNITY WELL-BEING

In determining the effects on lifestyle for the community of Pelly Crossing, the assessment focuses mainly on the overlap of mining activities with Category A lands, project distance from community, community employment opportunities, and long-term expectations of the community.

4.9 SUMMARY OF VALUES CONSIDERED

In summary, the values considered in this assessment are:

- Wildlife and Wildlife Habitat
- Health and Safety
- Aquatic Resources
- Environmental Quality
- Cultural and Community Well-being

PART B. EFFECTS ASSESSMENT AND REASONS FOR RECOMMENDATION

The following sections present the effects assessment of project activities related to values identified in Section 4.0. Each section includes an overview, an analysis of how project activities may affect values and, where relevant, measures to mitigate significant adverse effects. Part B ends with a conclusion of the effects assessment.

5.0 WILDLIFE AND WILDLIFE HABITAT

5.1 OVERVIEW

In determining the effects of the proposed project on wildlife and wildlife habitat, the assessment focuses on describing the effects related to alteration and loss of habitat as well as direct injury and/or mortality and wildlife disturbances. The Designated Office also considers the effects on Species at Risk including migratory birds and bears. A list of Species at Risk potentially found in the project area can be found in Section 2: Environmental and Socio-Economic Setting.

5.2 PROJECT EFFECTS

The proposed project does not directly overlap with any known key wildlife habitat areas. However, Yukon Government Department of Environment indicated that a bear incident in May 2010 resulted in the destruction of a bear attracted by food and food wastes at the camp (YOR document # 2010-0198-113-1). Installation and use of an electrified fence around food and food waste storage areas was recommended by the responding Conservation Officer, along with additional measures (YOR document # 2010-0198-113-1). Moose, caribou, sheep bears and smaller mammals are anticipated to be in the area. The proposed project is the continuation and expansion of an existing mining operation. The capacity of the camp is proposed to increase by an additional 100 people to approximately 300 people. The project is largely planned to occur within the existing mine footprint and therefore additional disturbance to riparian habitat, surface vegetation and cover and functional loss of habitat are expected to be minimal. However, the increased life of the mine and increased number of workers on-site is expected to be significant on wildlife.

Direct injury and/or mortality of wildlife may occur because of either direct consumption of a toxic substance or through human-wild life interactions. The ingestion of injurious and/or lethal doses of contaminants, such as petroleum fuels and lubricants, released into the environment through spills, accidents, malfunction and/or breakdowns could cause significant harm or even death.

Fatal human-wildlife encounters, particularly with respect to bears, can be a result of habituation to humans. Garbage and debris that is not handled appropriately may attract bears and other wildlife to camps and other areas frequented by people. This poses a significant safety concern for both wildlife and humans. Habituated bears that are successful at procuring garbage as a food source are particularly at risk. Given the likelihood of bears at the project location, human/bear encounters at this location are likely. Grey water, diesel, food, food odors and camp garbage other than clean wood and clean paper are

strong bear attractants. The proponent has indicated that garbage will be hauled out to a permitted facility on-site or burned at the camp. Open burning of garbage or waste as a sole bear deterrent is unlikely to be successful due to residual odors resulting from incomplete burns. Frequent burning of garbage in a fuel-fired or air-forced incinerator provides a more complete burn eliminating garbage and odors in camp. Bears become habituated to human presence through repeated interactions; therefore the longer the duration of a project, the more likely bears will be accustomed to routine activities and noise.

The Designated Office suggests that the Guideline for Industrial Activity in Bear Country be followed at the mine-site and that all staff shall be made aware of proper habits to prevent bears from habituating to human presence.

5.2.1 Mitigation

The following mitigation measures are specified to eliminate, reduce or control significant adverse effects of the project relating to wildlife and wildlife habitat. The following mitigation measures ensure that any residual effects of this project on wildlife and wildlife habitat will not be significant or adverse:

1. MintoEx shall construct and maintain an enclosure around temporary garbage storage area where garbage is stored prior to being transported to the landfill.
2. MintoEx shall install an industrial sized incinerator of sufficient capacity for camp size.
3. MintoEx shall construct an electric fence around the landfill and incinerator. The electric fence must be maintained on a regular basis so that it functions continuously.
4. MintoEx shall clean camp BBQs daily to reduce food smells.
5. MintoEx shall install an electric fence around the sleeping and kitchen units. This is important because the kitchen area is in the middle of camp and bears following food scents to the kitchen must walk through the parts of camp used for accommodation.

5.3 CUMULATIVE EFFECTS

The assessment of cumulative effects takes into consideration the effects that have occurred or might occur with the project or existing project(s). These effects are considered in combination with the effects of other projects for which proposals have been submitted to the Designated Office, or other existing or proposed activities in or outside the Yukon that are known to the Designated Office from information provided under YESAA. Existing projects include those previously submitted to YESAB, including other placer operations, quartz exploration and existing roads/trails.

Residual effects of this project on wildlife and wildlife habitat are likely minimal given the legislation, proposed mitigation by the proponent and recommended mitigations.

The proposed project is in an area that has an existing operating mine as well as historic access roads. The proponent by way of a barge in summer and ice bridge in winter controls all access to the site. I am unaware of any other existing activities or projects proposals submitted to the Mayo Designated Office that may contribute to cumulative effects to wildlife and wildlife habitat. Given the low potential for residual

effects once recommended mitigation is in place, I conclude that there will be no cumulative effects to wildlife and wildlife habitat.

6.0 HEALTH AND SAFETY

6.1 OVERVIEW

As an existing open pit mine with established infrastructure, the potential effects to health and safety related to open pit mining are mitigated by existing authorizations and plans. However, the potential effects of underground mining require assessment. This section will consider the potential effects to underground worker safety in relation to the following project effects:

- Air quality
- Working underground and adit failure
- Explosives
- Chemicals
- Emergencies, accidents and malfunctions

6.2 PROJECT EFFECTS

6.2.1 Air quality

Working underground puts workers into confined spaces alongside activities such as blasting, drilling and operation of machinery that may lead to the accumulation of particulate matter and to reduced air quality. Particulate matter smaller than 10 micrometers (i.e. rock dust; diesel exhaust) generally passes through the throat, nose to the lungs, and constitutes inhalable and fine particles (U.S. EPA, 2010). Effects of particulate matter include increased respiratory symptoms (e.g. irritation of airways, coughing or difficulty breathing); decreased lung function; development of lung and heart ailments (e.g. chronic bronchitis; lung cancer); and over time premature death in people who develop lung or heart disease from long-term or intense exposure to particulates. Given the likelihood of workers being exposed to particulate matter and the potential severity of effects, they are considered significant and adverse.

In addition to the effects of particulate matter, if ventilation equipment was to fail through improper operation, malfunction or accident, workers could potentially be working in an oxygen deficient environment or stranded without oxygen and have limited options for finding an alternative source. A reduction or absence of oxygen could lead to oxygen deficiency, which in turn may cause discomfort, reduced body function, unconsciousness and ultimately brain death if not recognized and resolved immediately. While the likelihood of this effect occurring requires some improper operation, malfunction or accident, if it were to occur it would be considered significant and adverse.

Air quality could also be compromised by gases accumulating over time in deeper recesses of the workings where air is not sufficiently recycled. Carbon monoxide, which results from the incomplete combustion hydrocarbons (e.g. diesel), may be emitted from generators, pumps and vehicles. Nitrogen dioxide is an extremely toxic gas to the human body and is produced from the detonation of explosives,

as is sulphur dioxide when blasting sulphide ores. Hydrogen (e.g. incomplete combustion in explosives), hydrogen sulphide (e.g. decomposition of sulphur compounds), methane (e.g. associated with coal seams) and nitrogen are also common gases that are of concern in underground workings, though less so in relation to this project (U.S. MRA, 2010). The effect of these gases on humans ranges from headaches, tiredness, irritation to nose and throat, dizziness and nausea, to convulsions and ultimately unconsciousness or even death. While the effects of these gases require a number of variables to interact for them to become likely, if they were to occur they would be considered significant and adverse.

Existing Legislation

I have considered the requirements of non-discretionary legislation and specifically the Occupational Health and Safety Regulations and the *Occupational Health and Safety Act*. The following sections are relevant:

- Part 2 – Confined Spaces;
- Part 8 – Materials and Storage (i.e. rock dust);
- Part 14 – Blasting; Part 15 – Surface and Underground Mines or Projects (i.e. mine rescue; and
- Part 16 – Mine Shafts and Hoists (i.e. ventilation and heating; safety examinations and certificates).

Consideration of Proponent's Mitigation

- MintoEx has agreed to install exhaust scrubbers on all mobile equipment used underground (pg. 4 of YOR document # 2010-0198-121-1) to minimize diesel particulate matter.

Significance Determination

I am satisfied that compliance with this legislation and implementation of the mitigation proposed by the proponent will adequately eliminate, reduce or control the potentially significant effects related to underground mining and exploration and the implications of poor air quality on health and safety.

6.2.2 Working underground and adit failure

Underground mining and exploration have inherent safety risks. By definition working underground entails working in confined spaces with associated risks such as rockfalls and the underground environment requires constant maintenance and vigilance to prevent harm to workers. The proposed location of the underground infrastructure at the Minto Mine is in competent and crystalline foliated granitoids of the Aisihik/Long Lake Suite (Hood et al., 2009) and should have acceptable ground conditions. However, it is imperative that the risk of failure or collapse of the underground workings and the blockage of the portal (with respect to the steep slopes, permafrost and avalanche potential) is reduced as much as practically possible. Since underground mining requires a controlled environment to safely work within, it is particularly sensitive to unpredictable changes (e.g. earthquakes; avalanches blocking the adit) and cannot afford a high tolerance for improper practices, malfunctions or accidents. Even in well maintained

and inspected mines rockfalls occur, and though infrequent, the effects are significant and can be adverse.

Existing Legislation

I have considered the requirements of non-discretionary legislation, specifically the Occupational Health and Safety Regulations and the *Occupational Health and Safety Act*. The following addresses the noted effects:

- Part 2 – Confined Spaces
- Part 6 – Mobile Equipment
- Part 8 – Materials and Storage (i.e. unconsolidated and solid material, hazardous substances, battery charging, compressed gas containers, rock dust, rock crushing)
- Part 10 – Construction and Building Safety
- Part 14 – Blasting (i.e. transportation and storage of explosives aboveground and underground, blending, drilling, handling, loading holes, guarding, misfires, underwater blasting and avalanche control)
- Part 15 – Surface and Underground Mines or Projects (i.e. mine closure, fire protection, mine rescue, electrical, underground haulage)
- Part 16 – Mine Shafts and Hoists (i.e. raising, stoping, ventilation and heating, shaft sinking, rope attachments, skips and cages, electric hoists, safety examinations and certificates, hoist operators and communication)

Significance Determination

I am satisfied that compliance with this legislation will adequately eliminate, reduce or control the potentially significant effects related to underground mining and exploration and the implications of rockfalls and portal blockages on health and safety.

6.2.3 Explosives

The project involves the use of explosives to facilitate underground excavation. Dyno-Nobel explosive magazines located on-site will provide a central storage facility for the explosives. Smaller magazines may be established underground or near the portal for short-term, low quantity storage. Transporting, storing, handling and detonating explosives poses inherent safety risks to workers. Effects associated with poor operating practices, accidents or malfunctions may be quite serious and include injury and death. These effects are considered to be significant and adverse.

Existing Legislation

I have considered the requirements of non-discretionary legislation, specifically the *Explosives Act* and associated Explosives Regulations; *Transportation of Dangerous Goods Act*; Quartz Mining Land Use Regulations (Schedule 1, Part M); the *Occupational Health and Safety Act* and the associated

Occupational Health and Safety Regulations. Part 14 of these regulations in particular address the potential for effects:

- Part 14 – Blasting (i.e. transportation and storage of explosives aboveground and underground, blending, drilling, handling, loading holes, guarding, misfires, underwater blasting and avalanche control)

Significance Determination

I am satisfied that compliance with this legislation will adequately eliminate, reduce or control the potentially significant effects related to the use of explosives on health and safety.

6.2.4 Chemicals

To avoid heating the underground workings during the winter months (October to February) MintoEx proposes the use of brine, as opposed to fresh water, for drilling purposes; the brine will have a CaCl_2 concentration up to 20 percent (p. 65 of YOR document # 2010-0198-062-1). From a worker health and safety perspective, extended exposure to brine can produce skin conditions such as rashes.

Consideration of Proponent's Mitigation

- MintoEx has stated that employees will be provided training and personal protective equipment that includes barrier cream for a few strategic areas of the body that may be exposed.

Significance Determination

Implementation of the mitigations proposed by the proponent in addition to continued monitoring and regular discussion with the Yukon Workers' Compensation Health and Safety Board adequately eliminates, reduces or controls the potentially significant effects related to the use of brine on health and safety.

6.2.5 Emergencies, accidents and malfunctions

As Minto Mine is currently an operating open pit mine, there are a number of existing mitigations related to emergencies, accidents and malfunctions. From a health and safety viewpoint, these mitigations will have to be updated to include the underground environment.

Consideration of Proponent's Mitigations

The following list outlines existing health and safety mitigations by the proponent:

- Health & safety plans are in place at the site and changes related to the initiation of underground mining activities have been drafted and will be implemented with the Phase IV activities;
- On the job training is aimed at safe operation of equipment;

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- A general culture of safety is fostered at the site - guidelines exist for regular meetings and incident review, inspections and monitoring;
- Safety meetings are held and documented for all staff at the beginning of each work assignment period;
- All site visitors/contractors must undergo mandatory safety orientation immediately upon site arrival;
- Medical equipment and trained personnel are on site 24 hours a day;
- Site and mobile communications are provided and maintained;
- Occupational health and safety standards are enforced for all personnel/contractors;
- Consumption of alcohol and 'recreational' drugs are not allowed on site. Employees are required to undergo 'fit for duty' drug testing prior to employment or after incidents if abuse is suspected;
- Traffic is controlled on mine access and site roads - radio control to prevent accidents;
- Communication and notification of hazardous materials transport to the site is in place through shipping/receiving department;
- There is no unauthorized access to the site permitted;
- Emergency and Spill Response Plan is in place and will be implemented if required;
- Transportation crews are instructed on traffic safety;
- Vehicles are equipped for winter travel and carry emergency first aid kits;
- Concentrate haul from site to Skagway occurs only during daylight hours and drivers must meet specific experience and training criteria;
- All employees are eligible for Workers Compensation Health & Safety Board benefits;
- Monitoring and maintenance programs are in place to ensure facility and worker safety and equipment integrity;
- Project engineering designs have appropriate factors of safety, containment systems, and redundant systems to minimize accidents and malfunctions, in keeping with permit conditions and applicable regulations and codes;
- Site well potable water is filtered and treated by UV, with testing conducted semi-annually for potability;
- Grey and black water treated and disposed of in permitted, engineered in-ground septic systems; and
- *Public Health Act* and the associated Camp Sanitation Regulations are adhered to.

Existing Legislation

The following non-discretionary legislation has been considered:

- *Occupational Health and Safety Act*;
- Occupational Health and Safety Regulations; and
- *Public Health and Safety Act*.

Significance Determination

Compliance with the above-mentioned legislation and implementation of mitigation measures currently in use, updated to include the underground environment, are expected to reduce to an extent the adverse effects of the project. However, further mitigation measures are required as recommended by the Yukon Workers' Compensation Health and Safety Board to ensure that the project does not result in significant adverse effects.

6.2.5.1 Mitigation

The following mitigation measures are specified to eliminate, reduce or control significant adverse effects of the project relating to emergencies, accidents and malfunctions. These mitigations ensure that any residual effects of this project will not be significant and adverse.

6. MintoEx shall ensure existing mitigations are regularly updated and that the following is achieved with respect to the health and safety of workers: 1) that Mine Rescue Training and equipment are in place; 2) a back-up plan for mine rescue assistance, such as an agreement with other U/G mines for assistance in event of an emergency is in place; and 3) the Return to Work Program for injured workers is updated.

6.2.6 Closure Plan

The proposed Phase IV Expansion of the Minto Mine includes underground mining using the room and pillar method. From a health and safety aspect, underground mining poses two issues of concern regarding closure of the mine:

6.2.6.1 Subsidence

The underground workings will be relatively flat, not more than 7m in height and backfilled as needed. The underground mining below Stage 2 of the Area 2 Pit is of concern for long-term stability both from a health and safety perspective and from an aquatic resources perspective (see Aquatic Resources section for further information on that component). The health and safety concerns revolve around subsidence of the back-filled pit that could potentially destabilize the backfill resulting in sinks and uneven terrain.

Significance Determination

It is my opinion that because the rock conditions are competent and the workings are horizontal with relatively little void space after backfilling, the opportunity for large-scale subsidence of the bottom of the pit is low. Furthermore, if subsidence was to occur there is not a major void underground to accommodate the surface material. Therefore, features such as sinks are not likely to form. For these reasons, I feel that there is little chance of significant or adverse effects related to subsidence into underground workings.

6.2.6.2 Openings

The Phase IV underground mining envisions at least one portal and several ventilation raises. From a health and safety perspective once operations stop and maintenance and inspection of the underground workings cease, they become an extremely dangerous place for all animals (including humans). Entry into uncontrolled underground workings could result in many forms of injury right through to death in extreme instances and for this reason, the effects related to unrestricted openings are considered significant and adverse.

Existing Legislation

I have considered the requirements of non-discretionary legislation and specifically the *Occupational Health and Safety Act* and the associated Occupational Health and Safety Regulations. Part 15 of these regulations in particular address the potential for effects:

- Part 15 – Surface and Underground Mines or Projects (i.e. mine closure, fire protection, mine rescue, electrical, underground haulage)

Significance Determination

I am satisfied that compliance with this legislation will adequately eliminate, reduce or control the potentially significant effects related to openings into underground workings.

7.0 AQUATIC RESOURCES

7.1 OVERVIEW

The project includes a Water Management Plan (WMP) to address on-site waters, including the direct discharge of wastewaters from the water storage pond to Minto Creek, and the indirect discharges of contaminated waters from surface runoff and underground seepage during and post operations. The discharge of these potentially contaminated waters may pose a significant adverse effect on the aquatic resources within Minto Creek.

7.2 PROJECT EFFECTS

7.2.1 Mining of Phase IV ore zones (Area 2 and Area 118)

The Minto Mine currently operates under Type A Water Use Licence QZ96-006. MintoEx proposed amendments to the WUL in 2009 (see YESAB Project No. 2009-0206) affecting mill rate, water use, water collection, conveyance and diversion, water storage and discharge criteria.

In the proposed amendments of November of 2009, MintoEx outlined improvements to the water management plan for the Minto Site. This included rationale and plans for:

- Segregation of water of differing quality through diversions, dedicated collection sumps and pump/pipeline conveyance systems;
- A new water treatment plant near the mill;

Minto Mine Phase IV Expansion – 2010-0198

- The current project proposes some additional changes to the collection and conveyance infrastructure previously assessed. Figure 5 shows the current general arrangement of facilities and water management infrastructure at the site and the proposed final plan for the Phase IV developments. Also presented are the corresponding existing and proposed water management infrastructure, including diversions, conveyance structure alignments and treatment facilities. The sections below discuss the WMP, proposed Phase IV changes, and identified stakeholder concerns associated with mining of Phase IV ore zones.

As discussed above, MintoEx proposed amendments to the WUL in 2009 affecting mill rate, water use, water collection, conveyance and diversion, water storage and discharge criteria. The Mayo Designated Office assessed the proposed changes and issued an Evaluation Report on March 3, 2010. This report recommended to the decision bodies “...that the project be allowed to proceed, subject to specified terms and conditions intended to mitigate the potential adverse environmental and socio-economic effects” (YOR document # 2009-0206-085-1).

February 18, 2011

YESAB
Yukon Environmental and Socio-economic
Assessment Board

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Water Board in June 2010 as part of the Application for Amendments to WUL QZ96-006. MintoEx submits that the revisions to the WMP, including revisions to the predictive water quality modelling and the monitoring program, meet the recommendations for the YESAB evaluation and form a sound plan for the management of site water and effluent discharge from the site during operations.

Table 5 summarizes the recommendations regarding the WMP, as issued by YESAB (YOR document # 2009-0206-085-1) and accepted by the Decision Document (YOR document # 2009-0206-087-1). These recommendations are to be considered and implemented collectively since the absence of one will undermine the purpose and effectiveness of the others.

The recommended approach relies greatly on the proponent maintaining a high level of performance. This approach requires:

- Two locations, one at the point of discharge and a second at the receiving environment, with set compliance and monitoring requirements;
- Comprehensive monitoring and data analysis to support real-time decision-making on a daily basis;
- Improved water balance and water quality models that are proven to accurately reflect actual site conditions with a high degree of predictability; and
- Comprehensive monitoring and enforcement by the appropriate regulatory authorities.

Table 5 Recommendations from YESAB, accepted in the Decision Document, regarding the Water Management Plan (modified from YOR document # 2009-0206-087-1)

1. Compliance point	It is recommended that the amended water use licence specify two compliance points, a receiving environment compliance point, and a discharge compliance point. The inclusion of both of these compliance points is essential to the effectiveness of the water management plan.
2. Receiving environment compliance point	It is recommended that the amended water use licence specify the location for the receiving environment compliance point, and that this location be in a location that appropriately represents the water quality within lower Minto Creek so as to ensure protection of aquatic life within the receiving environment.
3. Discharge compliance point	It is recommended that the amended water use licence specify the location of the discharge compliance point, and that this location appropriately represent the water quality within upper Minto Creek and below all water releases from the site so as to ensure compliance of Minto Mine discharge.
4. Site specific water quality standard	It is recommended that the amended water use licence specify a suitable water quality standard to be applied at the receiving environment compliance point. It is further recommended that the water quality

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

	standard be protective of the most sensitive life stage of representative species, include all contaminants of potential concern, and consider chronic toxicity (as opposed to acute toxicity) and inhibitory effects on fish olfactory senses.
5. Discharge quality standard	It is recommended that the amended water use licence specify a suitable discharge quality standard to be applied at the discharge compliance point, and that this discharge quality standard ensures a non-acutely toxic effluent.
6. Discharge criteria	It is recommended that the amended water use licence allow the proponent to manage their discharge to ensure compliance with (1) the site specific water quality standard at the receiving environment compliance point, and (2) the discharge quality standard at the discharge compliance point.
7. Compliance monitoring	It is recommended that the amended water use licence specify a compliance monitoring program that includes sufficient sampling and analysis to characterize the water quality within upper Minto Creek at the discharge compliance point and lower Minto Creek at the receiving environment compliance point.
8. Routine environmental monitoring	It is recommended that the amended water use licence specify, in addition to compliance monitoring, a routine environmental monitoring program that characterizes storage of water on-site, release of water from site, effectiveness of water treatment, flow in upper Minto Creek, flow in lower Minto Creek, water quality in upper Minto Creek, water quality in lower Minto Creek, water quality in tributaries of Minto Creek downstream from the water storage pond and sediment analysis for metal attenuation in both upper and lower Minto Creek.
9. Annual biological monitoring	It is recommended that the amended water use licence specify a requirement to undertake an annual biological monitoring program that appropriately characterizes the potential effects of the discharge on downstream aquatic life within both upper Minto Creek and lower Minto Creek. This monitoring program should include field surveys to record the utilization of the habitat and potential effects on aquatic life, including fish and benthic macroinvertebrates. For lower Minto Creek, the monitoring program should also record the utilization of the habitat by the Chinook salmon during the spawning period.
10. Water balance and water quality	It is suggested that the proponent incorporate a water balance and water quality model(s) as part of their water management plan. This model(s)

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

model(s)	should utilize the routine environmental monitoring data and other operational data, and be used by MintoEx to support day-to-day operating decisions regarding water management and compliance. It should be recognized by the proponent that this model(s) will require calibration and verification to address uncertainties in model parameters and assumptions.
11. Reporting	It is recommended that the amended water use licence specify a requirement to prepare and submit for approval an annual state-of-the-environment report, in addition to the reporting required under the existing water use licence. This report should be submitted by the proponent to the regulatory authority, and should present the compliance monitoring data and routine environmental monitoring data, and provide an interpretive narrative. Further, it should show comparisons of model predictions and measured data in order to validate the model(s) as a decision support tool.
12. Water collection, conveyance and diversion	It is recommended that the proponent review the design of their water collection, conveyance and diversion system to account for uncertainty in the estimated runoff volumes during freshet, and to ensure appropriate sizing of surge ponds and conveyance systems.
13. Stability and safety of the pit wall	It is recommended that the proponent retain a qualified professional engineer to assess the stability and safety of the open pit for use as temporary and/or permanent storage of water.
14. Water use	Subject to acceptance of the above terms and conditions, the water use licence may be amended to increase the authorized use of water to facilitate the requirements of the water management plan.
15. Adaptive management	It is recommended that consideration be given to annual review of the Minto Mine water management plan to incorporate any changes to the mine site and mining plans, identify and address any deficiencies in the water management plan, and determine the need for additional studies and or water management works. The AMMP will incorporate data collected from compliance, environmental and biological monitoring and information generated from the water balance and water quality models.
16. Contingency planning	It is recommended that the AMMP include proactive contingency measures (e.g. more advanced water treatment). The proponent will be prepared to expedite implementation of these contingency measures as required by the AMMP.
17. Implementation of	It is recommended that the AMMP be highly predictive and responsive to

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Adaptive Management and Contingency Plans	changing conditions on site. Contingency measures will be available for implementation well in advance of emergency situations (e.g. emergency discharge of non-compliant water; discharge of non-compliant water). Contingency measures will be available for immediate deployment as required by the AMMP. The AMMP will account for all potential accidents, malfunctions and unpredictable situations that may occur at the mine site or in the receiving environment as a result of this proposal.
18. Contaminants of Potential Concern	It is recommended that the water quality model and monitoring fully account for the following contaminants/parameters of potential concern: aluminum, ammonia, cadmium, chromium, copper, iron, manganese, molybdenum, nitrite, nitrate, phosphorous, selenium, suspended solids, temperature and zinc. These parameters should be analyzed using appropriate methodologies and at appropriate detection limits to ensure proper interpretation of potential environmental and socio-economic effects. It is further recommended that the amended water use licence consider discharge standards for some or all of these contaminants/parameters, where appropriate, at both the discharge compliance point and receiving environment.
19. Ammonia	It is recommended that the amended water use licence establish ammonia effluent standards at both the discharge compliance point and receiving environment that takes into consideration appropriate chronic water quality guidelines for the protection of aquatic life, and will provide protection for aquatic values including Chinook salmon and their habitat.
20. Monthly maximum	It is recommended that the amended water use licence take into consideration sensitivities to aquatic resources related to maximum concentrations. This consideration should apply to the proposed concentration of parameters for both the site-specific water quality standard at the receiving environment and the discharge quality standard at the discharge compliance point. The consideration of maximum concentrations of parameters should also be followed-up in the water quality modeling.
21. Dissolved organic carbon	It is recommended that the proponent comprehensively monitor levels of dissolved organic carbon in Minto Creek.
22. Testing to prove non-acute lethality of discharge	It is recommended that routine bioassay tests of acute toxicity be conducted to provide evidence of non-acute lethality. Testing should use the most representative or sensitive species (whichever is more conservative to test) and otherwise rainbow trout (<i>Oncorhynchus mykiss</i> ,

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

	96 h pass/fail) and Daphnia magna (48 h pass/fail).
23. Seepage Collection, Modelling and Monitoring	<p>It is recommended that the following adaptive monitoring and management plan related to seepage be implemented during design and construction of the facility for immediate implementation:</p> <ul style="list-style-type: none">• Construction and operation of an initial seepage collection system;• Investigation of foundation conditions for the seepage collection system during and post-construction, and evaluation of possible performance of these foundations;• Monitoring of performance of the proposed seepage collection system (e. g. foundation thawing, hydraulic gradients, contaminant transport, etc.);• Modeling of water quality and loading to identify appropriate performance thresholds for the collection system;• Establishment of triggers for design and implementation of feasible upgrades for the proposed collection system.
24. Accidents and Malfunctions related to Monitoring	<p>It is recommended that the proponent have back-up systems in place and redundant equipment available to ensure that there is reduced potential for accidents and malfunctions of monitoring equipment.</p>
25. Representative background water quality –	<p>It is recommended that monitoring stations W6 and W7 be added to the list of routine stations in the amended water use licence.</p>
26. Meteorological site data	<p>It is recommended that data collection at the meteorological station should include precipitation, snow monitoring and evaporation. Hydrological monitoring should continuously monitor flows in Minto creek at all compliance points. It should also monitor flow at key internal points to enlighten management decisions about the fate of water within the system according to the water management plan.</p>
27. Monitoring and Enforcement	<p>It is recommended that Yukon Government approve and implement an enforcement policy specific to this project. This policy will address how Yukon Government is going to implement the recommended terms and conditions and provide details on appropriate monitoring and enforcement.</p>

As concluded in the Evaluation Report for YESAB Project 2009-0206 (YOR document # 2009-0260-085-1), this current review maintains that legally requiring the proponent to meet an appropriate compliance

requirement at the point of discharge and the receiving environment mitigates the potential for significant adverse effects beyond their property. MintoEx and other interveners supported this approach during the Yukon Water Board Hearing held on December 6, 7, and 8, 2010 (YOR document # 2010-0198-134-1).

The approach does not exclude seasonal compliance requirements to allow for flexibility within the WMP to direct decisions, based on water quality, regarding the capture, storage, treatment and/or release of on-site waters. Current understanding of aquatic resources in lower Minto Creek indicates that Chinook salmon are not present during the freshet period, and other sensitive components of the aquatic environment are generally protected by ice during this period. It may be reasonable in this case to define separate compliance requirements for the freshet and non-freshet periods to account for the differing environmental sensitivities. During the freshet period, when adverse effects to aquatic resources are less likely to occur, compliance requirements should focus on discharge quality at the point of release to facilitate the management of on-site waters. During the non-freshet, when adverse effects to aquatic resources are likely, compliance requirements should focus on both the discharge quality at the point of release and receiving water quality in the lower Minto Creek to minimize olfactory effects on salmon and to ensure protection of most sensitive life stages of representative species.

7.2.1.2 Water storage

With the proposed placement of waste in the Main Pit, the surge capacity in the pit will decrease as the Life of Mine progresses. The water management plan requires that a free capacity of 700 Mm³ remain available in the Main Pit for water storage during the freshet every spring. MintoEx expects that the Main Pit has sufficient storage capacity until mid-2014, after which time freshet water is planned to be diverted to the mined-out Area 2 Pit if required.

7.2.1.3 Conveyance network

The Project proposes two changes to the existing conveyance network:

- As the Area 2 Pit develops, realignment of the existing airport access road and the South Diversion Ditch in the short section where the Area 2 Pit limit extends to the northeast; and
- Realignment of the W37 pipeline to keep it on the surface in this area as the MVF material is placed downgradient of the mill and DSTSF area.

During operations, surface water from all sources is expected to be collected in the Water Management System. The design of the conveyance network components, collection sumps and pump stations, are not designed for 100% capture and conveyance of waters during freshet; downstream structures, including the WSP, are expected to accommodate the overflow. MintoEx assumes that any underground seepage through the shallow and deeper sub-permafrost aquifer systems that is not directly collected in the site collection and conveyance network will report to surface upstream of the Water Storage Pond. In this way, MintoEx does not expect any uncontrolled releases of contaminated mine water to the Minto Creek drainage. Under the current WMP, water from the site ultimately reports to the WSP prior to release to the environment. The pending WMP will allow releases of compliant water from other points in the Water Management System.

Concern was voiced that the collection and conveyance system may not effectively respond to the WMP principle that all contaminated site waters should be collected at the source. Concerns remaining at the end of the screening stage include:

- The need for effective collection of drainage from the MVF and permanent instrumentation to monitor groundwater and seepage from the DSTSF (YOR document # 2010-0198-120-1); and
- The need for licensing requirements to monitor, report, upgrade and periodically inspect all water collection and conveyance works during all phases of the project (YOR document # 2010-0198-120-1).

7.2.1.4 Contaminants of concern

Appendix I of the proposal (YOR document # 2010-0198-072-1) provides estimates for total annual loadings in runoff from different project components. Areas affected by wasterock, Southwest Dump, Main Dump and the MVF (c.f. Figure 5.7 of YOR document # 2010-0198-072-1), will contribute to over half of the total annual loads for aluminum, cadmium, copper, iron, molybdenum, lead, selenium and zinc. Currently, releases of aluminum, iron, copper, lead and zinc are controlled under the WUL or MMER.

Under current operations, during discharge water quality in Minto Creek has exceeded a number of Canadian water quality guideline and site-specific water quality values of licensed parameters (aluminum and copper) and unlicensed parameters (chromium and iron) (Table 5-5 of YOR document # 2010-0198-062-1). This situation would remain probable without additional mitigation. Therefore, the current evaluation strongly supports the recommendations issued in the Joint Yukon Government-Selkirk First Nation Decision Document (YOR document # 2009-0206-087-01) for the protection of aquatic resources.

Copper

YESAB Evaluation Report, YOR document # 2009-0206-085-1, was based on a site-specific water quality guideline of 0.013 mg/L for copper that was originally proposed by MintoEx. The Phase IV assessment now proposes a site-specific water quality guideline of 0.017 mg/L for copper to coincide with the observed hardness of water within the Lower Minto Creek. Interveners have expressed ongoing concerns as to whether the proposed value fully considers olfactory effects on salmon. As a precautionary approach, for protection of salmon, SFN proposed that the assessment should continue to rely on the site-specific water quality objective of 0.013 mg/L for copper for the operational period (YOR document # 2010-0198-120-1). SFN provided supporting information demonstrating MintoEx's proven ability to achieve water quality at the discharge point that is protective of this more stringent objective in the downstream receiving environment (YOR document # 2010-0198-134-1).

SFN has also accepted the principle that a less stringent objective and, in effect, a less stringent effluent discharge requirement, could apply to freshet when Chinook salmon are not present in Minto Creek and other sensitive components of the aquatic environment are generally protected by ice (YOR document # 2010-0198-134-1). Allowance of distinct compliance requirements for freshet and non-freshet conditions is seen as a measure that allows for adequate protection of fish resources in Minto Creek while recognizing MintoEx's need for operational flexibility.

Ammonia

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

The proposed project activities contribute to ammonia and other nutrients in surface waters through the ongoing storage and use of nitrogen based explosives, such as ANFO. The current project proposes measures to mitigate potential release of nitrogen, in particular ammonia, to the environment by applying source controls, monitoring, reporting, and specific water treatment procedures. WUL effluent quality standards for ammonia are pending. MintoEx's states, *"The adaptive management plan proposed for both the current operations and for the Phase IV period incorporate adaptive responses to the receipt of all water quality results for which there are water quality objectives identified – including ammonia, nitrate and nitrite. Although these parameters will not be screened for using site analytical methods, their concentrations will be determined through the external analysis at an accredited environmental laboratory and the results will be used to determine appropriate adaptive responses to managing effluent treatment and discharge."* (p. 7 of YOR document # 2010-0198-114-1).

Concerns were raised that the mitigation measures implemented for source control in 2010 have not produced the desired reduction in nitrogen species. This concern was acknowledged in MintoEx's response to the second information request, *"Since the submission of the Project Proposal, the ongoing water quality surveillance program under the water licence for the Minto Mine has returned some nitrate concentrations in the effluent and downstream receiving environment that have resulted in a revision to the strategy for nutrient mitigation currently proposed in MintoEx's Water Use Licence Amendment Application QZ09-094 currently before the Yukon Water Board."* (YOR document # 2010-0198-056-1).

This supports the recommendation that the Adaptive Monitoring and Management Plan should include specific response thresholds and mechanisms to ensure that effluent meets the proposed discharge standards for nitrogen species (p. 7 of B. Slater's letter in YOR document # 2010-0198-120-1).

Chloride

Chloride may be present in wastewater because of releases of calcium chloride (CaCl_2) brine from underground operations. Chloride ions are very soluble and do not associate with solids in soils or in suspension in surface water; therefore it remains in solution in freshwater systems. It may be noted that although there is no Canadian water quality guideline for chloride, British Columbia and Quebec have adopted freshwater guidelines for the protection of aquatic life based on exposure duration (Nagpal, 2003 and MDDEP, 2009, respectively). Currently, MintoEx does not have not proposed water quality objectives nor have they predicted chloride concentrations for the receiving environment

Respectively, Environment Canada and Bill Slater, on behalf of SFN, voiced unresolved concerns regarding chloride at the end of the screening stage, *"The proposal confirms that the water management plan ensures that water attains regulated criteria before discharge. As per Table A.3 (Descriptive statistics of Minto Creek Background Water Quality Data) of Appendix A submitted during the recent Water Use Licence (WUL) application, the 95th percentile for chloride is 0.92 mg/l and 38.9 mg/l for calcium in Minto Creek. Calcium and chloride are not regulated substances as there were no proposed effluent standards for these parameters during the WUL application or the previous WUL for this site."* (YOR document # 2010-0198-119-1) and *"Section 3.3.8 of the Project Proposal identifies the use of calcium chloride brine in the underground for preventing freezing of water during the winter. Minto anticipates that some weak brine solution will be conveyed to the water treatment system. Potential effects of chlorine on aquatic environments have not been addressed in the proposal. Appropriate chlorine discharge standards should*

be established to ensure that no adverse effects occur.” (B. Slater’s letter in YOR document # 2010-0198-120-1).

Considering that chloride is a constituent of potential concern associated with project activities and that some jurisdictions in Canada have adopted guidelines for chloride in freshwater, the project would benefit from regularly monitoring for chlorine on-site and in the receiving environment. Furthermore, established discharge and receiving environment standards should be developed to protect the aquatic resources in Minto Creek.

7.2.1.5 Site and receiving environment water balance

The site and receiving environment water balance was developed to simulate conditions at Minto Mine representing the upper Minto Creek watershed upstream from monitoring station W3. The Minto Mine site water balance was reviewed and updated in 2010 using climatic and operational data to March 2010. In conclusion to these updates, Clearwater Consultants Ltd. (CCL) recommended that, *“All components of the water balance should continue to be monitored to allow modifications to be made as required to the model assumptions and parameters so as to better reflect actual site operating and hydrogeological conditions.”*

It is essential that inputs and assumptions for the site water balance continue to be reviewed and updated annually based on actual monitoring data and model predictions.

7.2.1.6 Water quality model

MintoEx’s water quality model predicts water quality in the receiving environment (W1/W2) as a function of waters released from the site (W3). It is an integral part of the WMP, as it will direct on-site decisions concerning the timing and volume of releases of mine waters from the site.

Concerns with uncertainties related to MintoEx’s water quality model were thoroughly discussed in the YESAB Designated Office Evaluation Report of March 3, 2010 (YOR document # 2009-0206-085-1). This current review has noted that since the report was issued, a number of adjustments have been made but uncertainty remains as to the monthly flow distribution assumed in the modelling since it differs from measured values and from previous estimates without justification (documents # 2010-0198-056-1 and 2010-0198-054-1). Specifically the model predicts higher than measured dilution potential in Lower Minto Creek during the summer.

These continued uncertainties in the water quality model are best addressed through proper validation of the model predictions against actual field measurements of flow and water quality. This request was made to MintoEx in YESAB’s second request for additional information dated October 8, 2010 (YOR document # 2010-0198-047-1). In their response to this request, MintoEx cited a lack of available site data as a limitation to validating the model at this time, *“In order to validate the water quantity model during operational conditions, concurrent measurements of streamflow at W3 and W1 and measured precipitation at the site would be required. Although these data have been collected for a number of years (...) Optimistically there are at best six months of (almost) complete concurrent data spread over a two year period.”* and *“As mining operations continue, additional regional and site flow and climate data will continue to be collected which may allow periodic refinement of the hydrologic models developed for the*

site. However, true validation of the closure water balance model cannot be carried out until after collection of data for a few years under actual closure conditions.” (YOR document # 2010-0198-056-1).

The continued uncertainties emphasize the need for proper validation of the water quality model as an integral part of the monitoring and reporting requirements. This will reduce the uncertainties and improve the effectiveness of the model as a tool for managing Minto Mine water releases.

7.2.1.7 Groundwater monitoring

Geotechnical investigations (cited in YOR document # 2010-0198-076-1) and groundwater monitoring (see Section 4.7 YOR document # 2010-0198-062-1; YOR document # 2010-0198-076-1) have generally indicated low hydraulic conductivity (estimated to be in the range of $K = 10^{-8}$ cm/s) so the project anticipates very little groundwater inflow, including during high precipitation and freshet events, unless a large water bearing fault is encountered. Since the underground workings are in an area of known permafrost, MintoEx anticipates that seasonal thaw of the active layer and perched water tables at shallow depths will have limited or no effect on water inflow to the underground workings.

The project indicates that underground workings are expected to extend to depths approximately 200 m below those currently monitored by groundwater wells (YOR document # 2010-0198-076-1). For example, operational groundwater well MW09-04 does not reach depths equivalent to the proposed bottom of the Area 2 Pit. No information has been provided to characterize possible groundwater inflows rates at those depths.

In YOR document # 2010-0198-119-1 Environment Canada states, “*According to Appendix M (SRK reports), no hydraulic conductivity (K) testing has been performed to date. This information is needed for estimating groundwater inflow conditions, in particular as it pertains to the open pits and the underground workings. (...) the existing groundwater monitoring network should be expanded to include a few more locations and inoperable monitoring wells should be replaced with functional ones that can be used for long-term monitoring. Furthermore, these wells will allow monitoring of water levels and evaluate the potential effect of pit and underground dewatering, as well as support predictions related to possible effects on the local water table from subaqueous disposal to the Main Pit.*”

In final comments, Environment Canada indicated that inflows from the anticipated seasonal thaw of the active layer or from the fractured rock which may also produce large amounts of water and may deserve more scrutiny as this may present water management concerns both in terms of water quantity and quality (YOR document # 2010-0198-119-1).

The groundwater monitoring program described in Appendix M of the proposal (YOR document # 2010-0198-076-1) consists of installing wells at four locations (MW09-01 to MW09-04). Two of these wells are currently inoperable due to ground movement either at ground surface (MW09-04) or deeper (MW09-02), leaving only two operational wells; one upgradient of the proposed North Pit and one downgradient of the existing main wasterock dump. There are no groundwater wells installed downgradient of the water storage pond. This location would most likely represent one of the more appropriate sites for monitoring groundwater conditions in terms of being downgradient from most if not all site infrastructure and components.

7.2.1.8 Mitigations

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to open pit and underground mining during operation. These mitigations will ensure that any residual effects of this project will not be significant and adverse.

7. MintoEx shall apply recommendations 1 to 27, inclusively, as stated in the Joint Yukon Government-Selkirk First Nation Decision Document of March 29, 2010, for the Minto Mine Water Management and Milling Rate Amendments (YOR document # 2009-0206-087-1).

Rationale: This current evaluation strongly supports the recommendations stated in the Joint Yukon Government-Selkirk First Nation Decision Document as the most effective measure to ensure that there are no significant adverse effects to aquatic resources in the receiving environment of Minto Creek.

The approach does not exclude seasonal compliance requirements to allow for flexibility within the Water Management Plan to direct decisions, based on water quality, regarding the capture, storage, treatment and/or release of on-site waters. Current understanding of aquatic resources in lower Minto Creek indicates that Chinook salmon are not present during the freshet period, and other sensitive components of the aquatic environment are generally protected by ice during this period. It may be reasonable in this case to define separate compliance requirements for the freshet and non-freshet periods to account for the differing environmental sensitivities.

8. MintoEx shall report annually to the advisory committee recommended in Mitigation 13 on model predictions compared to field monitoring (model validation), including determination of cause for significant differences between observed and predicted water quality, and corrections.

Rationale: MintoEx's water quality model predicts water quality in the receiving environment (W1/W2) as a function of waters released from the site (W3). It is an integral part of the Water Management Plan, as it will direct on-site decisions concerning the timing of and volumes of releases of mine waters from the site. The Minto Mine site water balance and water quality model must be properly validated with measured data. This concern was stated by interveners during the screening stage.

Given the importance of water quality model as a tool to predict compliance of effluent releases in the receiving environment, it is essential that MintoEx proceed as soon as possible with the validation of the model and commit to on going updates in response to significant differences between observed and predicted data.

9. MintoEx shall establish a suitable receiving environment water quality objective for copper for compliance at the receiving environment monitoring station that is protective of the most sensitive aquatic receptor during its most sensitive life stage.

Rationale: This is understood to be a value that is protective of the development of olfactory sense in juvenile Chinook salmon during rearing. This review recognizes MintoEx's efforts to characterize fish usage of the system (timing, duration and extent) by juvenile Chinook

salmon and other species, to monitor possible use of lower Minto Creek by adult Chinook during their spawning period and to support an effects level study to determine what concentration of copper in Minto Creek water may affect olfaction in juvenile Chinook salmon. Given the importance of this aquatic resource, the uncertainty surrounding the determination of background copper concentration in Minto Creek and the uncertainty surrounding olfaction effects levels, it is recommended that the water quality standard for the receiving environment be based on conservative assumptions.

10. MintoEx shall establish a suitable receiving environment water quality objective for chloride for compliance at the receiving environment monitoring station.

Rationale: Chloride is expected to be a constituent of concern in site water as a direct result of the proposed use of brine in underground mining operations.

11. MintoEx shall monitor and report to the advisory committee recommended in Mitigation 13 on chloride and nutrients (ammonia, nitrate and nitrite) as part of the Adaptive Monitoring and Management Plan at appropriate water management monitoring stations and in the receiving environment, and establish clear thresholds for these constituents that initiate responses before exceedences occur.

Rationale: Nutrients and chloride are not specifically addressed by the Adaptive Management Plan and are also not addressed indirectly through management of other contaminants. In order to avoid effects that may arise from these constituents, an adaptive management plan with specific response thresholds should be prepared. The water treatment plant is not currently designed to treat either ammonia or chloride in impacted site water. Since specific treatment measures will be required, it is important that MintoEx clearly indicate the protocol for initiating these treatment processes.

12. Require routine inspection, reporting, repair and upgrade of permanent environmental monitoring installations, including structures and instrumentation for monitoring groundwater, surface water and climate.

Rationale: Review of the project description has identified groundwater and climate station instruments that are not fully functional and have not been replaced or repaired in a timely manner. This measure has been proposed to remediate this situation.

13. An advisory committee that includes representatives from MintoEx, Selkirk and government agencies shall be established. In terms of mining activities, this advisory committee will receive and evaluate progress and compliance reports including cumulative effects of existing Minto Mine activities and future proposed activities.

Rationale: This measure responds to specific requests from interveners during the screening stage.

14. MintoEx shall develop and implement an Explosives Management Plan based on best management practices to reduce and control ammonia losses to the environment.

15. MintoEx shall report on routine monitoring, upgrading and periodical inspection of all water collection and conveyance works to the advisory committee recommended in Mitigation 13. This should apply to the construction, operation and closure phases, in accordance with commitments and plans that have been (or have yet to be) submitted, reviewed and approved.

Rationale: This measure is meant to respond to concerns that MintoEx collect all impacted site water as outlined in the Water Management Plan.

16. MintoEx shall establish a groundwater management plan to characterize the hydrogeological conditions including, but not limited to, groundwater quality and quantity, soil physical characteristics, vertical and horizontal gradients. The monitoring network should include stations downgradient of the Water Storage Pond and provide long-term monitoring of groundwater during operations, closure and post-closure.

Rationale: This measure is meant to respond to the observed deficiencies in the current groundwater monitoring network, to allow more precise estimates of potential groundwater inflows to open pits and underground workings, and to assure that any impacted groundwater is collected and treated at the site as outlined in the Water Management Plan.

7.2.2 New waste management practices for the Phase IV mining wastes

Phase IV will produce three types of solid waste during mining operations: overburden, wasterock, and tailings (YOR document # 2010-0198-067-1). Overburden is the unconsolidated soil above the bedrock, wasterock consists of rock mined from the pit that has less than the cut-off percent of copper (0.64%), and tailings consist of material left from processed ore. Minto is proposing to switch to thickened tailings in April 2011 once mining activities are completed in the Main Pit. Phase IV operations will produce an estimated 5.88 Mm³ of tailings (YOR document # 2010-0198-068-1).

The waste management plans consists of five disposal locations (YOR document # 2010-0198-062-1):

- The Main Pit buttress is to mitigate slope instability of the south wall in Main Pit. It is expected that the majority of the Main Pit South Wall Buttress will be covered by placed tailings at the end of the mine life.
- The Grade Bin 0.10 – 0.64 Disposal Area (GBDA) an area inside the Main Pit footprint to be used as a storage area for wasterock that contains between 0.10 and 0.64% copper. Any potentially acid generating material from underground waste would also be disposed of in this area.
- The Southwest Dump Expansion provides additional storage area for overburden and wasterock mined from the Area 2 and Area 118 pits. The wasterock deposited in the Southwest Dump Expansion will contain less than 0.10% copper
- The MVF is designed as an area for camp expansion. It will be constructed of Grade Bin 0.00 material to reduce the potential for transportation of metals.

- The Area 118 Pit will receive approximately 0.3 Mm³ of wasterock containing less than 0.10% copper.

Tailings will be deposited in the DSTSF, the Main Pit and the Area 2 Pit during Phase IV operations.

The project activities associated with the new waste management practices may affect aquatic resources via runoff to surface water and seepage to groundwater.

7.2.3 Main Pit

The project is unclear on how the leachate from the storage of higher grade waste will be collected and monitored over the life of mine timeline leading up to reclamation and closure. This includes the temporary placement in a disposal area to the south of the Main Pit (Area 1) and relocation and/or disposal in the Grade Bin Storage Area simultaneously with tailings. As stated by Environment Canada (YOR document # 2010-0198-119-1):

The Grade Bin Disposal Area is to provide an area inside the Main Pit footprint to dispose of material (approximately 1.38 Mm³) that has a higher risk of leaching metals into the environment, in turn reducing mitigation efforts due to the proximity to the pit. (...) Leachate derived from the [Grade Bin Disposal Area] leading up to reclamation and closure could pose concerns to the overall water management of the site; however, this is poorly described in the proposal. Issues and mitigations related to the temporary staging of higher grade waste in this area should be addressed. For example, how will [Grade Bin Disposal Area] leachate (ML/ARD) be collected and monitored?

(...) the discussion on wasterock management describes that of the 2.55 Mm³ of material (grade bin 0.10 - 0.64) expected during Area 2/118 development, 0.24 Mm³ will be used for construction of the buttress, 1.38 Mm³ will be placed in the [Grade Bin Disposal Area] and 0.93 Mm³ will be disposed simultaneously with the tailings in the Main Pit. Simultaneous disposal of these materials will result in a significant volume of higher copper content waste being encapsulated within the tailings at this location. (...) it is unclear if the proposed wasterock dumps will be designed in such a way that seepage will be collected and monitored for water quality and/or if a pad liner system will be constructed to minimize infiltration.

Regarding the co-disposal of tailings as conventional slurry in the Main Pit, some concern remains as to the potential contamination of the shallow groundwater system by tailings process water and pore water.

Phase IV proposes sub-aqueous disposal in the GBDA of the Main Pit to minimize exposure and reduce metal flux from oxidation of sulphidic material, and the disposal of thickened tailings in the Area 1 and 2 pits. Thickened tailings are not dewatered to the same degree as dry stack tailings. As described in Appendix E (YOR document # 2010-0198-068-1),

“enough water is left in the processed tailings to allow the water and tailings (known as slurry) to be pumped to the disposal facility. This slurry is deposited into the tailings storage facility and the tailings are allowed to settle, which produces supernatant water. The supernatant water is “squeezed” from the pores of the tailings during settlement and typically forms a pond above the

placed tailings. Minto's preliminary mill design will produce slurry with a solids content of approximately 50 % and the tailings are expected to settle to approximately 66 % solids."

In final comments, Environment Canada (YOR document # 2010-0198-119-1) stated,

"In regards to subaqueous disposal, the design basis for tailings management (Appendix E) uses water balance calculations that are based on a net groundwater flow of 0 m³ into the Area 1 and Area 2 open pits (inflow = outflow). The report does not specify what data or observations were used to support this statement. The proponent has had several years of operational history to monitor water levels in the Main pit. If this value is not known and cannot be estimated then the model should account for conservative estimates (i.e.: inflows into the pit > 0)."

"The co-disposal of tailings in the Main pit will ... involve the use of ... conventional slurry. (...) Water in the pit will therefore initially be composed mainly of this tailings process water, remnant in the slurry. This water may possibly flow from the pit through fractured bedrock and reach the shallow groundwater system. Additionally, pore water in the tailings may transfer to pit groundwater. This issue further underlines the importance of developing a groundwater monitoring system adequate to detect these impacts."

"The current monitoring program (Appendix F) describes which stations are presently in place; some of which are monitored for purposes of characterizing seepage water from the Main Waste Dump, ... [t]hough the placement of wasterock during Phase IV operations could impact these stations in the future. (...) As part of the Adaptive Monitoring and Management Plan (AMMP), the Seepage Monitoring Program should carefully consider how new wasterock dumps and staging areas are engineered so that seepages can effectively be monitored."

7.2.4 Mill Valley Fill

As described in the project description, the drainage systems for the MVF will consist of a drainage blanket to prevent the build up of porewater pressures within the fill and to allow water to continue to flow down the Minto Creek Valley. The drainage blanket will be 10 m thick and constructed of select wasterock with minimal fines to allow free drainage and the MVF will be graded to drain water from west to east.

Sump W37 is situated in the Minto Creek Valley downgradient of the DSTSF and the mill complex area. It collects impacted water from the stockpile and operational areas around the milling complex and the DSTSF. Phase IV does not propose changes for the W37 Sump. As the MVF material is to be placed downgradient of the mill and DSTSF area, the W37 pipeline may require realignment to keep it on the surface in this area (Section 3.5.3.2.5 of YOR document # 2010-0198-062-1).

Concerns were raised as to the current and future operation of the sump and conveyance infrastructure by B. Slater:

"Section 3.5.3.2.5 describes water collection and conveyance facilities for contaminated tailings seepage water at the "W37 Sump." As described in previous memos, this facility was not constructed as described in the Project Proposal for the Water Management Plan, has not operated effectively and does not include conveyance facilities (pumps and pipes) that are

functional during normal flow conditions. In most cases, pumps have not even been in place. Minto has not completed the investigation and upgrade activities described during the YESAA assessment of the Water Management Plan, and reflected in the conditions contained in the Decision Document.” (YOR document # 2010-0198-120-1).

The W37 Sump is a key component of the current and Phase IV Water Management Plan and the proper functioning of all components of the Water Management System is essential to protecting the aquatic receiving environment from significant adverse effects. However, routine inspection, repairs and upgrades of water management infrastructure are not cited as mitigation for the protection of water resources.

“Seepage collection and treatment in both the immediate and long term are both vital to site integrity and acceptable mine practices. The Proponent has committed to collecting and treating the tailings seeps in both bilateral discussions with Selkirk as well as at the December Water Board hearing. Effective collection and treatment should be the subject of a clear, affirmative YESAB recommendation and any applicable licence. This would be consistent with the recommendations of the evaluation report for the Water Management Plan (YOR document # 2010-0198-120-1).

7.2.4.1 Mitigation

The following mitigation measures are specified to eliminate, reduce or control significant adverse effects of the project relating to waste management. This mitigation ensures that any residual effects of this project will not be significant and adverse.

17. MintoEx shall implement new and appropriate monitoring points for seepage from existing and future waste piles.
18. MintoEx shall ensure commitment to effective drainage collection from the MVF and permanent instrumentation to monitor groundwater and seepage from the DSTSF.
19. MintoEx shall expand the existing groundwater monitoring network to include wells that will allow monitoring of water levels and evaluate the potential effect of pit and underground dewatering, as well as support predictions related to possible effects on the local water table from subaqueous disposal in the Main Pit.

7.2.5 New Infrastructure

New infrastructure for the Minto Mine site related to the project includes camp expansion for an additional 100 persons for a total capacity of 300 persons. The camp expansion will be to the south on the MVF. A heavy-duty mechanical shop will be constructed as well as office space within the mill.

These activities are expected to be completely within the footprint of the existing mine-site. There do not appear to be any significant off-site effects associated any construction, operation or decommissioning of these structures.

7.2.6 Closure and Reclamation

Metal leaching and nutrient loadings from disturbed site surfaces are long term environmental concerns. In general, the Phase IV closure plan proposes

- Sub-aqueous disposal of the GBDA;
- Backfilling and flooding the Area 1 and Area 2 Pits;
- Backfilling and revegetation of the Area 118 Pit;
- Milling ore stockpiles;
- Soil covers or engineered soil covers for the Main Waste Dump, Southwest Dump, DSTSF, and the MVF.

Active water treatment of site drainage is proposed for a minimum period of four years following closure and the construction of passive wetland or biologic treatment systems at the mill pond and Water Storage Pond is envisaged for the long-term.

The post-closure water balance is based on the site water balance discussed in the previous section. The post-closure water balance estimated monthly runoff from various subcatchments of Minto Creek for a range of return periods (YOR document # 2010-0198-072-1). Flows for the average return period were adopted for the catchment. The mine site was divided into subcatchments with runoff determined by the proportion of land that is undisturbed, disturbed and not reclaimed, disturbed and reclaimed, and pond. No significant concern was raised as to the adequacy of the model to reasonably represent site conditions.

The water balance model subcatchments were defined to allow loads to be assigned to various discrete components such as waste dumps, pit walls, and DSTSF. Water quality inputs for undisturbed areas were updated from values developed by Minnow Environmental Inc. (Documents # 2009-0206-017-1, 018-1, and 019-1), which were previously reviewed in YOR document # 2009-0206-085-1. The assumptions utilized to develop long-term chemical loadings for the discrete sources within non-reclaimed disturbed areas (YOR document # 2010-0198-072-1) were reviewed and no significant concerns were raised. However, comparison of predicted values against site water quality and tailings pore water would benefit ongoing development of the model.

Without mitigation, the predictive water quality model suggests that at closure there will be seasonally elevated metal concentrations for a number of parameters in the downstream environment including aluminum, copper and cadmium, with copper being the primary contaminant of concern (YOR document # 2010-0198-071-1). Successful reclamation is therefore an essential component of the project, without which the project will have significant adverse effect on aquatic resources.

Significant uncertainty remains about the assumptions involving predicted efficiency of reclamation methods. The reclamation “toolbox” for the Project is presented in Appendix H, *“specifically scoped to fulfill the requirements under the Yukon Environmental and Socio-economic Assessment Act (YESAA) for quartz mining projects proposed in the Yukon. The Plan is not intended to address closure of previously*

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

permitted infrastructure components which have been addressed in the 2009 Detailed Decommissioning and Closure Plan.” (YOR document # 2010-0198-071-1).

The reclamation plan focuses on source control through sub-aqueous disposal and engineered covers, and passive treatment systems, in particular passive treatment wetlands. Performance targets were developed from literature and are initially set as, *“The long-term performance of the engineered cover systems was assumed to be on the order of an 80% reduction in metal loadings for benches and a 50% reduction in metal loadings for faces. Passive treatment systems were assumed to be seasonally effective with a performance on the order of 75% reduction in metal loadings during the freshet period.”* (YOR document # 2010-0198-071-1)

In response to comments received, MintoEx proceeded with modeling several scenarios for site reclamation (YOR document # 2010-0198-055-1). The scenarios included either a basic soil cover (60% reduction) or a high quality soil cover (80% reduction) with or without subsequent treatment through a passive wetland system (66 or 75% reduction). Estimated load reductions are considered reasonable for the main constituents of concern, such as aluminum, cadmium and copper. Conclusions from modelling indicated that a combination of a reduction of infiltration through wasterock and tailings (through installation of soil covers) and of load removal in polishing wetlands will be necessary to adequately mitigate chemical loadings from the mine site in the post-closure period.

During the screening stage, significant concern was raised over the following assumptions utilized to predict post-closure water quality:

Source terms

- Questions were raised that limited humidity cell data is insufficient to fairly represent the neutral metal leaching properties of the wasterock (YOR document # 2010-0198-116-1).
- Reasonable worst case scenarios' are acceptable to demonstrate if site mitigations bring modeled water quality impacts down below significant levels. In cases where significant impact is demonstrated, the proponent may have created an overly conservative scenario and should model all site conditions to as close to a 'likely end-scenario' as possible. This will give a more accurate picture of post-closure. Further work in this regard is recommended (YOR document # 2010-0198-113-1).
- Environment Canada expressed concern that the groundwater in the underground workings *“may deserve more scrutiny as this may substantially influence the (...) present water management concerns both in terms of quantity and quality.”* (YOR document # 2010-0198-119-1).

Mine Closure Measures

- If the soil covers do not work as well as planned, the concern that follows is that, due to the low level of design and commitment required in the review process, certainty of results is similarly potentially low. The requirement for security does not offset this, as the security is calculated based on the proposed actions, which themselves may not be adequate. When plans to achieve a desired outcome are not clearly assessable as being adequate, the potential for significant shortfall in security can result. (YOR document # 2010-0198-120-1)

- Potentially negative effects on the performance of the soil covers that are proposed as a closure measure due to foundation instability in the SW Waste Dump and DSTSF. (YOR document # 2010-0198-120-1)

Pit Flooding

- It is stated that the Main Pit and the Area 2 Pit will be flooded after closure. There has been no presented data that this state is feasible or can be maintained over extended periods of time. Specifically, no mention has been made of whether or not the underground workings below the pits will be hydrologically connected and thereby influence water retention in the pits. Maintaining full water cover should be demonstrated in order to be an option under the Reclamation and Closure Plan. If water cover in the pits cannot be maintained and periods of time exist when there are discharges either by ground or surface waters, then this may increase site loadings (YOR document # 2010-0198-116-1).

Groundwater

- Not including groundwater after closure as a source term may be a non-conservative point (YOR document # 2010-0198-116-1).

Monitoring and Updating the Reclamation and Closure Plan

- In order to ensure that closure plans remain relevant and continue to address changes in water quality that may arise at the site, the water quality predictions should be updated and modeling revised as needed. Monitoring should be undertaken to support this type of future analysis (YOR document # 2010-0198-120-1).
- MintoEx has submitted an updated Decommissioning Plan which details the reclamation and closure objectives and specific proposals to meet or exceed the QML Terrestrial Objectives. This plan includes methods to monitor and update results of new information, the provision of financial securities and the cost of both progressive and final reclamation. Some aspects of this plan may require revisiting following an environmental assessment as additional closure concerns may be identified (EMR response in YOR document # 2010-0198-113-1).

Water Quality Objectives

- Based on the Minnow Environmental Inc. evaluation, SSWQOs in the receiving environment have been proposed in a recent WUL amendment. These SSWQOs would represent good water quality management during the operational phase of the project when site presence and water management would limit durations of peak concentrations. However, for post-closure with no on-site presence, these 95th percentile concentrations or Water Effects Ratio concentrations (both being SSWQOs) should be replaced with baseline averages that would better represent the natural steady state of the receiving waters. Therefore, in the analyses following, it is appropriate to compare mitigated receiving water quality to the “mean” adopted baseline concentrations (YOR document # 2010-0198-116-1).

The evaluation of potential effects to environmental quality presented in the previous section determined that without mitigation instability of the Southwest Dump and the MVF could affect the efficiency of soil

covers over the long-term. Considering this and the lack of demonstrated efficiency of reclamation measures proposed for the project, the extent of reclamation deemed necessary to achieve objectives in the receiving environment, and the low level of commitment it is reasonable to conclude that the project will likely cause significant adverse effects to aquatic resources in Minto Creek without additional measures.

7.2.6.1 Mitigation

The following mitigation measures are specified to eliminate, reduce or control significant adverse effects of the project relating to post closure reclamation. These mitigations ensure that any residual effects of this project on aquatic resources will not be significant and adverse.

20. The advisory committee recommended in Mitigation 13 shall also conduct comprehensive reviews of reclamation and closure plans. The committee shall convene each time a plan is revised and shall inform the development and refinement of each plan.

Rationale: This recommendation supports the views expressed by Yukon Government, Energy, Mines and Resources, Minerals Branch and the Selkirk First Nation during the Project Screening phase and is in line with principles set out in the Yukon Mine Site Reclamation and Closure Policy (YG, 2006). Such a group could address contentious issues such as long-term water quality objectives and evaluate environmental and technical performance of reclamation options.

21. The principle stated in the site Water Management Plan that all contaminated site waters should be collected, must also apply to closure and post-closure phases. The Minto Mine collection and conveyance network should continue to be monitored, reported and upgraded as needed during the post-operational phase;

22. The decommissioning plan should provide clear water quality objectives for the long-term protection of aquatic resources in the downstream environment of Minto Creek and the Yukon River.

Rationale: This measure addresses concerns stated by several interveners that the proposed operational site-specific water quality guideline might not be sufficiently protective post-mining without active water management.

23. The proposed Reclamation and Closure Plan must be expected to meet objectives that are protective of aquatic resources without reliance on long-term active treatment.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

24. MintoEx shall commit to progressive reclamation of wasterock storage facilities and other disturbed sites prior to final closure as stated in the Decommissioning and Reclamation Plan.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

25. MintoEx shall commit to and proceed with, environmental and technical studies of preferred reclamation options that have clear objectives, completion dates and reporting requirements. These studies shall be statistically robust and provide enough information to assess the success, or lack thereof, of the different reclamation tools proposed in the Closure and Reclamation Plan and redirect reclamation and closure plans, if need be, in a timely manner. The study objectives and design shall be viewed and informed by the advisory committee recommended in Mitigation 13 prior to implementation. Results shall be included in an annual reclamation status report. Studies shall include but not be limited to: 1) in-situ water behaviour (quantity and quality) through different engineered soil covers on selected reclaimed areas and 2) laboratory and scaled experimental passive treatment wetlands.

Rationale: This recommendation is in accordance with the Yukon Mine Site Reclamation and Closure Policy (YG, 2006).

26. The advisory committee recommended in Mitigation 13 shall also receive regular monitoring, progress and compliance reports associated with site waste management. Water monitoring during the closure, reclamation, and post-closure phases of mining, should allow for the following: 1) comparison of predicted and actual water quality, 2) continued sampling of quality and quantity of water resources, including seepage and groundwater from tailings and wasterock storage facilities, surface water at “end-of-pipe” and in the receiving environment and 3) monitoring of effectiveness of mitigation measures and comparison to predicted performance.

7.3 CUMULATIVE EFFECTS

The proposal has been evaluated in the context of other activities that may cause cumulative effects to aquatic resources within Minto Creek and the Yukon River.

MintoEx is the only company undertaking mining activities within the Minto Creek watershed and no other industrial utilization of the resource is known (e.g. agriculture, forestry). The project will result in an incremental increase in disturbed land area and affect total loadings to Minto Creek during operation and post-operation. For Minto Creek, the potential for cumulative effects on aquatic resources during operations is considered low at this time since the MintoEx Phase IV project is expected to succeed the current operations with very little temporal overlap. This situation may change in the future, as MintoEx may expand their activities from that presently described or other companies may consider new activities; however, these will need to be evaluated in the future based on the potential cumulative effects of the activities at that future time.

For the Yukon River, the potential for cumulative effects is also considered low based on the estimated loadings from the MintoEx site and in consideration of the assimilative capacity of the Yukon River. Monitoring of water quality and environmental trends within the Yukon River should be undertaken by the appropriate agency as part of an overall environmental management strategy.

I have determined that this project will not result in significant adverse cumulative effects. This is in consideration of how residual effects of this project interact with the effects of other projects (for which proposals have been submitted) or other existing or proposed activities.

8.0 ENVIRONMENTAL QUALITY

8.1 OVERVIEW

The long and short-term environmental quality near the Minto Mine site is, at least partially, dependent upon the physical stability of the structures at the mine-site. The Minto Mine Phase IV Expansion will include the following waste management and containment structures:

- South Wall Buttress – this will consist of a wasterock buttress to control movement of the south face of the existing Main Pit.
- Mill Valley Fill – the MVF consists of a wasterock structure placed at the toe of the DSTSF. The MVF is intended to control long-term movement and creep of the dry stack tailings and underlying native soils.
- Grade Bin Disposal Area – this area contains wasterock with elevated levels of copper. The rock will be disposed of within the existing Main Pit.
- Southwest Dump Expansion – the Southwest Dump Expansion will contain overburden and wasterock from open pit mining operations.
- Area 118 Open Pit – this area will contain wasterock from open pit mining activities.

Each component is discussed below in the context of potential instabilities that could affect environmental quality.

8.2 PROJECT EFFECTS

8.2.1 Stability of the South Wall Buttress

The South Wall Buttress is situated along the south wall of the existing Main Pit. The buttress is designed to mitigate slope movement and instability of the overburden materials on the south wall of the Main Pit. The South Wall Buttress will consist of wasterock placed on the south face of the Main Pit at an inclination of approximately 1.5:1 (horizontal to vertical). Benches of approximately 10 to 15 m width will be provided at two levels within the buttress. The overall height of the buttress is approximately 70 m.

Failure or movement of the buttress would occur entirely within the existing Main Pit. Therefore, there would be no off-site impacts related to failure. The consequences of failure would be related to mine operations and worker safety.

Over the long-term, movement of the material may result in ground displacement and settlement within the completed pit area. This may result in settlement or movement of the completed cap or cover for the area. The long-term efficiency of reclamation measures is an important issue, as it relates to effects to aquatic resources discussed in Section 7.0.

MintoEx has conducted detailed analysis of the stability of the buttress. The analysis indicates that the buttress is safe against both deep-seated and shallow surface slope failure. Maintenance will be required during operation to repair erosion and minor surface movement or failure.

8.2.1.1 Mitigation

To eliminate, reduce or control significant adverse effects of the project relating to the stability of the southwall buttress, the following shall be provided:

27. MintoEx shall visually inspect the South Wall Buttress in the Main Pit on a regular basis to assess surface movement and shall provide detailed inspection and monitoring reports to the decision bodies.
28. MintoEx shall grade and/or place additional wasterock as required to maintain the surface profile and function of the buttress and shall provide detailed inspection and monitoring reports to the decision bodies.

8.2.2 Stability of the Mill Valley Fill

The MVF consists of wasterock material placed at the toe (north side) of the existing dry stack tailings storage facility. The thickness of the fill will be approximately 10 m. Recent studies have indicated that the DSTSF, and the underlying overburden, is moving downslope. The movement is the result of long-term creep associated with an underlying frozen clay layer. The MVF will be used to reduce or stop downslope movement of the existing DSTSF and underlying soil and will also provide an expansion for the existing camp area.

The downslope movement of the dry stack tailings material will result in continued movement and sloughing of tailings and wasterock at the toe of the facility. This could hamper efforts to stabilize the material with long-term cover and vegetation that could result in erosion and transport of exposed tailings material. In reference to this, Environment Canada stated, *“With so much emphasis on the DSTSF movements and the suggested mitigation it would be advisable that all of the recommendations presented in Appendix Q [Dry Stack Tailings Storage Facility Update Report, September 10, 2010] be implemented.”* (YOR document # 2010-0198-119-1).

MintoEx has undertaken detailed investigation and monitoring of the movement of the DSTSF. They have also conducted modeling that involves the use of the MVF as a stabilizing measure to arrest movement of the failings and underlying soil.

Preliminary results of the modeling are available and suggest that the MVF will be effective in arresting the long-term creep of the DSTSF and underlying soil. On-going monitoring will be required to determine the final configuration of the MVF. Alterations to the fill may be required to ensure that the long-term creep is stopped.

MintoEx has also conducted an investigation regarding the extent of the frozen clay layer that has resulted in the creep. The investigations indicate that the clay layer is not present in areas to the east (downslope) of the DSTSF or the MVF. MintoEx concludes that there will be no down valley movement of the fill.

It is recognized that the proponent's investigations and analysis are on going. While the results of the work to date are favourable, on going monitoring and further analysis are required to confirm the final design of the works.

In regards to site investigations Yukon Conservation Society voiced interest that MintoEx “*make available any and all findings regarding the movement of the foundation soils. Given the possibility of further mines operating in the Yukon central belt, the greater the dissemination of this knowledge among the mining community, regulators and contractors the greater the ease with which remedial action can be taken.*” (YOR document # 2010-0198-115-1).

In addition, Environment Canada (YOR document # 2010-0198-119-1) stated: “*(...) questions/concerns further emphasize the need for detailed characterization of valley bottom conditions. While the installation of additional inclinometers will be used in better defining valley bottom conditions is intended as part of the MVF design workplan, will adequate time be allocated for data collection, review and interpretation prior to the commencement of the MVF construction?*”

Until results from investigations have shown that the mitigation measures are successful, I have determined that the project will result in significant adverse effects to environmental quality. These effects can be eliminated, reduced or controlled by the application of the following mitigation measures.

8.2.2.1 Mitigations

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to the MVF:

29. A detailed program shall be provided by MintoEx for monitoring the downslope movement of the DSTSF and underlying soil. The program shall include the location and nature of all instrumentation and frequency of monitoring.
30. MintoEx shall provide a detailed contingency plan in the event that future monitoring indicates continued movement of the DSTSF and MVF. The plan shall include consideration of alternatives such as placement of additional fill or construction of additional stabilizing structures.
31. MintoEx shall commit to any additional works that may be necessary to ensure long-term stabilization of the DSTSF. This is necessary to ensure that the facility can be stabilized with respect to long-term placement of cover and reduction of erosion potential.

8.2.3 Grade Bin 0.1 to 0.64 Disposal Area

The GBDA is used for storage of wasterock that contains between 0.1 and 0.64% copper. The area is situated on the southwest slope of the Main Pit. The material will be placed at an elevation above the buttress and below the crest of the Main Pit. The material will be placed at an inclination of approximately 1.5:1 over a height of up to 40 m.

Failure or movement of the area will occur entirely within the existing Main Pit. Therefore there will be no off-site impacts related to failure. The consequences of failure will be related to mine operations and worker safety.

Over the long term, movement of the material may result in ground displacement and settlement within the completed pit area. This may result in settlement or movement of the completed cap or cover for the area.

The proponent has conducted detailed analysis of the stability of the fill. The analysis indicates that the fill is safe against both deep-seated and shallow surface slope failure. Maintenance will be required during operation to repair erosion and minor surface movement or failure.

The fill will eventually be covered beneath tailings, and the pit will be filled to a flat profile. At this stage there will be no risk of further significant ground movement related to the buttress.

8.2.3.1 Mitigation

To eliminate, reduce or control significant adverse effects of the project relating to the Grade Bin 0.1 to 0.64 Disposal Area, the following activities shall be undertaken:

32. MintoEx shall visually inspect the fill in the Main Pit on a regular basis to assess surface movement and shall provide detailed inspection and monitoring reports to the decision bodies.
33. MintoEx shall grade and/or place additional wasterock as required maintaining the surface profile and function of the South Wall Buttress in the Main Pit and shall provide detailed inspection and monitoring reports to the decision bodies.

8.2.4 Southwest Dump Expansion

The Southwest Dump Expansion is intended to provide additional storage area of overburden and wasterock mined from the Area 2 and Area 118 open pits. The expansion is situated at the western edge of the mine footprint. The overburden placed in the Southwest Dump Expansion will consist only of non-ice rich material.

The materials will generally be placed to a thickness of 30 m. The material will be placed at relatively flat grades with the exterior face of the material sloped at overall grades of approximately 2.5:1 (horizontal to vertical).

MintoEx has noted movement of the foundation soils at the toe of the existing Southwest Dump area. This movement may be related to movement associated with the Main Pit, and may be due to a frozen clay strata.

MintoEx intends to construct the South Wall Buttress and monitor movement of foundation soils at the toe of the Southwest Dump. If the movement stops, or is at an acceptably low rate, then the proponent will place the material within the currently permitted Southwest Dump footprint area. In the event that the movement of the South Wall Buttress is unacceptable, then the proponent will construct an expanded waste dump area (Stage 1 and Stage 2). These will be situated up-slope and at a greater distance from the South Wall Buttress area.

Considering the rating and Dump Stability class assigned to the Southwest Dump Expansion in Table 4 of Appendix D (YOR document # 2010-0198-067-1), Environment Canada (YOR document # 2010-0198-

119-1) recommended that the level of effort for investigation, design and construction implemented for the Southwest Dump Expansion should equal the recommendations of the BC Mine and Waste Rock Research Committee.

Placement of additional fill within the Southwest Dump permanent area has the potential to aggravate movement within the south wall of the Main Pit. In addition, long-term downslope movement of the material in the Southwest Dump will create difficulties in capping and stabilization of the material over the long term. This would hamper efforts to stabilize the material with long-term cover and vegetation. This could result in erosion and transport of sediment.

Failure or slumping of the material will occur within the existing mine area. There do not appear to be any significant off-site effects associated with failure or slumping of the material. This is considered primarily a mine operations and worker safety related issue.

MintoEx has conducted stability analysis for the various configurations of the Southwest Dump area. The analysis indicates that the proposed configuration of the fill placement and slump area is stable. Some maintenance may be required during operation to deal with surficial slumping or failure.

Recent analysis indicates that there may also be long-term creep movement associated with the Southwest Waste Dump area, similar to that associated with the DSTSF and the adjacent Main Pit. Therefore remedial measures (South Wall Buttress) associated with the open pit may also arrest creep within the Southwest Dump area. However, analysis with respect to the mode of movement and success of remedial measures is still on-going.

The need for immediate field measures to investigate the creep, especially in the context of the proposed expansion was underlined during the screening stage and re-iterated in final comments by Environment Canada (YOR document # 2010-0198-119-1). In addition, Environment Canada recommended a thorough assessment of the Southwest Dump expansion in light of stability concerns including Southwest Dump creep and the reclamation overburden dump material liquefaction potential.

Until this time, I have determined that the project will result in significant adverse effects to environmental quality. These effects can be eliminated, reduced or controlled by the application of mitigation measures.

8.2.4.1 Mitigation

The following mitigation measures are specified to eliminate, reduce or control significant adverse effects of the project relating to the Southwest Dump Expansion prior to final approval:

34. MintoEx shall perform further detailed analysis of the stability of the Southwest Waste Dump facility. Particularly, the analysis must consider long-term creep.

Rationale: This measure is meant to fill in the data gaps identified during the screening stage of the evaluation and the need for a thorough assessment of stability concerns.

35. Based on the results of the analysis in Mitigation 34, appropriate contingency measures must be developed.
36. MintoEx shall develop a detailed monitoring program with respect to monitoring the movement of the fill and underlying overburden materials within the Southwest Waste Dump

area. The program shall be integrated with other monitoring programs at the site and shall report to the advisory committee recommended in Mitigation 13. The program shall provide details regarding the location and nature of all instrumentation and frequency of monitoring.

37. MintoEx shall provide detailed information regarding design of contingency measures in the event that monitoring indicates continued long-term creep. The contingency measures shall address the long-term stability of the Southwest Waste Dump area, to ensure the area can be adequately capped and vegetated.

8.2.5 Area 118 Open Pit

Area 118 consists of an open pit associated with mining activities. Mining activities in this area are expected to be completed in July 2012. The pit will then be used for disposal of wasterock materials. The wasterock materials will be placed entirely within the pit area.

There are no significant stability related effects associated with Area 118. The wasterock will be placed in horizontal lifts, entirely below the crest of the pit excavation. The material will be contained entirely by the pit walls.

8.3 CUMULATIVE EFFECTS

The assessment of cumulative effects takes into consideration the effects that have occurred or might occur with the project or existing project(s). Existing projects include those previously submitted to YESAB, including other placer operations, quartz exploration and existing roads/trails. Residual effects of this project on environmental quality are likely minimal given the legislation, proposed mitigation by the proponent and recommended mitigation.

The proposed project is in an area that has an existing operating mine and historic access roads. I am unaware of any other existing and proposed activities or project proposals submitted to the Mayo Designated Office that may contribute to cumulative effects to environmental quality. Given the low potential for residual effects once recommended mitigation is in place, I have concluded that there will be no cumulative effects to environmental quality.

9.0 CULTURAL AND COMMUNITY WELL-BEING

9.1 OVERVIEW

MintoEx completed construction of initial mine infrastructure in early 2007 and commenced commercial operation in late 2007. The Minto Mine completely overlaps with SFN Category A settlement land parcel R-6A. The mine is located approximately 41 km from the closest community, Pelly Crossing, where the SFN government is located. Approximately half of the estimated 500 SFN members reside in Pelly Crossing with the remainder residing in other communities in Yukon and elsewhere.

The mine currently employs approximately 230 people with the proposed expansion adding up to 83 additional employees. Information provided by MintoEx in their project proposal sets out that

approximately 17% (i.e. 35-40) of their current workforce is made up of SFN members (Figure 4-12 of YOR document # 2010-0198-062-1). This percentage goes up to 33% when you take into account other Yukon First Nations' members (Figure 4-12 of YOR document # 2010-0198-062-1).

Selkirk First Nation and MintoEx are parties to a Cooperation Agreement originally dated September 16, 1997 and amended November 4, 2009. In addition to establishing cooperation with respect to permitting and environmental monitoring, this confidential document deals with other economic and social measures as well as communication between SFN and MintoEx (YOR document # 2010-0198-062-1). MintoEx has developed and implemented numerous programs to ensure employment and training opportunities are available to employees as well as SFN members. For example, scholarships for advanced education have been established for SFN members and the company has developed and implemented a drug and alcohol policy for employees. MintoEx also works with the SFN Drug and Alcohol Department as appropriate to assist employees with drug and alcohol related issues.

The proposed expansion will extend existing employment as well as create new employment opportunities for SFN members, Pelly Crossing residents and Yukon residents in general. This will contribute towards stability in personal and family incomes as well as ensuring ongoing opportunities for businesses that benefit from the existing operations of the mine.

9.2 PROJECT EFFECTS

Mines are by their nature finite and are often associated with boom-and-bust scenarios. The “boom” created by the Minto Mine has resulted in large economic inputs to local communities through job-creation, local expenditures, and resource revenues paid to SFN. The “bust” that may accompany the mine shutdown results from the loss of these economic inputs. It would be beneficial to track the effects, both positive and negative, for the life of the mine. Tracking and understanding these effects will help SFN members and the community of Pelly Crossing prepare for and understand the changes that have occurred because of the mine.

Selkirk First Nation has proposed that the most relevant social, cultural and economic effects be identified and that these effects be tracked for all phases of the Minto Mine (SFN letter in YOR document # 2010-0198-120-1). The results could be used to inform appropriate information that would then be used to carry out long-term monitoring of project-specific effects, as well as cumulative effects. It would track the effectiveness of current mitigation measures in addressing actual impacts including those not predicted and provide certainty to the process.

MintoEx has committed to participate in a tripartite working group with SFN and Yukon Government to develop a framework and to implement a plan related to understanding socio-economic conditions within the SFN community, and the effects of Minto Mine on the community (YOR document # 2010-0198-137-1).

Significance Determination

The commitment by MintoEx to participate in a working group with SFN and Yukon Government to develop a framework for understanding socio-economic conditions within SFN community is expected to reduce the adverse effects of the project. However, the following recommendation will provide the

necessary information to the working group to allow MintoEx, SFN, and Yukon to initiate actions to respond to unanticipated effects.

9.2.1 Section 110(1) Recommendation

Under Section 110(1) of YESAA, I am recommending that monitoring of the project effects be conducted. The effects monitoring should consider the following two programs:

- A project specific monitoring program: The project-specific socio-economic and socio-cultural effects monitoring program shall result in an annual report. Ideally the first report would include all the data available at the time of writing and preferably all project phases (construction, operation and closure). The development of the monitoring program should consider what are currently known effects but should also remain flexible so that unforeseen effects can be incorporated. The following list of indicators of direct and indirect socio-economic and socio-cultural effects is provided for illustrative purposes; it should not be considered definitive: Employment and income data and information for Minto Mine; Contracting and business expenditures and distribution; Workforce development data and information; Cultural and community well-being; and Cumulative summaries for all project phases and years

Rationale: MintoEx is currently planning additional mining phases for newly discovered deposits on the Minto Mine property (SFN letter in YOR document # 2010-0198-120-1). The mine has been continually expanding its resource base with new discoveries and this pattern of discovery concurrent with mining is likely to continue. My recommendation relies on the assumption that this monitoring program will operate throughout the remaining life of the mine, ensuring the reduction of potential significant adverse effects through utilization of the results. Therefore the collection of the project specific and cumulative effects data is considered a key component of the cumulative effects assessment of socio-economic effects of future projects.

- Cumulative Effects Monitoring: It is recommended that a cumulative effects assessment and monitoring framework be developed and implemented by the tripartite working group referred to in YOR document # 2010-0198-137-1. This working group is expected to develop an integrated comprehensive cumulative effects program that will include ecological, socio-economic and socio-cultural components. The working group should define the monitoring program so that specific categories are directly quantifiable and that these variables will measure change over time. Information gathered under the project specific monitoring program should be provided for inclusion in the cumulative effects monitoring program.

Rationale: Given that there is significant mining and exploration activity occurring in Central Yukon, monitoring of cumulative effects including projects other than the Minto Mine would be invaluable to ensure accurate baseline information. For example, three major projects within 250 km of Minto Mine are currently active: Alexco Resources at the Bellekeno Mine, Western Copper activities and Victoria Gold at the Eagle Gold project. This boom is resulting in uncertainties as to the availability of the local workforce and the capacity of businesses to

meet these demands. Cumulative effects monitoring will allow the effectiveness of MintoEx's current mitigation measures to be tracked and evaluated in a larger socio-economic context.

9.3 CUMULATIVE EFFECTS

Activities currently being undertaken within the project area that may contribute to potential effects on cultural and community well-being of SFN members and residents of Pelly Crossing including those known to the Mayo Designated Office via project proposal submissions are:

- Carmacks Copper (YOR project # 2006-0050);
- Yukon Energy Stewart to Carmacks Transmission Line (YOR project # 2006-0286);
- Bellekeno Advanced Exploration and Production License activities (YOR project # 2009-0206);
- Temporary Camps for Bridge Painting Projects in the Mayo Region (YOR project # 2010-0052);
- Yukon Queen II (YOR project # 2010-0170);
- Yukon College Community Campus (YOR project # 2010-0200);
- Eagle Gold Project (YOR project # 2010-0267); and
- ATAC Resources exploration (YOR project #s 2010-0121, 2011-0030, 0031, 0037).

The proposed project is in an area that has an existing operating mine that has been an important employer in the region since 2006. The collection of employment and demographics information throughout the project life of the mine would assist in forecasting potential effects of future phases of the Minto Mine as well as the potential effects of future projects.

Residual effects of this project on cultural and community well-being are likely minimal given the proposed mitigation by the proponent and recommended mitigation, specifically the cumulative effects monitoring framework and program.

10.0 CONCLUSION OF THE ASSESSMENT

I have given full and fair consideration to information received during this assessment, as per section 39 of YESAA. I have also taken into consideration the matters referred to in section 42(1) of YESAA.

In conclusion, I have recommended to the decision bodies that the project be allowed to proceed, subject to specified terms and conditions, as the project will have significant adverse environmental or socio-economic effects in or outside Yukon that can be mitigated by those terms and conditions.

Appendix A LIST OF KEY MITIGATIONS THE PROPONENT HAS COMMITTED TO UNDERTAKE

The following is a compilation of the key mitigations proposed by the proponent and noted in this evaluation report. These mitigations are important because they mitigate significant adverse effects of the project. I have confidence that the proponent will implement these mitigations and I expect that the decision bodies and regulators will ensure that these activities are undertaken as proposed.

HERITAGE AND HISTORIC RESOURCES

- Adhere to provisions of the Cooperation Agreement;
- No disturbance of trap line trails, use is maintained;
- Trapper Compensation Agreement in place – provides continued access to traditional harvest areas;
- Ongoing community consultations and communication to ensure awareness of project extent and operations, with opportunity for public discussion or raising of concerns;
- Ongoing Traditional Knowledge studies with SFN elders to guide project and closure planning;
- A previous Heritage Assessment was completed, with consultation with SFN regarding these sites resulting in a further recent investigation of one site. In the summer of 2007 an archaeological project was completed at the Northern Tutchone Cultural landmark known as Trouble Hill. This site was a salmon fishing camp and the location of a historic feud between the Tutchone and the Chilkat Tlingit. The project field crew included SFN Members, Parks Canada Cultural Resource staff and a YG staff archaeologist. Funding for the project was provided by MintoEx, SFN, and YG. This site is located outside the Phase IV expansion area, and also outside the main project footprint; and
- All discoveries of heritage and paleontological resources are reported to SFN government's heritage department and YG Heritage Branch.

WILDLIFE AND WILDLIFE HABITAT

- The disturbance footprint and related vegetation clearing is to be limited to the extent necessary to minimize habitat loss;
- The project footprint as a whole is relatively small, and an updated site reclamation plan has been prepared for ongoing and final site restoration;
- Waste handling adheres to wildlife protection measures of Commercial Dump Permit No: 81-005;
- Camp is kept clean and combustible waste is incinerated completely on a daily basis to eliminate odors that may attract wildlife;

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- If wildlife becomes a nuisance or problem, a portable electric fence will be installed around the perimeter of the camp. All nuisances / problems with wildlife will be reported to the local conservation officer immediately for assistance in identifying further effective means of reducing wildlife mortality;
- No hunting policy for project employees is adhered to and firearms are banned from the mine site;
- Vehicle-animal encounters are prevented by employees following posted speed limits;
- Employees are required to fill out the Company's posted wildlife log; and
- Road reclamation and access limitations as part of the decommissioning plan.

HEALTH AND SAFETY

- Health & safety plans are in place at the site and changes related to the initiation of underground mining activities have been drafted and will be implemented with the Phase IV activities – the Phase IV Emergency Response Plans and Safety Protocols are included in Appendix G (YOR document # 2010-0198-070-1).
- On the job training is aimed at safe operation of equipment;
- A general culture of safety is fostered at the site - guidelines exist for regular meetings and incident review, inspections and monitoring;
- Safety meetings are held and documented for all staff at the beginning of each work assignment period;
- All site visitors/contractors must undergo mandatory safety orientation immediately upon site arrival;
- Medical equipment and trained personnel are on site 24 hours a day;
- Site and mobile communications are provided and maintained;
- Occupational health and safety standards are enforced for all personnel/contractors;
- Consumption of alcohol and 'recreational' drugs are not allowed on site. Employees are required to undergo 'fit for duty' drug testing prior to employment or after incidents if abuse is suspected;
- Traffic is controlled on mine access and site roads - radio control to prevent accidents;
- Communication and notification of hazardous materials transport to the site is in place through shipping/receiving department;
- There is no unauthorized access to the site permitted;
- Emergency and Spill Response Plan is in place and will be implemented if required, as necessary;

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- Transportation crews are instructed on traffic safety;
- Vehicles equipped for winter travel and carry emergency first aid kits;
- Concentrate haul from site to Skagway occurs only during daylight hours and drivers must meet specific experience and training criteria;
- All employees are eligible for Workers Compensation Health & Safety Board benefits;
- Monitoring and maintenance programs are in place to ensure facility and worker safety and equipment integrity;
- Project engineering designs have appropriate factors of safety, containment systems, and redundant systems to minimize accidents and malfunctions, in keeping with permit conditions and applicable regulations and codes;
- Site well potable water is filtered and treated by UV, with testing conducted semi-annually for potability;
- Grey and black water treated and disposed of in permitted, engineered in-ground septic systems;
- Public Health Act Camp Sanitation Regulations are adhered to; and
- MintoEx has agreed to install exhaust scrubbers on all mobile equipment used underground (pg. 4 of YOR document # 2010-0198-121-1) to minimize diesel particulate matter.

AQUATIC RESOURCES

- The new Water Management Plan for the site (largely unchanged for Phase IV) includes:
 - The completion of a conveyance network structure including features to reduce erosion and sediment transport, and reduce water velocity/energy within the network;
 - Commissioning of a new water treatment plant that can be optimized based on future treatment requirements;
 - A comprehensive monitoring and adaptive water management plan that guides effluent discharge decisions based on water quality surveillance in lower Minto Creek and licensed effluent discharge standards, including ammonia and likely nitrate, through timely feedback of rapid site monitoring of TSS and total copper concentrations;
 - The ability to selectively hold or release water from various sources based on quality;
 - The ability to test and release unaffected water while holding and treating affected water. This will allow the release of water in spring and summer to maintain

sufficient flows, and will reduce the need for later season releases of water, thereby more closely attaining a pre-disturbance flow regime in Minto Creek;

- Compliance with operational requirements of tailings and waste management plans for the Minto Mine;
- Annual biological monitoring and reporting programs for fisheries, benthos, stream sediment, and periphyton as proposed under the new Water Management Plan;
- Weekly effluent quality monitoring and reporting under Water Use Application QZ09-094, and the federal Metal Mining Effluent Regulations (MMER), monitoring of deleterious substances listed in Schedule 4 of the MMER;
- Monthly lethal toxicity testing of effluent using rainbow trout;
- Annual sub-lethal toxicity testing of effluent on fish, invertebrate, algae and aquatic plant species;
- Continuing the Environmental Effects Monitoring (EEM) program (currently in Phase II) under the MMER;
- Installation of temporary fish barrier and subsequent capture and re-location of fish at risk of being stranded;
- All fish sampling programs to be conducted under guidance of experienced fish biologist;
- Acid Base Accounting Test Program under the water use license in place with regular reporting requirements and %Cu monitoring of waste, which guides segregation and placement of waste materials in dumps and for construction purposes;
- A physical monitoring program and regular stability inspections by registered engineer and subsequent reporting in place for dam, diversions, and waste dumps;
- Contributions of funding for further research into the effects of copper on fish olfaction;
- Installation and maintenance of erosion and sediment control features as required to reduce sediment input to mine-area watercourses and conveyances;
- The implementation of a Spill Contingency Plan for the site if required; and
- Proper handling and storage of waste materials ensured through permitted waste management facilities including commercial dump, Land Treatment Facility for hydro-carbon contaminated soils, special waste storage area and waste incinerator.

ENVIRONMENTAL QUALITY

- The placement of new infrastructure will occur within existing disturbed / development areas wherever possible in an effort to reduce the amount of new vegetation clearing and general site disturbance required;

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- The disturbance footprint and associated vegetation clearing is to be limited in size to the extent necessary;
- Progressive reclamation will occur on-site wherever possible to begin site restoration processes and to minimize the production of fugitive dust;
- The fugitive dust management plan will be continued;
- Employees and visitors to site will adhere to speed limits in order to limit the production of fugitive dust;
- Wherever possible, vehicle use (including ATVs) will be restricted to roads and existing pathways so as to limit additional disturbance to ecosystems and plants;
- Wherever possible, vehicles entering and leaving the site will be clean (e.g., no large, obvious clods of mud), so as to limit the spread of invasive plant propagules;
- Exposed soil will be managed in such a manner as to discourage the production of fugitive dust and colonization by invasive plant species, e.g., covers, dust suppressants (water), temporary or permanent seeding of exposed soil;
- Reclamation plans will include provisions to limit access in order to reduce the exploitation of undisturbed lands in the vicinity of the mine site and reduce the potential and inadvertent spread of invasive plant species;
- Implement approved closure plan for the project identifying the re-establishment of a self-sustaining native vegetative cover as a reclamation objective;
- Recently approved Reclamation Overburden Dump will supply reclamation medium for revegetation activities during closure; part of the Adaptive Management Plan for reclamation medium supply; and
- Integration of Selkirk First Nation objectives for closure planning and site reclamation.

SOCIO-ECONOMIC

- Consumption of alcohol and 'recreational' drugs not allowed on site – individuals have been removed from site for infractions;
- 'Fit for Duty' drug testing required for all employees;
- Company works with SFN Drug & Alcohol department as appropriate to assist employees with substance abuse issues and reintegration into mine workforce;
- Well-paying, full time employment can improve self-esteem and reduces financial stress on family;
- The company offers a flexible approach to employee leave to accommodate cultural activities such as harvest and government gatherings;
- Skills developed in the course of mine employment are lifelong and transferable;

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- The company provides direct financial support for community athletics and recreation;
- The company works collaboratively with the community to identify issues and provide support through regular community update sessions;
- The project area is not visible from public roads, and therefore will not impact visual aesthetics from public areas;
- Waste streams are managed under permit conditions to reduce likelihood of community effects due to waste management, i.e. special waste storage and removal to permitted facilities, sewage management on site in in-ground systems;
- Closure Plan is approved by YG with SFN review for the Minto Mine, and is updated every 2 years. The proposed closure concepts for Phase IV will be expanded into more detailed plans and incorporated into this document revision when Phase IV development is authorized under the QML and WUL. The DDRP includes a Temporary Closure Plan. Revegetation is planned and implemented progressively using indigenous flora where native vegetation has been removed or destroyed;
- Natural revegetation of the roads and airstrip will be promoted to remediate visual effects of mine development disturbance;
- Training and transferable skills upgrading is provided directly by the company and contractors in the form of on-the-job training and apprenticeship programs, including to date:
 - Mill trainee program,
 - Big 5 training,
 - Rigging/hoisting,
 - Joint OH&S,
 - Zoom-Boom operations,
 - Barge Deckhand,
 - Ship's Master 60 Ton,
 - Fall Arrest Training,
 - Queens University Supervisory Training,
 - Ice Rescue Technician,
 - Surface Mine Rescue,
 - Mill Operator,
 - Youth-in-Mining,
 - Minto Rocks Program and
 - Darin Isaac Electrical Apprenticeship.

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

- Scholarships for advanced education have been established for SFN beneficiaries under the Cooperation Agreement;
- There is enhanced employment opportunity at the Minto site and other mining and industrial development projects through local training programs established partially through funding by MintoEx (Yukon Mine Training Association), particularly with respect to underground mining programs;
- Extension to mine life will provide an extended timeframe for these educational/training opportunities to be offered to more individuals, and the development of others;
- Cooperation Agreement already negotiated with local First Nations, has provisions for community/First Nation employment, all targets met to date;
- Preferential hire of local residents is to the benefit of the company and individuals, with local knowledge and decreased transportation costs;
- The Company provides an attractive wage and benefits package to employees to encourage longterm employment and reduce turnover;
- Company actively consults with the community, individuals, groups, and stakeholders for increased project awareness;
- In accordance with the established Cooperation Agreement, company utilizes local/SFN companies and individuals to provide services, with initial option to provide services presented to SFN Development Corporation. Many contracts have been established with more being planned;
- Local companies and contractors used to provide support services to MintoEx;
- Direct cash contributions to community development, projects proposed by SFN;
- Company consistently provides information on service/infrastructure requirements to enable local community to effectively plan;
- Company works with agencies and institutions currently providing services to provide support and to better serve community needs; and
- MintoEx has committed to participate in a tripartite working group with Selkirk First Nation and Yukon Government to develop a framework and then implement a plan related to understanding socio economic conditions within the Selkirk First Nation community, and the effects of Minto Mine on the community (YOR document # 2010-0198-137-1).

Appendix B LIST OF RELEVANT NON-DISCRETIONARY LEGISLATION APPLICABLE TO THE PROJECT

The following is a notation of the key legislation and associated sections that I believe are relevant to this project. These provisions help to ensure that significant adverse effects do not occur. Note that this list is not intended to be a comprehensive list of all the relevant legislation that applies to this project. Rather it is a reflection of the legislation that was discussed in this report. I have confidence that the proponent will adhere to this legislation, and I expect that the decision body and regulators will enforce the legislation.

Legislation	Key Provisions (by part or section number)
<i>Yukon Waters Act</i>	Sections A,B,C,D,L,G,H, I and M which respectively speak to Removal and Re-establishment of the vegetative mat, Erosion control and permafrost, Trenching, Roads, trails and off-road and trail use, Petroleum fuel and hazardous substances, Spills and spill contingency plans, Use of vehicle and Release of sediment.
<i>Occupational Health and Safety Act</i> and the associated <u>Occupational Health and Safety Regulations</u>	Part 2,6,8,10,14,15,16 which respectively speak to Confined Spaces, Mobile Equipment, Materials and Storage, Construction and Building Safety, Blasting, Surface and Underground Mines or Projects and Mine Shafts and Hoists.
<i>Public Health and Safety Act</i>	
<i>Yukon Historic Resources Act</i>	Sections 64 and 71, which discusses the destruction of historic objects or human remains and report of findings of historic resources
<u>Archaeological Site Regulation</u> (O.I.C. 2003-73)	Section 4, which discusses respecting historic resources
Selkirk and Little Salmon Carmacks First Nation Final Agreements	Chapter 13, Sections 13.3.0, 13.8.0 and 13.9.0 which respectively speak to Ownership and Management, Heritage Sites and Yukon First Nation Burial Sites.
<i>Explosives Act</i> and associated <u>Explosives Regulations</u>	

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

<i>Transportation of Dangerous Goods Act</i>	
<i>Quartz Mining Act</i> and the associated <u>Quartz Mining Land Use Regulations</u>	Schedule 1, Part M
<i>Environment Act</i> and the associated <u>Spill Regulations</u>	Sections 2 through 4 which speak to spills of substances
<i>Wildlife Act</i>	
<i>Fisheries Act</i>	
<i>Species at Risk Act</i>	

Appendix C LIST OF SUBMISSIONS MADE BY INTERESTED PERSONS AND OTHERS DURING THE ASSESSMENT

Name of Person or Party	Type of Submission	YOR Document Number	Date Submitted
Working Group	Comment	2010-0198-035-1	September 14, 2010
Working Group	Comment	2010-0198-036-1	September 14, 2010
YESAB	Information Request	2010-0198-037-1	September 14, 2010
YG EMR Minerals Resources	Comment	2010-0198-038-1	October 6, 2010
Selkirk RRC	Comment	2010-0198-039-1	October 6, 2010
Selkirk First Nation	Comment	2010-0198-043-1	October 7, 2010
B. Godin	Comment	2010-0198-044-1	October 7, 2010
P. Paslawski	Comment	2010-0198-045-1	October 7, 2010
B. Slater	Comment	2010-0198-046-1	October 7, 2010
YESAB	2 nd Information Request	2010-0198-047-1	October 8, 2010
Clearwater Consultants	Comment	2010-0198-054-1	November 17, 2010
SRK Consultants	Comment	2010-0198-055-1	November 17, 2010
Working Group	Comment	2010-0198-057-1	November 17, 2010

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

Environment Canada	Comment	2010-0198-058-1	November 26, 2010
Selkirk First Nation	Comment	2010-0198-060-1	November 26, 2010
YESAB	3 rd Information Request	2010-0198-061-1	November 26, 2010
Yukon WCB	Comment	2010-0198-112-1	December 22, 2010
YG Minerals Resources Community Services Environment Heritage Resources	Comment	2010-0198-113-1	December 22, 2010
Yukon Conservation Society	Comment	2010-0198-115-1	December 23, 2010
YG Water Resources	Comment	2010-0198-116-1	December 24, 2010
Environment Canada	Comment	2010-0198-119-1	December 24, 2010
Selkirk First Nation	Comment	2010-0198-120-1	December 29, 2010
Minto Explorations	Comment	2010-0198-121-1	January 7, 2011
Selkirk First Nation	Comment	2010-0198-122-1	January 7, 2011
YESAB	Note to File Teleconference with Minto Explorations	2010-0198-125-1	January 12, 2011
YESAB	Note to File WCB/YESAB meeting summary	2010-0198-126-1	January 12, 2011

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

YESAB	4 th Information Request	2010-0198-127-1	January 12, 2011
Minto Explorations	Comment	2010-0198-130-1	January 14, 2011
Minto Explorations	Comment	2010-0198-137-1	February 14, 2011

Appendix D REFERENCES

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg. With Updates.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada), 2009. Wildlife Species Search.

Available for download from:

http://www.cosewic.gc.ca/eng/sct1/index_e.cfm

GYWFM (Government of Yukon, Community Services, Protective Services Branch, Wildland Fire Management), 2010. Yukon Fire History GIS Coverage and Metadata.

Available for download from:

[http://www.geomaticsyukon.ca/Yukon%20Coperate%20Spatial%20Data%20%20page%202.html#Land and Natural Resources - Fire](http://www.geomaticsyukon.ca/Yukon%20Coperate%20Spatial%20Data%20%20page%202.html#Land_and_Natural_Resources_-_Fire)

HNP (Hallam Knight Piesold) Ltd., 1994. Minto Project, Initial Environmental Evaluation, Supporting Volume II, Environmental Setting. Prepared for Minto Explorations Ltd. May 1994.

Hood, S., Hickey, K., Colpron, M. and Mercer, B., 2009. High-grade hydrothermal copper-gold mineralization in foliated granitoids at the Minto mine, central Yukon. *In*: Yukon Exploration and Geology 2008, L.H. Weston, L.R. Blackburn and L.L. Lewis (eds.), Yukon Geological Survey, p. 137-146.

Magrum. 1994. An impact assessment of the Minto Project. Memo from the Selkirk First Nations to the Northern Affairs Program.

MDDEP (Ministère du Développement durable, de l'Environnement et des Parcs), 2009. Critères de qualité de l'eau de surface, Direction du suivi de l'état de l'environnement, ministère du Développement durable, de l'Environnement et des Parcs, Québec, ISBN 978-2-550-57559-7 (PDF), 506 p. et 16 annexes.

Nagpal, N.K.. 2003. Water Quality Ambient Water Quality Guidelines for Chloride. Overview Report. Ministry of Environment, Environmental Protection Division. Government of British Columbia.

Available for download from:

<http://www.env.gov.bc.ca/wat/wq/BCguidelines/chloride/chloride.html>

Oswald, E.T and Senyk, J.P., 1977. Ecoregions of Yukon Territory. Canadian Forestry Service and Environment Canada Report BC-X-164

U.S. EPA (United States Environmental Protection Agency), 2010. Particulate Matter.

Available for download from:

<http://www.epa.gov/particles/>

Mayo Designated Office Evaluation Report

Minto Mine Phase IV Expansion – 2010-0198

U.S. MRA (United States Mine Rescue Association. Mine Gases), 2010.

Available for download from:

<http://www.usmra.com/download/minegases.htm>

YG (Yukon Government), 2006. Yukon Mine Site Reclamation and Closure Policy for New Mines. Energy, Mines and Resources. Whitehorse YK