YESAB
Yukon Environmental and Socio-economic Assessment Board

Designated Office Evaluation Report

Whitehorse Copper Tailings Reprocessing and Reclamation

Project Assessment 2011-0064

Proponent: Eagle Industrial Minerals Corp.

Assessment Completion Date: June 15, 2012

Whitehorse Designated Office

Suite 203 309 Strickland Street

Whitehorse, YT Y1A 2J9

Tel: (867) 456–3200

Fax: (867) 456–3209

www.yesab.ca

EXECUTIVE SUMMARY

The proposed project consists of excavation and reprocessing of approximately 6 million cubic metres of tailings to recover iron-bearing magnetite from the former Whitehorse Copper mine site south of downtown Whitehorse. The activities are proposed to occur annually for up to eight months beginning in 2013. Project activities are expected to occur for approximately seven years, 24 hours per day between March and November. Magnetite will be extracted via magnetic separation and shipped to market via truck to the port in Skagway, Alaska.

The proposal includes placement of processed tailings into the existing open pit and adjacent subsidence areas as well as the 'Old Pond' area. The proposed reclamation includes permanently removing tailings from the 'A' and 'B' Valleys (covering about 21 ha) to allow natural re-vegetation. The project involves the ongoing management of tailings containment structures and the deconstruction of two large tailings dams at the head of the 'A' and 'B' Valleys. The reclamation objective is to create stable areas for industrial use, likely lay-down or storage areas. Approximately 23,000m^3/day of water is expected to be required for processing to be taken from the on site pit lake. Of this amount, the project expects approximately 220 m^3/day of make-up water will be required after recycling the process water. Prior to the use of the pit lake water in processing, pre-treatment of the pit lake is proposed via in-situ bioremediation.

Project activities have the potential to negatively impact the water quality via seepage water that may emanate from the processed and disposed tailings. Noise from 24-hour operation of heavy equipment and dust from working the tailings have the potential to negatively impact the health and quality of life of nearby residents as well as disturb wildlife. Traffic to and from the project site has the potential to disturb residents and increase public safety risk on local highways. There are also safety risks involving the ongoing management and deconstruction of the tailings dams and public access across the site.

Views and information on the project were submitted by numerous local residents, as well as the City of Whitehorse, Yukon Government, Yukon Conservation Society, Kwanlin Dun First Nation (KDFN), Ta'an Kwäch'än Council (TKC), and the Chief Medical Officer of Health, Yukon. Several valued components were identified: water quality, environmental quality, wildlife and wildlife habitat, noise, and public safety.

The Designated Office has determined that the project will have significant adverse effects on aspects of all of the above-mentioned valued components. The Designated Office believes that mitigations recommended in this report as well as those proposed by the proponent and compliance with the applicable existing non-discretionary legislation are considered adequate to eliminate, reduce or control the significant adverse effects of the project.

OUTCOME

The Whitehorse Designated Office, pursuant to section 56(1)(b) of the *Yukon Environmental and Socio-economic Assessment Act* (*YESAA*), recommends to the decision bodies that the project be allowed to proceed, subject to specified terms and conditions, as it has determined that the project

will have significant adverse environmental or socio-economic effects in or outside Yukon that can be mitigated by those terms and conditions.

THE TERMS AND CONDITIONS OF THE RECOMMENDATIONS ARE AS FOLLOWS

1. The Adaptive Management Plan (AMP) to be submitted as part of the Yukon Lease shall be updated to include the monitoring and mitigation measures proposed by the proponent in YOR Document 2011-0064-081 and any additional commitments made by the proponent since the AMP's initial submission to YESAB on July 6, 2011.
2. The AMP shall also contain measures to contain and treat groundwater contaminated by project activities if ongoing monitoring indicates levels of a contaminant, metal or parameter above the Yukon Contaminated Sites Regulation or Health Canada Drinking Water Quality Guidelines, whichever is more stringent, after considering any background contribution to the parameter concentrations in accordance with Yukon Environmental Programs Branch Protocol #10.
3. Any modification, addition or removal, of the recommended well installation locations or surface monitoring locations shall be done in accordance with the Water Use License. Any new monitoring wells or locations proposed shall have a monitoring baseline established prior to project operations.
4. The proponent shall report all spills as defined in section 132 of the *Environment Act* and ensure that all spills are assessed and remediated in accordance with the applicable non-discretionary legislation as well as the protocols and standards deemed appropriate by Yukon Environment, Environmental Programs Branch.
5. During site closure at the end of the project the proponent shall place a gravel cap to a minimum of 15cm in depth over all areas of tailings deposition, including the Old Pond, the Little Chief pit and the subsidence area. This shall be reflected in the site Reclamation Plan.
6. The proponent shall scarify and seed and/or replant the natural surface of the 'A' and 'B' Valleys as soon as possible after exposure of the original organic soil layer to minimize the likelihood of erosion. Seeding/replanting shall be done with plant species native to the Yukon.
7. Fill material from the tailings dam decommissioning if deposited on the valley bottoms should be covered with a layer of organic soil material and seeded / planted in order to minimize the likelihood of erosion. Seeding/replanting shall be done with plant species native to the Yukon.
8. The proponent shall make best efforts not to increase the disturbed footprint of the site.
9. The proponent shall ensure effective temporary and permanent erosion control measures are implemented on and adjacent to disturbed areas before, during and after undertaking the project activities to prevent the erosion of organic material and the entry of sediment into creeks, wetlands and other waterbodies.

10. To avoid disturbance to caribou during winter, no project activity should occur from December 1st to March 31st of each year.
11. If project activities are planned during the above noted dates, the proponent shall contact the Environment Yukon Southern Lakes Regional Biologist for advice on additional mitigation.
12. Waste shall be removed from the site to the Whitehorse landfill on a regular basis so as not to build up a source of odours that may attract wildlife to the site.
13. The proponent shall develop and implement a noise monitoring plan to determine baseline ambient noise levels that exist during their proposed operating season. The study shall encompass all hours and seasons of the year during which the project will operate at:
    - the project site,
    - at nearby residences on Squatter's Road, Mt. Sima Road and Canyon Crescent.

    The results of the monitoring shall be provided to the Whitehorse Designated Office.
14. The proponent shall monitor noise levels from project activities during construction and operation, including the shipping of magnetite along the Mt Sima Road. This shall encompass all hours of the day and all seasons of the year during which the project proposes to operate. The monitoring report shall be provided to the Whitehorse Designated Office.
15. If monitoring results show that noise levels at the lease property line exceed 40dBA or the baseline ambient noise level for that time of day and season-whichever is higher of the two values during overnight hours (11 o'clock pm to 7 o'clock am), the proponent shall limit the operation of heavy equipment and other noise-generating activities as necessary to reduce noise levels at the property line from any aspect of ongoing project activities to 40dBA or the baseline ambient noise level for that time of day and season.
16. If monitoring results show that project-related haul truck traffic on the Mt. Sima Road during overnight hours (11 o'clock pm to 7 o'clock am) is found to exceed 40dBA or the baseline ambient noise levels at existing residences on the road, project-related haul truck traffic shall be restricted to take place between the hours of 7 o'clock am and 11 o'clock pm.
17. Temporary work including road improvements and dam decommissioning or any other work at higher elevations within the project site involving heavy equipment shall only take place between the hours of 7 o'clock am and 11 o'clock PM.
18. Trucks hauling magnetite to Skagway or returning from Skagway shall refrain from using engine retarding brakes on the Mt. Sima Road or within 1km of residences along the Alaska or Klondike Highways.
19. The proponent shall, in addition to signage, implement appropriate traffic control measures to prevent all terrain and off-road vehicle access to the site during project activities.
20. The proponent shall work with local residents to identify trails through the project area and assist in providing alternate continued access to recreational values such as the Copper Haul Road TransCanada Trail by way of establishing a perimeter trail. This will reduce the

likelihood of local residents accessing the project area for recreational purposes and exposing themselves to safety risks on site.

21. The proponent shall be required to stabilize or enhance the dam structures and ensure they meet current Canadian Dam Association guidelines. This includes containment structures in both in the Old Pond area and modifications to A and B valley dams.
22. An appropriately engineered and stamped deconstruction plan shall be developed for the A and B Valley tailings dams.
23. The A and B Valley dams shall be breached down to streambed or natural elevation upon deconstruction.
24. Security provided for reclamation under the applicable provisions of the *Quartz Mining Act* shall be adequate to reclaim the site in the event of unexpected closure. Development of security shall include consideration of managing the A and B Valley dams if all or part of the tailings have been removed when the unexpected closure occurs.

Issued by the Whitehorse Designated Office on June 15, 2012.

For more information please contact:

Sean Cox, Assessment Officer

Tel: (867) 456–3200

Email: Whitehorse.do@yesab.ca

Table of Contents

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

Eagle Industrial Minerals Corp. (EIMC) is the project proponent. Contact information for EIMC is available in the project proposal[1]. EIMC currently has three magnetite extraction projects in development in southeast Alaska, on Vancouver Island and the proposed project. EIMC is wholly owned by Mr. Charles E. Eaton.

1.2 GEOGRAPHICAL CONTEXT

The proposed project consists of an approximately 246 hectare leased parcel of land located within the municipal boundaries of the City of Whitehorse (Figure 1). Table 1 provides further details of the project location and surroundings.

<table>
<tr><td>NW Boundary:
496447 E
6724641 N</td><td>NE Boundary:
497433 E
6724114 N</td><td rowspan="2">Watershed(s) and Drainage Region:
Major Drainage Area: Yukon River
Sub-Sub Drainage: Headwater Yukon
Sub Drainage Area: Lake Laberge</td></tr>
<tr><td>SW Boundary:
496232 E
6722940 N</td><td>SE Boundary:
497326 E
6722196 N</td></tr>
<tr><td colspan="2">First Nation Traditional Territories Involved:
Ta’an Kwäch’än
Kwanlin Dün</td><td>Nearby Watercourse or Waterbody:
Yukon River</td></tr>
</table>

Table 1. Project location.

[1] YOR Document # 2011-0064-001

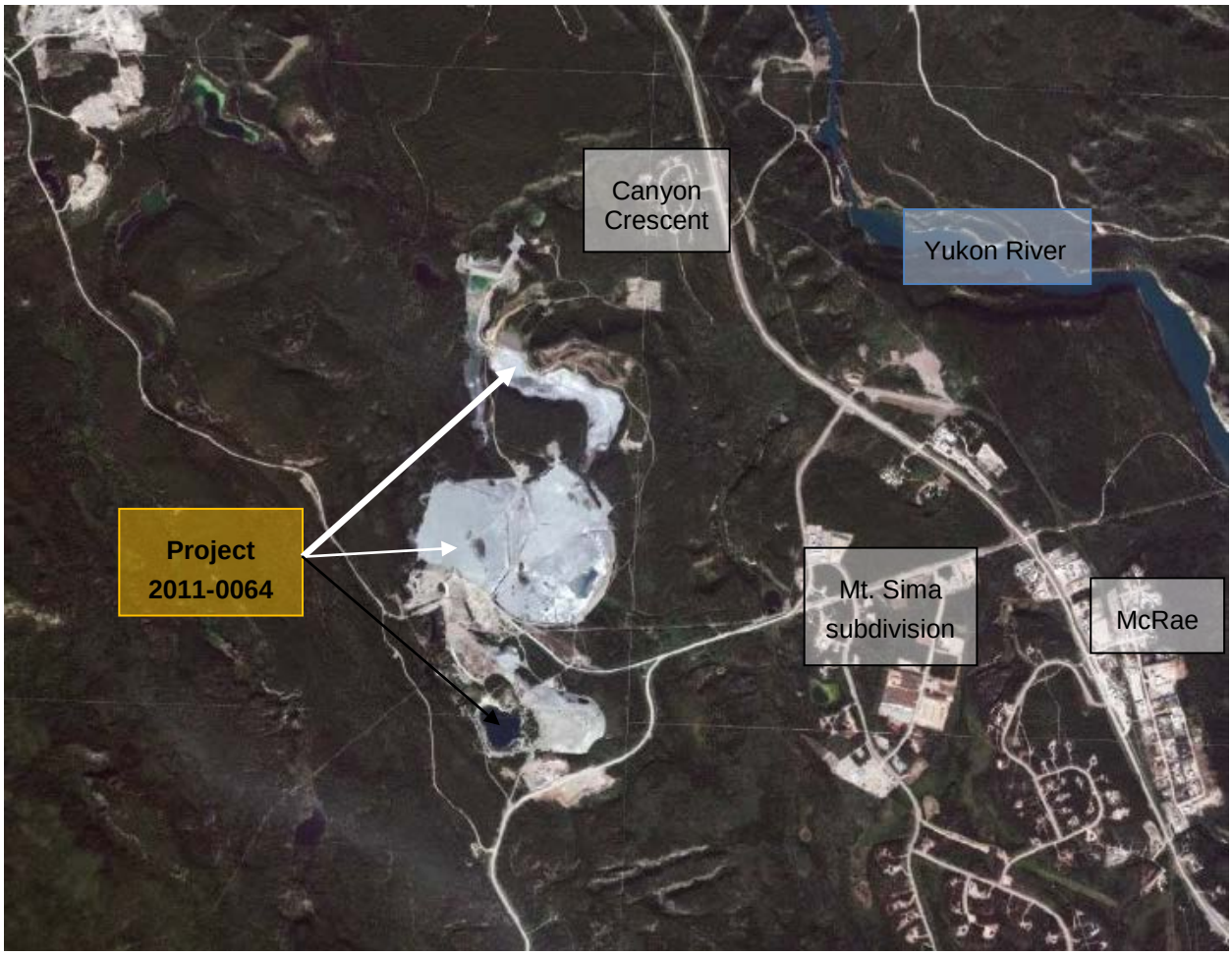

Figure 1. Whitehorse Copper area overview.

1.3 HISTORY OF PROJECT

Copper was discovered in the hills west of Whitehorse during the Klondike Gold Rush with the first claims staked in 1898. Numerous copper mines were in operation by the turn of the 20th century. Ore was hauled to port in Skagway, Alaska via the White Pass and Yukon Route Railway which was completed to Whitehorse in 1909. Mining and ore shipments were active up until 1920. After World War II and through to the 1980s a second wave of copper mining occurred in the Whitehorse area as a result of new exploration techniques. New mines were opened and several old mines were re-developed[2].

The historic Little Chief and Middle Chief deposits at the project site were staked in the late 1800s but were not fully developed until the late 1960s because the deposits were low grade. New Imperial Mines

[2] YOR Document # 2011-0064-003

constructed a mill at the site in 1966 and open-pit mining followed quickly thereafter. Milling and mining was suspended in 1971 due to a shortage of ore and the company was reformed in 1972 as Whitehorse Copper Mines. The company commenced underground mining in 1973 until the ore at the Little Chief underground mine was depleted in December 1982[3]. During mine operations, tailings were deposited in what are now known as the Old Pond impoundment and the 'A' and 'B' Valley areas. Decommissioning activities took place between the early 1980s through to the early 1990s and the site has been inactive since that time.

1.4 PROJECT DETAILS

The proponent proposes to reclaim and reprocess the tailings at the Whitehorse Copper site in order to extract commercially viable quantities of magnetite (Fe_3O_4) remaining in the tailings for use in the production of iron ore. The extracted magnetite will be trucked to port in Skagway, Alaska for sale overseas, likely to the Asian market. The proponent also proposes that as a result of their activities the site will be partially rehabilitated to green space and partially made into limited use industrial land suitable for supply laydown or vehicle parking but not building structures, at least in areas of tailings deposition.

The proponent submitted a document titled *Project Description: Whitehorse Copper Tailings and Reprocessing & Reclamation Project*[4] that provides details on the proposed project. The following section provides a summary of the project details included in the project proposal document and supplements the project details with responses to information requests provided during the assessment. Figure 2 provides a site overview that shows the various key locations discussed in the sections that follow.

[3] Gadsby, 1992
[4] YOR Document # 2011-0064-003

Figure 2. Whitehorse Copper Site Overview.

SITE PREPARATION

Several activities are proposed to occur before tailings reprocessing will commence, including:

- Construction of a tailings processing plant on the former plant site foundation;
- Construction of a perimeter road around the pit and subsidence area. Portions of this road exist and 200m of new sections are intended on the west side of the subsidence area. This road will be raised up to 8m in height to contain reprocessed tailings when deposited (Figure 3)
- Upgrading of the intersection at Mt. Sima road is proposed to enhance safety and visibility for traffic; and

- Construction of a new trail for recreational snowmobilers to bypass the project site.

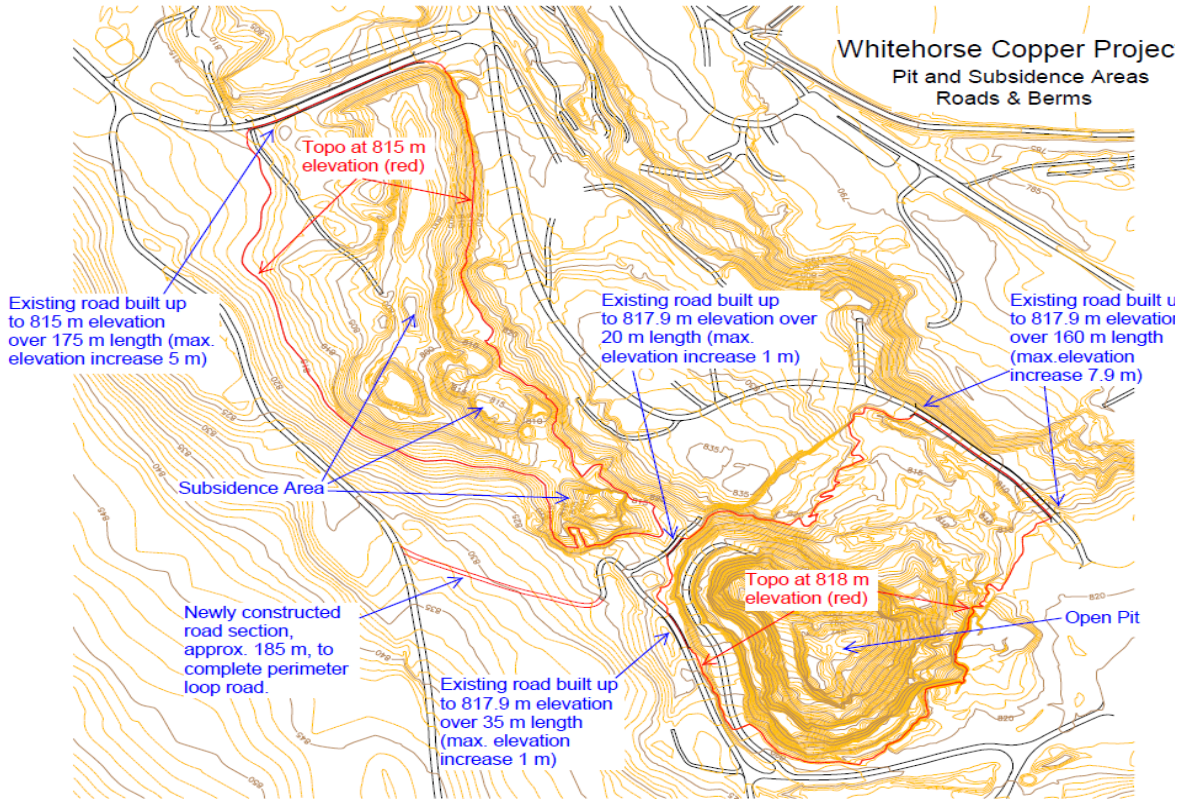

Figure 3. Whitehorse Copper Pit and Subsidence Areas Roads & Berms

EXCAVATION

The project proposes to excavate approximately 6.08 million cubic meters (9.1 million metric tons) of tailings from the 'Old Pond' area in years 2 through 4, followed by excavation of tailings in the 'A' and 'B' Valleys during years 5 through 7. The annual excavation volume is expected to be approximately 1 million m^3 per year. Equipment proposed to be used includes front-end loaders or excavators. Initially, while distances from the tailings to the plant are short, 35-ton off-road haul trucks will be loaded by excavator and deposit tailings into a stockpile at the plant site. As distances increase, field conveyors may be utilized instead of haul trucks. At the longest distances and when higher-moisture content tailings are encountered deeper in the deposits, the proponent plans to employ a slurry pipeline to transport the tailings to the plant. In the higher moisture content tailings, hydraulic excavation using process water pumped from the plant may be used. This would involve spraying process water on tailings to create an in-situ slurry that would then be pumped directly to the processing plant via pipeline. Transported tailings will be placed into a feed stockpile or into a slurry surge tank adjacent to the processing plant.

PROCESSING

In the early stages of operation, a front-end loader will reclaim tailings from the feed stockpile and load them into a hopper to which water will be added to produce a slurry. When the slurry pipeline is in place to handle the more distant tailings, the associated slurry equipment will be relocated from the plant site to the field (see previous section).

Water is proposed to be sourced from the following sources: Little Chief Pit lake, existing wells drilled into underground workings, a decant pond at the 'Old Pond' area and from seeps when activities are occurring nearby. Approximately 23,000 m^3/day of water is expected to be required for processing. Of this amount, the project expects approximately 220 m^3/day of make-up water will be required after recycling the process water.

Pit lake water will be pre-treated with 120ppm of organic carbon which will be added along with up to 150,000 litres of molasses and/or alcohol. All additives will be food grade and added either by broadcast or through a temporary pipeline with an outlet floating at the centre of the lake. This is intended to create reducing conditions and to precipitate metals including arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, tin, uranium and zinc to a solid phase to reduce water quality concerns.[5]

The slurry will be pumped into three successive stages of rotating magnetic drums that will cause the magnetic particles to adhere to the drum while the non-magnetic particles are washed away. Recovery of 700,000 m^3 (1.7 million metric tons) of magnetite (Fe_3O_4) is expected by magnetic separation from tailings. Coarse-grained magnetite particles (>116 microns) are proposed to be removed as these have a lower than economic grade. The final proposed processing step before shipment consists of dewatering the magnetite to reduce weight for transport via filtering.

DEPOSITION

Following processing and removal of commercial magnetite, there will be approximately 5,380,000 m^3 of tailings remaining. The proponent has proposed to manage the deposition and reclamation of the site as follows:

- 2.9 million cubic meters of tailings are proposed to be deposited as a slurry into the 'Old Pond' area. This represents 53% of the processed tailings. The area will be divided into 6 cells that will allow both excavation and deposition to occur simultaneously. If required, existing dams and diversions within the 'Old Pond' area will be stabilized. The surface of tailings will be covered with 15 cm deep layer of gravel (or waste rock) to limit the future dust generation and create a surface suitable for light industrial usage (such as equipment storage or parking).

[5] YOR Document # 2011-0064-029-1

- 2.5 million cubic meters of tailings are proposed to be deposited into the open pit and subsidence areas. Deposition is proposed to occur by pumping tailings as a slurry from the processing plant. The proponent proposes to direct placement of tailings to fill subsidences first, followed by the open pit. Tailings are proposed to be sloped at a grade of 2% from the pit to the north end of the subsidences, so that the final topography has the tailings in the open pit at a higher elevation than in the subsidences.

- Coarse magnetite bearing tailings (>116 microns) separated during processing, estimated at about 200,000 tonnes, are proposed to be temporarily stockpiled near the plant site. These may be re-ground to be sold as a separate product at a later date if economic conditions allow. If this oversize material is not removed from site, it will be returned to the tailings stream so a sizable stockpile of material will not build up.

- No tailings would be deposited back into the 'A' and 'B' Valleys to allow for natural re-vegetation. The tailings dams in the 'A' and 'B' Valleys are proposed to be decommissioned to limit water storage by cutting a V-shaped notch into each dam. The notch removed from the 'A' dam will be 80m wide and 28m in depth while the removal from the 'B' dam will be 55m wide and 18m in depth. Tailings are proposed to be removed down to natural surface but the dams are not. The material removed from the dams may be placed above/below the dams along the valley sides, used for creation of a spillway for erosion control, or possibly used for construction aggregate or surface treatment.

RECLAMATION

The basic reclamation plan proposed involves five objectives and the plan is intended to allow the proponent to meet as many of the objectives as possible within the bounds of technical and economic feasibility. These objectives were drawn largely from the City of Whitehorse Official Community Plan which has zoned the 'Old Pond' area of the site to be an industrial area, the 'A' and 'B" Valleys to be green space and the area in between to be "future planning space"[6]. The objectives of the proponent's reclamation plan are:

1. Convert the 'Old Pond' area to usable industrial land;
2. Eliminate dust;
3. Enhance public safety;
4. Increase green space and wildlife habitat; and
5. Improve aesthetics.

To accomplish these objectives, the proponent has proposed to remove and process approximately 6.08 million cubic meters of existing tailings and anticipates re-depositing just over 5 million cubic meters of processed tailings in the Little Chief Pit and adjacent subsidence area (2,400,000 m^3) and the remainder

[6] City of Whitehorse, 2010

in the 'Old Pond' area (2,900,000 m^3). By doing this, the 'A' and 'B' Valleys will be left empty of tailings and allowed to re-vegetate and the fissures, high walls and other safety risks in the area of the Little Chief Pit and subsidence areas will be filled in, reducing public safety risk in those areas.

The remaining tailings will be placed in the 'Old Pond' area, the total volume of which will be 17% less than the current volume. The proponent expects that strategic placement of tailings within this area will allow them to maximize areas of original ground. Once the tailings in the 'Old Pond' have dried sufficiently to allow vehicle traffic (estimated by the proponent at one year depending on moisture content), the surface will be covered with a 15cm deep gravel layer. The proponent expects that this gravel surface will be adequate for light industrial uses such as the parking of vehicles and storage of equipment or materials such as pipe, but will not be sufficiently robust to permit the construction of buildings.

Reclamation of the 'A' and 'B' Valleys is proposed to consist of removing tailings down to original ground and decommissioning the tailings dams to ensure that water will not accumulate behind them. The proponent has indicated that they intend to scarify the ground and allow it to re-vegetate without seeding.

The project proposal also discussed reclamation alternatives that focused on improving the usability of the 'Old Pond' area for more varied industrial uses than equipment storage and vehicle parking. These alternatives include reducing the moisture content of tailings via filtering and/or adding rock to the tailings to produce an engineered fill. The creation of a gravel layer on the tailings placed in the Little Chief Pit and subsidence areas to prevent dusting or a re-vegetated surface was also discussed as an alternative. According to the proponent, these alternatives do not form part of the project activities unless other stakeholders are willing to provide sufficient funds to implement them.

TRANSPORT OF ORE

It is proposed that the recovered magnetite concentrate will be trucked via 50-ton truck and trailer combinations to the port of Skagway, Alaska, located 165km south of Whitehorse via the Klondike Highway. It is anticipated that a round-trip will take each truck four to five hours, resulting in two trips per day per truck. The proponent anticipates utilizing 15 trucks for a total of 30 trips per day during the season of the operation, or approximately 1 truck every 48 minutes. Access to the Alaska and Klondike Highways from the project site will be via the Mt. Sima Road.

RAIL SHIPMENT OPTION

The proponent has discussed the possibility of moving ore via the White Pass and Yukon Route railway which currently operates between Carcross YT and Skagway. This was not included by the Designated Office as a component of the project scope as information provided in the project proposal indicated that this option was unlikely to proceed due to:

> "*the railway no longer having the right equipment (cars and power) for such service, so resuming ore hauling services would be expensive... a considerable amount of money would have to be spent to rehabilitate the existing tracks to enable freight movements."*[7]

Prior to 1982 the railway carried mineral concentrates from Whitehorse to Skagway, however with the closure of Whitehorse Copper and the Faro Mine this service ceased. The tracks between Carcross and Whitehorse have been partially abandoned, although still under the control of the White Pass and Yukon Route Railway, while the tracks from Carcross to Skagway operate as a tourist route only. According to the proponent:

> "*If the ore were loaded into intermodal containers in Whitehorse, and the containers hauled by truck to Carcross, there might be some cost savings with this short rail haul, and the large capital cost of rehabilitating the tracks might not be required. The railroad has recently publically expressed interest in resuming freight traffic, but has set no specific timetable."*[8]

If the railway option becomes a reality it would serve to reduce or eliminate the public safety effects on the South Klondike Highway from heavy truck traffic associated with this project and other projects. This, along with reactivation of the tracks to Whitehorse has been the subject of some public attention,[9] as has been a report produced regarding the operation and cost analysis by PROLOG Project Logistics Yukon commissioned by the Yukon Government Department of Economic Development.

The rail operation and cost analysis report finds that "*WPYR has capacity to reintegrate freight with passenger operations and that there are viable options for which current financial success is not at risk*."[10] And for the proponent, "*rail operating costs offer a substantial savings below truck costs, with 20% savings via Carcross and over 50% savings via Whitehorse.*" [11] While these cost estimates do include new equipment investment, "*track investment, either for Carcross-Whitehorse reconstruction or for Skagway Ore Dock development, is specifically excluded from the terms of reference for this report*."[12]

The report notes that the volume of material and short life of the proposed project does not warrant investment in new track infrastructure, despite the cost savings to the proponent by shipping via rail from Whitehorse. "*However, pre-building the WPYR to Whitehorse to realize early revenues from Eagle Minerals would strategically position WPYR to dove tail into larger and longer project requirements."*[13]

The report goes on to state:

> "*Eagle Minerals traffic provides a window of opportunity, before an impending influx of Yukon mine supply and export activity, to:*
>
> - *Cover WPYR freight rail restart costs via Carcross without any new track investment;*

[7] YOR Document 2011-0064-002 p. 34
[8] YOR Document 2011-0064-002 p. 28
[9] Whitehorse Star '*Plan could encourage railway's return to the city*' June 6, 2012.
[10] YOR Document 2011-0064-108 p.3
[11] YOR Document 2011-0064-108 p.2
[12] YOR Document 2011-0064-108 p.7
[13] YOR Document 2011-0064-108 p.9

- *Demonstrate whether WPYR is an attractive alternative to parallel highway hauls; and*
- *Evaluate actual public benefits vs. WPYR costs prior to taking additional investment decisions.*

The Eagle Minerals traffic is opportune for WPYR because it minimizes freight rail restart risks with:

- *An operating season that misses the worst winter weather;*
- *A level of traffic that is high enough to support freight rail operations; but*
- *A level of traffic that is low enough to avoid interference with passenger rail operations."*[14]

In correspondence to the Designated Office, the proponent has noted that some of the original assumptions in the report were not correct, further analysis was necessary and that it was unclear what parties might provide the required capital. Although hopeful for the rail option, the proponent is assuming truck haul for the entire distance.

If the option of freight transport by the White Pass and Yukon Route Railway does proceed it may be subject to assessment by YESAB as provided under the *Yukon Environmental and Socio-economic Assessment Act* (YESAA) Assessable Activities, Exceptions and Executive Committee Projects Regulations.

1.5 PROJECT SCOPE

The proposed project consists of excavation and reprocessing of approximately 6 million cubic metres of tailings to recover the iron-bearing magnetite from the former Whitehorse Copper mine site. The proposal includes placement of processed tailings into the existing open pit and adjacent subsidence areas as well as returning them to the 'Old Pond' area. The proposed reclamation includes permanently removing tailings from the 'A' and 'B' Valleys to allow natural re-vegetation. Tailings are proposed to be returned to the 'Old Pond' area with the objective to create areas for industrial use. Approximately 23,000 m^3/day of water is expected to be required for processing. Of this amount, the project expects approximately 220 m^3/day of make-up water will be required after recycling the process water. Prior to use in processing, pre-treatment of the pit lake water is proposed via in-situ bioremediation. The project is located approximately 13 km southwest of downtown Whitehorse within the municipal boundaries. Access to the project area is by Mt. Sima Road. The activities are proposed to occur annually for up to eight months per year beginning in 2012. Project activities are expected to occur for approximately seven years and are considered to occur between March and November, annually.

Project activities include:

[14] YOR Document 2011-0064-108 p. 10

- Access construction, road upgrades and trail by-pass construction;
- Pit Lake water treatment for use as process water via in-situ bioremediation of metals;
- Construction of processing plant on an existing foundation;
- Use of excavators, front-end loaders and hydraulic means for excavation of tailings;
- Quarrying, stockpiling, screening and transportation of tailings;
- Processing of tailings by magnetic separation;
- Truck transport of processed magnetite on the South Klondike highway enroute to Skagway, Alaska;
- Deposition of processed tailings into 'Old Pond', Little Chief Open pit and adjacent subsidences;
- Decommissioning of 'A' and 'B' Valley Dams;
- Waste management; and
- Fuel use and storage.

2.0 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

2.1 BIO-PHYSICAL ENVIRONMENT

The project area is on the south-western periphery of the City of Whitehorse. Immediately to the west of the site is the undeveloped Mount McIntyre / Golden Horn Mountain uplands, and the only contiguous green space on the west side of the Yukon River through the Whitehorse area (Figure 4).

The proposed project site is a former mine predominantly covered in processed tailings and waste rock. There are five main project areas, including: the Little Chief Open Pit, Subsidence area (former underground workings), Old Pond, 'A' Valley and 'B' Valley (see Figure 2). The Old Pond and 'A' and 'B' Valley contain tailings from the former mine processing, while the Little Chief Open Pit contains a pit lake filled from groundwater that is hydrologically connected to the former underground mine workings as a result of collapses.

The tailings deposition areas currently do not support significant vegetation as the tailings are alkaline and consist of crushed rock with minimal organic soil. Vegetation in areas immediately adjacent to the tailings areas are diverse and include pine forest in dry areas and riparian willow stands in low-lying moist areas.

While the Whitehorse Copper site itself holds limited value as wildlife habitat due to lack of vegetation, wildlife are known to transit through and around the area. Wildlife most likely to utilize the project location and immediate area are the normal assortment of species that co-exist with humans including bears, moose, deer, foxes, small mammals and both migratory and resident birds. According to the report done by Environmental Dynamics Inc (EDI) the presence of moose, mule deer, black bear, coyote and wood frogs have all been confirmed within the project area[15].

Woodland Caribou have also been observed around the project site during winter. The Southern Lakes caribou herd suffers from low numbers as a result of historic hunting pressure dating from the Klondike Gold Rush and the influx of development following the construction of the Alaska Highway. Protection of winter range has been identified as a key component of the protection and recovery of the caribou population in the southern Yukon[16].

The project is located within 2km of Wildlife Key Areas for Golden Eagle and Gyrfalcon reproduction during the summer season. These are upland habitat areas around Golden Horn Mountain and are of substantially higher elevation and different habitat composition than the undisturbed areas immediately adjacent to the project area.

The site decommissioning report and a fisheries assessment conducted during the summer of 2010 found that the three water bodies on site did not contain fish. The closest downstream fish-bearing watercourse is the Yukon River[17].

Figure 4. Aerial photograph of the area surrounding the proposed project indicating nearby areas of forest connectivity.

[15] YOR Document 2011-0064-003
[16] Florkiewicz et. al., 2006
[17] YOR Document 2011-0064-003

HYDROGEOLOGY

Relevant information from a variety of sources has been combined to develop a conceptual hydro-geological model for the project site. Project submission documents #2011-0064-038, -081 and -082 developed by Access Consulting Group provide detailed background and references for this section of the report. These hydrogeological models underwent review by SLR Consulting on behalf of Environment Yukon to refine the site conceptual model, model assumptions and potential risks to groundwater. Environment Yukon indicated in their last comment submission that "*the latest information provided by the proponent* [YOR Documents #2011-0064-081 and -082] *includes the provision of an appropriate analytical model, filling a large data gap."* Project activities will not change the existing underlying hydrogeological conditions of the site. Thus, flow pathways for potential contaminants of concern will not change between current, operational and closure conditions of the site.

Currently, tailings are stored in the A and B Valleys and the Old Pond area (shown in Figure 2). Once the proposed project is completed, all reprocessed tailings will be stored in the Little Chief open pit lake and subsidence area as well as in the Old Pond; the A and B Valleys will be restored to semi-natural conditions with no remaining tailings and decommissioned dams. As a result of this site reconfiguration, the geology and resulting groundwater flows from the pit lake, subsidence areas, and Old Pond are the primary determinants of downgradient impacts to groundwater quality from project activities. The removal of tailings from the A and B Valleys will remove any potential source of leachate and reduce the hydraulic head of these areas. Given that groundwater flows from areas of high to low hydraulic head, a reduction of hydraulic head at the A and B Valleys will likely reduce any downgradient flows from these areas.

Figure 5 provides a visual summary of the project site hydrogeology. There are three defined drainages within the project area which have been labelled as A, B and C in Figure 5. Figure 5 also shows the pathways of the conceptual geologic cross-sections of each of the three drainages. These cross-sections can be found in YOR Document #2011-0064-038 in Figures 2 through 4.

Three dominant bedrock geologies have been mapped in the project area (Figure 5) and include the Triassic Aksala Formation metasediments, Cretaceous age Whitehorse Batholith Granodiorite and the Tertiary age Miles Canyon Basalt. Bedrock geologic mapping indicates that the Little Chief Pit, the underground workings and subsidence area, and much of the west side of the project area are all underlain by metasediments of the Aksala Formation[18]. It is has been assumed that the Aksala Formation extends to at least the depth of the underground workings, 380 m below grade (mbg). As seen in Figure 5, the granodiorite extends from the mine area east towards the Yukon River and extensively underlies the tailings storage areas to the north and also contains the Little Chief pit. Overburden in this area is relatively thin. The Miles Canyon Basalt, reported to be greater than 30 m thick at its western boundary and over 120 m thick adjacent to the Yukon River,[19] extends from the Yukon River to about midway between the river and the mine area (Figure 5).

[18] 2011-0064-038
[19] Pearson et al., 2000

In general, groundwater is present in thin overburden sediments which thicken towards the east of the site and also in bedrock comprised of granodiorite with minor limestone in the west and more fractured basalt away from the project area to the east. Historic and recent water well drilling indicate that the basalt aquifer is the primary source of groundwater downgradient of the project site.[20]

Groundwater in the granodiorite and limestone bedrock in the project area is likely recharged from upgradient topography while downgradient basalt is likely locally recharged, especially in the C drainage area due to the thin soils and low permeability of upland recharge areas. Very little, if any, recharge to the bedrock groundwater system is occurring at the site due to the dry climate and minimal run-off during the spring melt. [21]

[20] 2011-0064-038
[21] 2011-0064-038

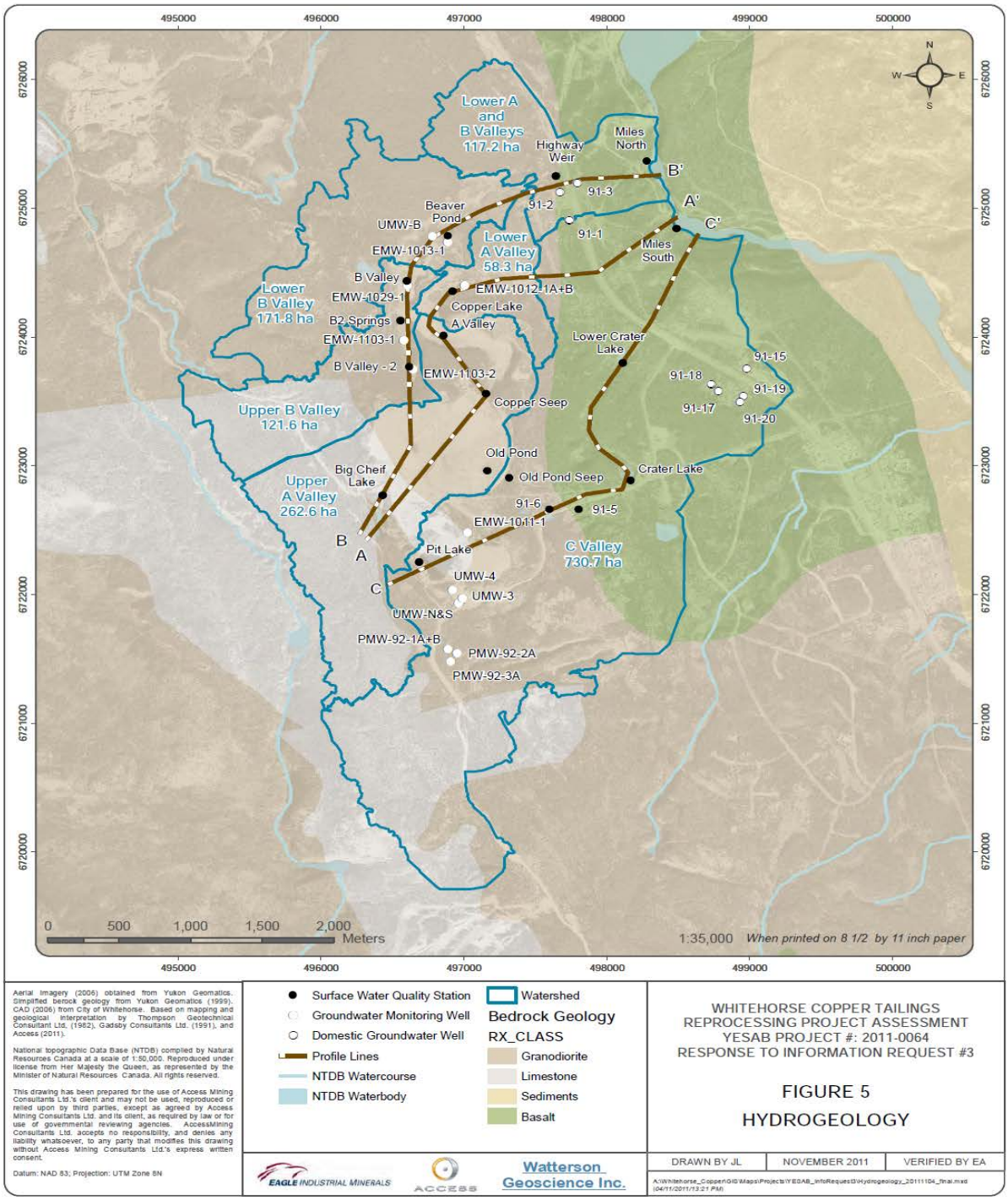

Figure 5. Hydrogeology of the project site from YOR Document 2011-0064-038

Due to the large difference in aquifer hydraulic conductivities between overburden and bedrock, most groundwater flow in and downgradient of the project area occurs through overburden sediments with only minor flows through underlying bedrock. Groundwater flow generally follows surface topography with flow to the east and eventually discharges into the Yukon River. [22]

While a thin water table has been observed in the tailings themselves, infiltration is not thought to be significant through the tailings because of the low hydraulic conductivity of the material. According to field observations, water ponding on all three tailings repositories during the spring, summer and fall seasons indicates that permeability is likely below estimated values. It is also likely that the permeability of deeper tailings has been reduced by settlement and in-situ compaction.[23] In addition, historic geotechnical exploration and more recent drilling conducted in 2011 indicates that the tailings storage areas were constructed above impermeable clay, colluviums and glacial till sediments. These impermeable sediments will reduce vertical infiltration into underlying bedrock and limit downgradient groundwater migration into the overburden aquifer.[24]

The overburden flow pathway starts at the toe of the A and B Valley dams where a thin overburden aquifer extends to the Yukon River. Water quality samples from monitoring wells located immediately below these two dams, suggest that a negligible amount of tailing seepage is introduced to these aquifers under present conditions. In addition, the A and B dams were constructed using impermeable materials, which serve to restrict downgradient flow of seepage through or beneath these dams.[25]

The shortest groundwater pathway to the overburden aquifer extends from the base of the B Valley dam to the Yukon River, downgradient of the existing tailings storage. Modelling of contaminant transport in this pathway[26] has indicated that contaminant travel times in groundwater range from 5 years to the nearest potential receptor and will reach "*the nearest existing groundwater well before 10 years and the Yukon River in less than 20 years*."[27] However, modelling also shows that contaminant levels would have to be several times higher than existing maximum allowable standards at the input source of the overburden flow pathway (B Valley dam) in order to register an exceedance of drinking water standards at the nearest downgradient receptor (refer to the section on water quality below).

The Old Pond area completely overlies the granodiorite unit. Because infiltration will occur downward over a large vertical surface area, this seepage is likely to report to shallower bedrock groundwater[28]. The low granodiorite permeability and limited fracture network results in very little groundwater flow from the project area bedrock contributing to downgradient underwater resources.[29] Water level differences observed in nearby wells (~100m apart) completed in the granodiorite support the overall conceptual model that the granodiorite fracture network is limited in extent and connectivity[30], as does the

[22] 2011-0064-081
[23] 2011-0064-081
[24] 2011-0064-038
25 2011-0064-081
26 See Figure 3 in YOR Document 2011-0064-081
27 2011-0064-081 p.11
[28] 2011-0064-018
29 2011-0064-038
[30] 2011-0064-018

observation that few wells completed in this unit produce significant amounts of water.[31] The Old Pond dams were constructed with a sand and gravel under-drain that was designed to allow potential water build-up behind the dams to flow downgradient. A small amount of seepage occurs at the Copper Seep on the eastern boundary of the Old Pond where this dam forms the upgradient boundary of the A-Valley repository.

The Little Chief open pit and underground mine workings are also contained within the granodiorite, underlain by the Askala Formation as described above. It is proposed that these areas will be filled with reprocessed tailings during project activities. All groundwater originating from the Little Chief pit must first flow through the granodiorite to reach the more permeable basalt located downgradient to the east. Upon decommissioning of the mine and the end of dewatering in the 1980s, the underground mine workings gradually filled with infiltrated surface water or groundwater. It is understood that recharge of the underground workings occurred between 1982 and at least 1995, taking approximately 13 years. Once the underground workings were filled, the underground water proceeded to fill the Little Chief pit between 1995 and 2002, with a small portion of surface run-off between 1982 and 1995, creating the present day pit lake.

The downgradient groundwater seepage velocity from the existing mine workings towards lower topography through the granodiorite is estimated at approximately 102 m/year. This compares to groundwater velocity estimates of 229 m/year for the basalt areas further to the east. The mean seepage velocity through both units is estimated at 34.5m/year.[32]

Modelling and research has indicated that natural attenuation processes including adsorption and biodegradation take place within the bedrock groundwater in and around the project area which serves to reduce metal loadings downgradient.[33] These processes are discussed further in the water quality section below.

GEOCHEMISTRY OF MINED MATERIAL

The proposed project site is predominantly processed tailings and waste rock. There are five main project areas, including the Old Pond, A and B Valley areas which contain tailings and the Little Chief Open pit and underground workings / subsidence area into which the proponent proposes to deposit reprocessed tailings (along with the Old Pond).

The existing tailings range from 3 to 9 m thick, with the thickest deposits being in the 'B' Valley area. Average tailing thickness is approximately 9.2m for all three areas. A geochemical characterization program was conducted on samples of the tailings using a composite of samples taken in March, April and August of 2010. Based on their review of the results Access concluded that acidic drainage is not a

[31] 2011-0064-081
32 2011-0064-081
[33] 2011-0064-081

concern for the project,[34] however metal leaching was identified as a potential concern from the shake flask extraction testing performed when using the pit lake water as proposed for re-processing the tailings. Cadmium, chromium, copper, molybdenum and selenium were elevated when compared against the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of Freshwater Aquatic Life. Manganese, molybdenum, selenium, arsenic and uranium were elevated relative to the Health Canada Guidelines for Canadian Drinking Water Quality and/or the Yukon Contaminated Sites Regulation (CSR).

Updated kinetic testing and humidity cell results provided in May 2011 indicate that all metal concentrations are decreasing or stable over time with the exception of uranium (which after an initial decrease slowly increased back to initial value from the Old Pond sample) and iron. After an initial spike, arsenic concentrations rapidly decreased over the next five sampling events. Following this, concentrations continued to decrease but at a slower rate. Approximately five months after the initiation of the testing, the arsenic concentration from the Old Pond tailings sample continued to exceed or equal the Health Canada drinking water guideline.[35]

The humidity cell results indicate that metal concentrations from the tailings will decrease over time, however this contrasts with current porewater samples from the B Valley tailings. Samples collected there 30 years after deposition indicate that copper, chromium, molybdenum, selenium and zinc are of concern when compared against the CCME guidelines for the protection of Freshwater Aquatic Life; molybdenum, manganese and selenium were of potential concern when compared to the Health Canada Guidelines for Canadian Drinking Water Quality and Yukon CSR drinking water standards.

Calcite was the only carbonate mineral identified in the tailings samples and no sulphide-bearing minerals were detected. The waste rock was identified as calc-silicate skarn and limestone.

WATER QUALITY

Limited surface water and groundwater quality data is available. There are temporal gaps between operations, closure and sampling. The most recent water quality data can be reviewed in Appendix B and C of YOR Document # 2011-0064-082. Additional historical surface water and groundwater quality samples were indicated to be collected in the original mine decommissioning plans. "*Mining operations began in 1967 and extensive groundwater quality sampling conducted twenty-four years later found very little evidence of affected groundwater quality. Groundwater samples analyzed in 2011, after another twenty years, also found little evidence of degraded groundwater quality. Therefore, historic and recent groundwater quality data demonstrate that historic mining activities have had little effect on groundwater quality*."[36] It should be cautioned however, that the first sampling occurred a decade after mine closure and impacts which may have occurred in between closure and that first sampling may not be accounted for.

[34] YOR Document #2011-0064-004
[35] YOR Document# 2011-0064-023
[36] 2011-0064-038 p. 9

Figure 6 provides a visual summary of water quality monitoring conducted in and around the site. Sampling was conducted from a variety of surface water sources (represented by squares) drinking water wells (diamonds) and monitoring wells (circles).

UPGRADIENT 'BACKGROUND'

Groundwater quality samples have been collected from existing and new monitoring wells as well as residential drinking water wells (see Figure 6). There are eight residential drinking water wells located downgradient from the site. Sampling from upgradient wells to establish "background" water quality indicate generally good quality and concentrations do not exceed the Health Canada Drinking Water Quality Guidelines except for uranium from the deeper well. The average uranium concentration measured in 2010 and 2011 at this location was 80mg/L. This is interpreted as being due to local mineralization in the granodiorite. [37] Data from the TW06 series of wells located southeast of the Little Chief pit, are below Health Canada Drinking Water Quality Guidelines except two samples which measured uranium concentrations greater than the guidelines at around 50 mg/L. Elevated uranium has been found in upstream samples from the Yukon River, numerous surface water bodies in the area and in cross-gradient wells completed in granodiorite. It has not, however, been found in the basalt bedrock to the east. It is believed that elevated uranium is "ubiquitous in the area and associated with the granodiorite bedrock."[38]

[37] 2011-0064-023
[38] 2011-0064-081 p. 8

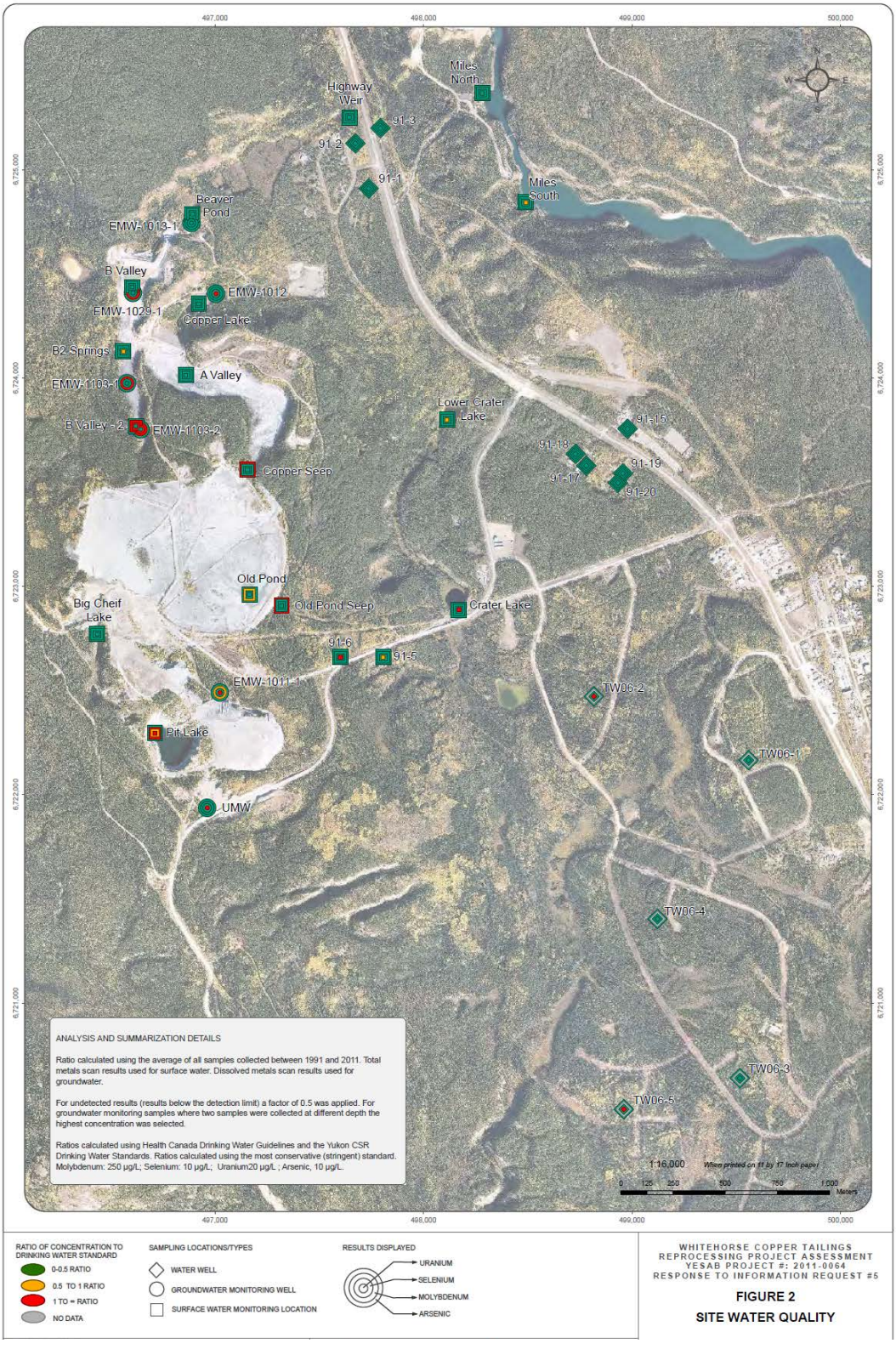

Figure 6. Site water quality monitoring. From YOR Document 2011-0064-081.

GROUNDWATER MONITORING RESULTS

Groundwater wells were sampled in 1991, 1992, 2010, 2011 and 2012 in conjunction with the closure of the original mine and in preparation for the proposed project. Analysis on samples collected in preparation for the proposed project included dissolved metals as well as routine groundwater parameters. Not all parameters were analyzed during the 1991 and 1992 sampling. Sampling included both monitoring wells and drinking water wells.

DRINKING WATER WELLS

Downgradient drinking water wells were sampled in two clustered groupings between 1 and 2 km downgradient of the project area as shown on Figure 6: the Canyon Crescent neighbourhood (wells 91-1, -2, and -3) and wells surrounding the Pioneer RV park on the Alaska Highway north of McRae (wells 91-15, -17, -18, – 19 and 20). These wells largely draw water from the basalt bedrock as noted earlier in the report.

Except for manganese exceedances in two drinking water wells in 1991, potential constituents of concern (PCOC) have not been identified in the drinking water wells. Under the Health Canada Drinking Water Guidelines manganese is considered an aesthetic objective as manganese stains plumbing fixtures and laundry and produces an undesirable taste in beverages. Manganese is also considered by Health Canada to be one of the least toxic elements. The aesthetic objective level for manganese in drinking water is not considered a threat to health and drinking water with much higher concentrations has been safely consumed. A maximum acceptable concentration has not been set.[39]

MONITORING WELLS B VALLEY DRAINAGE

Monitoring well EMW-1013-1 is located immediately downgradient of the B Valley dam and is considered representative of the overburden groundwater flow path from the B Valley. Sampling at this location has not noted exceedances of Health Canada Drinking Water Quality Guidelines except for manganese 4x the guideline level as measured in December 2011. Sampling of the same well in February 2012 did not show elevated levels of manganese. Wells 1012-1A, 1012-1B, 1011-1 EMW-1103-2, and EMW-1103-1 also had manganese above the drinking water guideline in the December 2011 sampling. Well 1012-1A had elevated manganese in the February 2012 sampling, but it was not above standard.

MONITORING WELLS A VALLEY DRAINAGE

There are two monitoring wells in the A Valley Drainage: EMW-1012-1A and -1B located downgradient of the A Valley tailings dam. Well -1A showed exceedances of the Yukon CSR Drinking Water standards or the Health Canada Drinking Water Quality Guidelines for manganese and molybdenum during sampling in November of 2010 and -1B showed exceedances of manganese, molybdenum and selenium during the same sampling event.

[39] Health Canada, 1987. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/manganese/index-eng.php

Monitoring Wells Downgradient of Little Chief Pit

Monitoring well EMW-1011-1 is located immediately downgradient of the Little Chief Pit lake where processed tailings are proposed to be deposited. Sampling from this well in December 2011 and February 2012 showed exceedances of manganese (approximately 2.5x to 4x the Health Canada Drinking Water Quality Guidelines) and uranium (2x to 3x times the Yukon CSR drinking water standard). Water level in this well was roughly uniform with surface water level in the pit lake and similar water quality results strongly suggests a groundwater connection.

Pore Water Samples

Three wells were installed into the tailings in 'B' Valley (EMW 1029-1, 1103-1, 1103-2). Concentrations of molybdenum from all three locations in the single sampling event collected in the fall of 2010 exceeded the Yukon CSR drinking water standard. Concentrations of manganese exceeded Health Canada Drinking Water Quality Guidelines at two locations (1103-2, 1103-3), and concentration of selenium from one well (1103-2) exceeded the Health Canada guidelines and CSR standard. EMW 1103-1 and 1103-2 also exhibit elevated sulphate concentrations.

Surface Water Monitoring Results

Pit Lake and Subsidence Area

Water quality samples in the Little Chief pit lake from summer and fall of 2010 and 2011 exceed Health Canada Drinking Water guidelines or Yukon CSR standards for molybdenum and uranium; have elevated levels of selenium approaching Health Canada Drinking Water Quality Guidelines (greater than 50% of the guideline level); and have elevated arsenic levels (less than 50% of the guideline level). When compared to the CCME Freshwater Aquatic Life guidelines there are several exceedances as noted in Table 2. It is worth noting as the pit lake filled in post-closure there has been no historical water quality sampling performed.

Parameter	HC-DW guideline (ug/L)	Yukon CSR Drinking Water (ug/L)	CCME-FAL guideline (ug/L)	Summer 2010 (ug/L)	Fall 2010 (ug/L)	Summer 2011 (ug/L)	Fall 2011 (ug/L)
Aluminum	**n/a**	**n/a**	**5 (based on measured pH)**	32	11	17	9
Arsenic	**10**	**25**	**5**	3.5	4.9	3.1	3.9
Cadmium	**5**	**n/a**	**Varies with measured water hardness**	0.20	0.31	0.08	<0.01
Copper	**n/a**	**n/a**	**Varies with measured water hardness**	12.2	16.1	11.1	12.5
Mercury	**1**	**n/a**	**0.026**	<0.02	0.04	<0.02	<0.02
Molybdenum	**n/a**	**250**	**73**	516	665	509	679
Selenium	**10**	**10**	**1**	7.2	9.9	6.0	8.3
Uranium	**20**	**100**	**15**	93.4	107	77.7	102

Table 2. Surface water quality of the Little Chief Open Pit lake. Shading indicates exceedance of the most stringent guideline. Note that CCME-FAL guidelines for Aluminum, Cadmium and Copper all vary according to measured parameters (pH or water hardness).[40]

OTHER SURFACE WATER SAMPLES

Surface water quality samples have been collected from seeps, lakes and areas of ponded water, including the Big Chief lake (to represent the subsidence area northwest of the Little Chief pit), Old Pond, B Valley, A Valley, Copper Lake, Crater Lake, Lower Crater Lake Road Pond, Copper seep, Old Tailings Pond seep, B2 Spring, Beaver Pond, highway weir and two 'springs' adjacent to the Yukon River named Miles North and Miles South. Water quality sampling was conducted in 1991, 2010 and/or 2011 (depending on location). Several locations were sampled in 1989 for selected parameters.[41]

Surface water near EMW-1103-2, at the upper end of the 'B' Valley (B Valley-2) was sampled in 2010 and 2011 and consistently exceeds the guidelines/standards for molybdenum and selenium concentrations. The sample collected in 1991 from the Old Pond contained elevated molybdenum which would have exceeded the CSR standard; however concentrations were documented as being lower in 2010 and 2011.

Crater Lake and both Road Pond locations (91-5 and 91-6) exceed Health Canada Drinking Water Quality Guidelines for uranium in recent samples. Uranium was not reported for samples analyzed in 1990s. At Lower Crater Lake and Miles South, uranium concentrations are elevated in the single sampling event in 2011. These locations are all located in the 'C' watershed and concentrations generally decrease from upgradient to downgradient. "*Downgradient surface water monitoring results from Copper*

[40] Sourced from YOR Document # 2011-0064-082
[41] These results are reported in YOR Documents 2011-0064-038 and -082

Lake and Crater Lake may represent surface expression of shallow groundwater and might be expected to show a significant influence from inputs from the site (e.g. seepage of tailings pore water into shallow groundwater). The presence of concentrations of uranium slightly above HC drinking water guidelines in Crater Lake indicates that elevated uranium is part of the background at the site, and that meteoric dilution and/or natural attenuation of metals may be occurring." [42]

Arsenic concentrations exceed the Health Canada Drinking Water Quality Guidelines at the Copper seep (2011) and at the Old Tailings Pond seep (2010). Arsenic "*solubility is thought to only occur where significantly oxidizing conditions exist, which is confined to the upper part of the tailings storage areas above the phreatic surface*".[43]

Samples from A Valley, Copper Lake, Crater Lake, Copper seep and Old Tailings Pond seep contain concentrations of manganese which exceed the Health Canada Drinking Water Quality Guidelines.

2.2 SOCIO-ECONOMIC ENVIRONMENT

The project is situated within the City limits of Whitehorse, between the Alaska Highway, Copper Haul Road, Mt. Sima Road and at a distance south of McLean Lake Road. On the west side of the Yukon River to the east of the project location exists a mixture of residential, light industrial and commercial developments and the Alaska Highway

ZONING & LAND USE

The City of Whitehorse 2010 Official Community Plan (OCP) indicates the area is designated for Industrial Land Use. The OCP indicates the general intentions for land development which are then implemented by the Zoning Bylaw. The Old Pond and mill site areas are zoned for "service industrial" and "heavy industrial" uses respectively. The A and B Valley areas are zoned undesignated rural, which has no planned or designated use until such time as the land is assigned a use in the OCP[44] (Figure 7).

[42] YOR Document 2011-0064-023
[43] YOR Document 2011-0064-023
[44] YOR Document 2011-0064-050

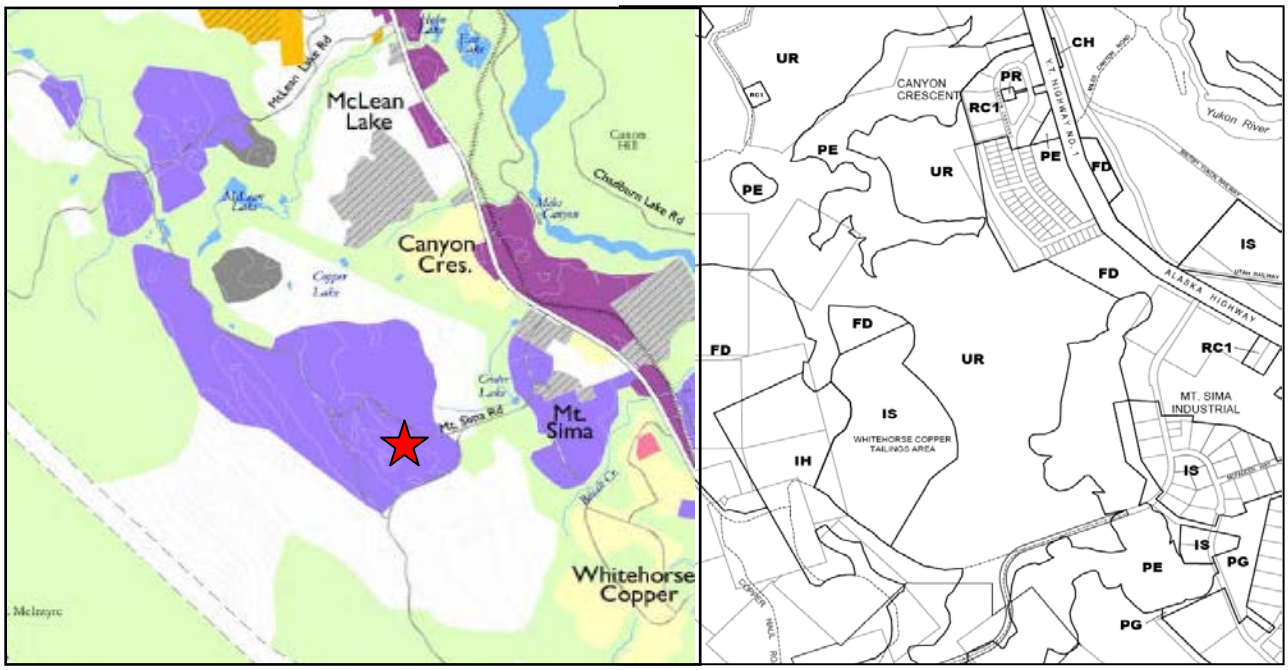

Figure 7: Extract of Map 2 from City of Whitehorse 2010 OCP. Purple colouring denotes industrial land use and the red star indicates the approximate location of the proposed project. The map on the left indicates zoning from Map 18 of Schedule A of the City of Whitehorse Zoning by-law.

There are residential properties located nearby the project area in Canyon Crescent (~345m away) and mixed industrial / residential properties in the Mount Sima subdivision (~685m away) (Figure 7). Additional nearby residences are located off Squatter's Road north of the project area (the closest being~ 285m away) and in the Whitehorse Copper subdivision to the south of the Mount Sima subdivision (~1.5km away). It is worth noting that residences in Squatter's Road are in the "undesignated rural" zoning which implies that setbacks and other restrictions on adjacent land use in the city's Official Community Plan or bylaws that may be in place for residential zoning do not necessarily apply.

FIRST NATIONS LANDS

The project area is located within the traditional territories of the Kwanlin Dün First Nations (KDFN) and Ta'an Kwäch'än Council (TKC). Several parcels of KDFN and TKC land are located near the project area:.

- KDFN C-24B and TKC C-8B, located within 50 m;
- TKC C-90B, KDFN C-178B, KDFN C-59B, KDFN C-137FS, KDFN C-136FS located within 800m;
- TKC C-37B, KDFN C-179B, KDFN C-180B -181B, -182B, -183B, -184-B, -185B, -186B, -187B located within 1.3km.

RECREATION USE

The project site has been used over the 30 years since the closure of the Whitehorse Copper mine as an area for recreational activities, including off-road vehicles and dog-walking. In the winter, cross country skiers and snowmobilers also use the project area. Comment submissions also indicate that surface water bodies such as Copper Lake below the 'A' Valley dam are used by local residents for swimming in the summer months.[45]

The Copper Haul Road to the west of the site is used recreationally year round, including as a snowmobile trail in the winter. Presently a snowmobile trail crosses the project site that allows residents of the Mount Sima and Whitehorse Copper subdivisions direct access to the Trans-Canada trail on the Copper Haul road. The OCP designates the area to the north immediately surrounding McLean Lake and the McLean Lake watershed as a municipal park. This area is used for fishing, hiking and other recreational day uses.

The Mt. Sima Road provides access to the Mount Sima Ski Hill. Mount Sima has plans to expand their operation year-round in 2012 in a partnership with Wildplay Element Parks that would include outdoor activities such as Monkido and forest canopy zip lines, downhill mountain biking , alpine interpretive tours for motor coach passengers and lift-access hiking opportunities[46].

MINERAL CLAIMS

19 quartz mining claims exist within the project area and 20 other active mineral claims exist within 500m of the project boundary. The proponent has acquired the quartz claims within the project area and intends to transfer ownership back to the sellers upon completion of the project. The Oro quartz claims (Oro 1, Oro 2, and Oro 3) are immediately south of the land leased by the project and include the Little Chief Pit and subsidence areas where the proponent intends to deposit processed tailings (see Section1.4.4). The proponent has entered into an agreement with the claim owners, H. Coyne & Sons to allow placement of tailings on the claim in compliance with the *Quartz Mining Act*.

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 9 item 3 of the Activity Regulations, specifically:

  Direct use of water

[45] YOR Document 2011-0064-099
[46] http://opportunitiesnorth.com/Documents/Presentations/opps-north.sima-final.pdf

- 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 Whitehorse Designated Office during the assessment. A list of the decision bodies and authorizations required for the project can be found in Table 3 below.

Decision Body	Authorization(s) Required	Act or Regulation
Yukon Government: EMR – Lands Client Services	*Government of Yukon Lease* Yukon Water Board: *Water Use License*	Yukon *Lands Act*, Lands Regulation Yukon *Waters Act*
	City of Whitehorse: *Development Permit*	Zoning By-law 2006-01, Section 4

Table 3 Decision Bodies and Authorizations Required

It should be noted that Section 24 of the *Government of Yukon Lease* states that "*all plans referred to in this Lease shall conform to any applicable Yukon Decision Document promulgated under the* Yukon Environmental and Socio-Economic Assessment Act *related to the proposed project*."

4.0 SCOPE OF THE ASSESSMENT

In conducting the assessment, the matters outlined in section 42(1) of YESAA and the comments submitted during the Seeking Views and Information (SVI) period of the assessment were taken into consideration.

A working group comprised of representatives from the Yukon Conservation Society, Yukon Government, Energy Mines and Resources, Yukon Environment, Environmental Programs Branch and Yukon Environment, Water Resources Branch was formed to assist the Designated Office during the adequacy determination phase of the assessment. The working group input is part of the record on the YESAB Online Registry (YOR).

This assessment included an initial SVI period of 35 days. Comments during the initial SVI period were received from the City of Whitehorse (CoW), Yukon Conservation Society (YCS), Kwanlin Dün First Nation (KDFN), Ta'an Kwäch'än Council (TKC), local residents Ian Church, Marianne Darragh, Joyce and Erwin Bachli and five Yukon Government Departments (Community Services, Energy Lands and Resources, Environment, Health and Social Services, Tourism and Heritage).

Following the initial SVI period, the Designated Office issued an information request to the proponent in order to address issues raised in the YG Environment submission. As a result of this information request and the response from the proponent, a second SVI period was provided for 28 days in order to allow additional views and information to be sought, ending on May 28, 2012 Comments were received during this period from Isabelle Gagnon, including a petition on behalf of several Canyon Crescent subdivision residents; Marianne Darragh; a joint submission by Lynn and Cole Blaikie and Scott Lowrey; Marc Pronovost.; YCS; Yukon Environment; TKC and the Yukon Chief Medical Officer of Health.

This section of the report provides a summary of the comment submissions and indicates how the comments were considered in the assessment. The record of comments received during this evaluation can be viewed on the YESAB Online Registry (YOR) at www.yesab.ca/registry or at the Whitehorse Designated Office. Appendix C provides a list of submissions and the corresponding YOR number.

CITY OF WHITEHORSE

The City's Planning and Development Services Department provided information as to the designation and zoning of the project area as industrial and recommended that the cleanup of the site and other brownfield sites be supported. The City also noted that it anticipates reviewing the details of the proposed development through the Development Review Committee once they have been submitted.[47]

These comments have been noted for information purposes and served to inform Section 2.2 of this report.

YUKON CONSERVATION SOCIETY

YCS noted their support for the concept of reworking the old mine tailings but did raise concerns in regards to several aspects of the project proposal. These included: the primary purpose of the project; the extent and nature of reclamation plans; the lack of definition of the annual operating season; noise and traffic; water use and licensing; the manner of the application of the *Quartz Mining Act* by Yukon Government;, financial aspects of the project including securities and royalties; socio-economic impacts on the local labour and housing markets; and electrical power use.[48]

The proponent provided a response to the YCS comments during the SVI period and provided direct comment on each of the concerns listed in the initial YCS submission.[49]

The YCS submission during the Additional Seeking Views and Information period reiterated the concerns raised in their initial submission. In addition, YCS raised the issue of increased summer usage at Mt. Sima and the "*push by Mt. Sima to become a summer destination resort."*[50]

The YCS comments are considered further in Sections 5 and 9 of this report.

[47] YOR Document 2011-0064-050
[48] YOR Document 2011-0064-054
[49] YOR Document 2011-0064-058
[50] YOR Document 2011-0064-093

KWANLIN DÜN FIRST NATION

Kwanlin Dün First Nation (KDFN) identified a parcel of their Category B Settlement Land (C-24) as being within the 500m buffer of the project and identified several concerns with the project relating to their land and rights under Chapter 14 of the KDFN Final Agreement. These concerns included: water resources, noise, dust and the value of adjacent settlement lands that are designated for residential and/or commercial development. Concern was also raised that the multi-year project schedule may curtail the intended development potential of land parcel C-24. KDFN also encouraged early and ongoing consultation with the proponent throughout all stages of planning and development.

The KDFN comments are considered further in Sections 5, 6 and 9.

TA'AN KWÄCH'ÄN COUNCIL

Karl Blattman of Danu Environmental Services provided comments on behalf of the TKC and identified concerns with regards to impacts beyond the planned spatial boundaries of the project that could have "*unforeseen consequences to the rights to TKC citizens*." These concerns were limited largely to project effects on surface and subsurface waters. TKC requested to be kept informed throughout the life of the project with regards to test results, inspections and inspection reports and initial and updated remediation plans. As well, they requested that a TKC employee be invited to participate in any site visits and inspections conducted by the proponent or regulators.[51]

In the TKC submission during the Additional Seeking Views period, concerns with expressed in regards to project impacts to settlement land parcels C-8 and C-90 specifically from noise, dust and possible groundwater contamination. C-8 has been designated for future residential use and C-90 for commercial use. The TKC submission stressed that these issues could impact these settlement land parcels *"in both the short and longer terms if adaptive management and monitoring techniques are not applied*."[52]

The TKC comments are considered further in Section 5 of this report.

IAN CHURCH

Ian Church provided comments that generally supported the concept of utilizing this project to resolve past shortcomings in regards to the project site and noted the need to achieve the basic sustainable development "*tenant of meeting todays* (sic) *needs while not limiting the options or passing on liabilities for future generations – the concept of intergenerational equality*." Mr. Church's comments included concerns in regards to: the application of CCME standards with regards to contaminants; adequacy of the proposed 15cm cap on top of the tailings to control dust; potential for groundwater and soil contamination; residual environmental challenges on the site for future users; appropriateness of future industrial uses of the site over the long term; water quality issues; source of aggregate materials for reclamation activities

[51] YOR Document 2011-0064-062
[52] YOR Document 2011-0064-089

and the impacts on traffic, road surfaces and greenhouse gas emissions from increased truck traffic and project activities.[53]

Mr. Church's comments are considered further in Sections 5, 6 and 9 of this report.

MARIANNE DARRAGH

Marianne Darragh provided concerns in regards to: heavy equipment noise from the project area; the necessity and size of undeveloped buffers around heavy industry and residential land uses; light, water and air pollution; area trails and use of the project area by wildlife.

Ms. Darragh also submitted several documents she felt were relevant to the project including the site decommissioning plan from 1992 and the City of Whitehorse development plan for the Whitehorse Copper country residential subdivision. These documents are available on the YOR.

Ms Darragh submitted further comments during the Additional Seeking Views and Information period with specific concerns in regards to project noise and the adequacy of the City of Whitehorse Bylaw provisions to manage the impact of industrial noise on residential areas.

Ms. Darragh's comments are considered further in Sections 5 and 9.

JOYCE AND ERWIN BACHLI

Joyce and Erwin Bachli provided comments in support of the project and the economic benefits it will bring to the Yukon including employment and tax revenue. They commented on two issues: traffic and increased noise and noted that traffic will go through the industrial area where gravel is already being hauled.

The Bachli's comments are considered further in Section 9.

YUKON GOVERNMENT – COMMUNITY SERVICES

Yukon Government Department of Community Services comments provided information on the necessity of a burn permit if slash or other woody debris is burned between April 1st and Sept 30th. The Office of the Fire Marshall also provided information on the necessity of a permit if fuel storage is to exceed 4,000 litres and that fuel storage and fire protection measures must meet current National Fire Code standards.[54]

These comments are in respect to non-discretionary regulatory measures and are considered information only. As such they have not been considered further in this report.

YUKON GOVERNMENT – ENERGY, MINES AND RESOURCES

Yukon Government Department of Energy, Mines and Resources (EMR), Mineral Resources Branch provided comments that informed on the planning required as a condition of the proponent's lease with the Yukon Government for the purpose of re-working the tailings at the old mine site. EMR's comments

[53] YOR Document 2011-0064-059
[54] YOR Document 2011-0064-061

indicated that "*although this is not a mining project, it will be subject to many of the same requirements as a quartz mining lease*." The plans required include: Reclamation and Closure Plan subject to the Yukon Mine Site Reclamation and Closure Policy pursuant to the *Quartz Mining Act*; an Operational Plan and an Environmental Protection Plan.

In addition, EMR provided information on the application of the Security Regulation pursuant to the *Quartz Mining Act* and the guidelines for financial security for reclamation and closure that must be adhered to by the project proponent.[55]

These comments have been considered as information only, as the information and outcome generated in this assessment will guide the development of the aforementioned plans. Section 24 of the lease between the proponent and Yukon Government stipulates that all plans required under the lease "*shall conform to any applicable Yukon Decision Document promulgated under the* Yukon Environmental and Socio-economic Assessment Act *related to the proposed project."*[56]

YUKON GOVERNMENT – ENVIRONMENT

Yukon Government Department of Environment identified water quality, waste management and air quality as valued ecosystem components in their comments and raised concerns in regards to the project effects on each. Since its involvement in the project adequacy review to present, Environment "*has maintained that the greatest potential impact of this project is to downstream water quality through the groundwater vector. The proponent should demonstrate any potential influences from the project to drinking water wells and water quality that would reach to the Yukon River.*"

Water Resources Branch of the Department retained SLR Consulting (Canada) Ltd. to review the groundwater model provided by the proponent and included the SLR report with their comment submission. The review concluded that "*the applied models either violate the theoretical assumptions of model code (overburden model) or are extremely sensitive to single, poorly defined parameters (porosity, bedrock model)*." Further*, "… without an appropriate model the results any conclusions derived thence, are considered unsound and unreliable.*" Environment's conclusion is that the proponent's findings "*that no contaminants of concern (COC) are likely to be exceeded in any down-gradient receptor area cannot be substantiated with the information and models presented*."

The Department of Environment's comments and the SLR report prompted the issuance of an information request to the proponent following the initial SVI period in order to address the issues raised in regards to water quality. This prompted an information request response that directly addressed Environment's concerns as set out in the SLR report.[57]

In their submission during the Additional Seeking Views period, Environment commented that their review of the proponent's revised water quality modelling indicated that the information provided filled a large

[55] YOR Document 2011-0064-061
[56] YOR Document 2011-0064-015
[57] YOR Document 2011-0064-081

data gap in the project file. The department further indicated that "*review of the monitoring and mitigation plans will be undertaken by this Department as part of the Water Licence application review.*"[58]

Commenting on waste management, the Department raised issues with both the proponent's Spill Response Plan and Waste Management Plan that included: ensuring the spill plan comprehensively covered all materials; reporting all spills and ensuring proper remediation; triggering thresholds for special waste permits; and transportation requirements associated with special wastes.

In regards to air quality, the Department identified dust as a primary concern, as "*residents of the Canyon Crescent residential subdivision have already identified dust as a current nuisance and industrial activity has the potential to increase dust dispersal.*" The Department recommended that the proponent develop a Dust Abatement Plan that outlines how they plan to manage dust generated during operations both within the facility and during hauling.

These comments are considered further in Sections 5 and 6.

YUKON GOVERNMENT – HEALTH AND SOCIAL SERVICES

Yukon Government Department of Health and Social Services, Environmental Health Services Branch commented on water use and subsequent impacts to groundwater and specifically drinking water. They indicated that "*source water (wells) protection for those down gradient should be considered a high priority and adequate characterization of water quality on site, groundwater flow and hydrogeology is required to ensure this value is protected.*"

Environmental Health Services further recommended that a Health Impact Risk Assessment be conducted to identify and evaluate any potential health risks in order to formulate a more definitive opinion of the risk to human health of groundwater users down gradient of the project.

Environmental Health Services further commented that dust will be an issue with the proposed project and that since the tailings contain silica there is a definite health hazard to be considered. They recommended that the "*proponent develop a Surveillance and Abatement Plan to mitigate the risk that blowing dust from this project will have on the community*."[59]

These comments are considered further in Section 5 and 6.

YUKON GOVERNMENT – TOURISM AND HERITAGE

Yukon Government Department of Tourism and Culture, Heritage Resources Branch provided comments that indicated the project area has been inventoried for historic sites and none are located in areas to be impacted by project activities, further they identified that the project area has low potential for the presence of archaeological sites as it has been impacted by previous mining activities. Heritage Resource Branch recommended that the standard conditions included in all mining approvals would

[58] YOR Document 2011-0064-091
[59] YOR Document 2011-0064-061

provide sufficient mitigation for historic resource concerns and listed those specific conditions in their submission.[60]

As Heritage Resources has indicated that the project area does not contain historic sites, has a low potential for the presence of archaeological sites and that standard conditions will provide sufficient mitigation to protect any heritage resources, these comments have not been considered further in the assessment.

ISABELLE GAGNON

Ms. Gagnon is a resident of the Canyon Crescent neighbourhood adjacent to the project area. She met with Whitehorse DO Manager, Jennifer Anthony, on May 9, 2012, and raised concerns in regards to notification of Canyon Crescent residents of the project activities; drinking water well sampling methodology; surface water quality including one currently used by residents for garden irrigation; possible monitoring of water quality in drinking water wells; and quality of life impacts from noise, dust, air and water quality.[61] Ms. Gagnon also supplied a petition signed by 15 residents of Canyon Crescent that "*requested the cessation of any further possibility of excavation and reprocessing of the tailings until being assured of the non-threat*" to all of the residents' concerns in regards to well/surface water quality, noise impact and air and soil quality.[62]

Ms. Gagnon's comments are considered further in Sections 5, 6 and 8.

MARC PRONOVOST

Marc Pronovost visited the Whitehorse Designated Office and also provided a submission with a summary of concerns in regards to the project activities. The main points / questions raised in the submission were in regards to: specific noise level limits; public access to the project area roads; project water use and water quality protection; dust and air quality monitoring and management; continued access for swimming in Copper Lake; project impacts on the tourism industry; application of the *Quartz Mining Act*; site remediation; and the necessity of a health impact study.

Mr. Pronovost also provided supplemental comments following the end of the SV&I period. Please see the 'Additional Public Comments Considered' section below.

LYNN BLAIKIE, COLE BLAIKIE AND SCOTT LOWREY

The Blaikie/Lowrey submission indicated that they are residents of Canyon Crescent and provided comments in regards to: noise from 24/7 project operations; dust, fumes and other impacts to air quality; water quality; trail use through the project area; support of Marianne Darragh's comments as submitted during the initial seeking views period and reiteration of the position stated in the Canyon Crescent residents petition provided by Isabelle Gagnon.

These comments are considered further in sections 6 and 8.

[60] YOR Document 2011-0064-061
[61] YOR Document 2011-0064-090
[62] YOR Document 2011-0064-088

YUKON CHIEF MEDICAL OFFICER OF HEALTH

The Chief Medical Officer of Health, Yukon requested an extension of the Additional Seeking Views period after being contacted by concerned Whitehorse residents. A two week extension was granted in order for the office to conduct a review of the project from a human health risk point of view. The Chief Medical Officer of Health indicated that he believes "*the main health concerns from this project – noise, dust, and water quality effects, have been appropriately identified, analyzed and addressed. With regards to water quality, I am reassured by the plans for ongoing monitoring combined with the results of the groundwater flow analysis and monitoring to date.… I am pleased to see the recently posted dust management* [plan] *as well as plans for a communications line for noise or other concerns to be set up for nearby residents. As currently proposed, I have no further concerns with this project. However, any deviations from the proposed plan of action would require reassessment."*[63]

ADDITIONAL PUBLIC COMMENT CONSIDERED

Following the end of the Additional SVI period, the proponent held a public open house on June 4, 2012, to address public concerns raised about project environmental impacts. Representatives from the Designated Office attended the open house and considered new information raised during the presentation and public question and answer period.[64]

Following this open house, the project was the subject of considerable public and media interest. The Designated Office fielded many inquiries in regards to the project during the Preparing Recommendations stage of the assessment process; with several people wishing to provide their comments on project activities outside of the SVI period. Comments specific to aspects of the project not raised in prior submissions were considered on an individual basis.

BRENDA GADSBY

Brenda Gadsby phoned the Designated Office and raised concerns in regards to 24/7 truck traffic on the Mt. Sima Road. She indicated that she was a resident of the road and there were likely 2 other commercial properties with attached residences that would be directly affected by the truck traffic. This information was not already in the project record and provided details relevant to the significance determination of project effects relating to heavy truck traffic and noise on the Mt. Sima Road. As a result, the Designated Office decided to consider the submission.[65]

MARC PRONOVOST

Marc Pronovost met with assessors at the Designated Office on June 8, 2012 after attending the open house and having supplemental conversations with the proponent. During this meeting, he provided the Designated Office with additional comments and provided further details to the responses to the questions he raised during the open house in regards to a perimeter trail for Canyon Crescent residents, access to Copper Lake for swimming and impacts of the A Valley dam decommissioning on Copper Lake.

[63] YOR Document 2011-0064-103
[64] YOR Document 2011-0064-105
[65] YOR Document 2011-0064-107

As this information directly informed mitigation measures in regards to effects on public safety, the Designated Office decided to consider the submission.[66]

In summary, the values considered in this assessment are:

- Water Quality (Section 5)
- Environmental Quality (Section 6)
- Wildlife and Wildlife Habitat (Section 7)
- Noise (Section 8)
- Public Safety (Section 9)

[66] YOR Document 2011-0064-109

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 WATER QUALITY

5.1 OVERVIEW

Processed tailings will permanently remain in the Little Chief pit, subsidence areas and the Old Pond area. Approximately 23,000 m^3/day of water is expected to be required for processing. Of this amount, the project expects approximately 220 m^3/day of make-up water will be required after recycling the process water. Prior to use in processing pre-treatment of pit lake water is proposed via in-situ bioremediation. As the deposition of tailings fills the Little Chief pit, water in the pit lake is expected to dissipate into the groundwater aquifer.[67] Residential water wells are located downgradient and within approximately 2200 m of the open pit and 1100 m of the A and B Valleys.

In their comment submission Yukon Environment recognizes arsenic, copper, selenium and uranium as potential contaminants of concern (PCOC) with respect to drinking water and arsenic, copper, molybdenum and selenium as PCOC with respect to aquatic life. It should be noted that the potential drinking water receptors are wells for individual residences in country residential settings. Multiple comment submissions from local area residents indicated drinking well water quality at lots in the Canyon Crescent and Mount Sima subdivisions was a significant concern. The City of Whitehorse obtains its municipal water supply from the Selkirk aquifer under the Riverdale subdivision and will not be affected by project activities.

Yukon Government, Environmental Health Services commented that "*source water (wells) protection for those down gradient should be considered a high priority and adequate characterization of water quality on site, groundwater flow and hydrogeology is required to ensure this value is protected*." Their comment goes on to highlight the potential "*risk to human health of groundwater users down gradient of this project*."[68]

5.2 PROJECT EFFECTS

As seen from the geochemistry results of the tailings samples, the tailings are not necessarily inert nor benign and metal leaching is a potential concern. As proposed, water from the Little Chief open pit lake is to be used for process water, and testing has indicated that the concentrations of copper, molybdenum,

[67] YOR Document 2011-0064-002
[68] YOR Document 2011-0064-061

and selenium are predicted to increase during reprocessing. The concentrations of other metals including: cadmium, arsenic, and zinc, are predicted to decrease during reprocessing[69]. Re-processed tailings will be deposited and stored in the Little Chief pit, subsidence areas and in the Old Pond. Effectively the "Copper Seep" at the head of the B Valley (see Figure 6) will become the closest point of stored reprocessed tailings to potential downgradient receptors.

Proposed project activities include pre-treatment of the entire pit lake prior to the commencement of the project using food-grade, carbon-rich additives (sugars and alcohols), with the specific mixture, volume and speed and method of introduction to be determined after additional testing of the lake water. Initial treatment of the entire pit lake will be accomplished over a period of 2-3 months in the late summer and fall prior to operations commencing. The treated lake water will be used for the processing of the tailings during the operations phase of the project and the water within the pit lake will be monitored for its quality to determine whether there is a need for additional treatment under an adaptive management framework. Additional treatment would most likely be in the form of a carbon addition to the tailings following processing in order to provide additional carbon during the deposition of tailings. Secondary treatment of the pit lake is another means by which the pit lake water quality could be managed. Concentrations of the pit lake water quality after pre-treatment are reported by assuming there will be an 80% reduction in the current concentrations[70]. This treatment method has been used successfully at the Minto Mine in 2007 and 2008 to treat waste process water prior to release.[71]

As limited groundwater monitoring and sampling has been conducted during past mining operations or since mining ceased in 1982 (three reported monitoring events have occurred in 1991, 2010 and 2011) it is uncertain whether any PCOC have migrated from the site to these receptors. Surface expressions of the water table (springs, seeps, lakes) have also been sampled, but geochemical changes can occur between surface and subsurface conditions. Site disturbance and placement of tailings into the open pit and subsidence area surrounded by fractured bedrock creates potential pathways for constituents to migrate to downgradient receptors.

A AND B VALLEY AREA GROUNDWATER

It is proposed that the A Valley tailings will be reprocessed after the Old Pond tailings are reprocessed and the B Valley is the last area to be reprocessed. Prior to reprocessing of the tailings, the groundwater quality in the A and B Valleys will remain the same as existing conditions. During processing of the A and B Valleys the water quality of seepage from the tailings should remain below the drinking water standards due to the proposed pre-treatment of the process water. In addition, as noted in the April 25 2012 response to information request, the "*potential for groundwater contamination during tailings removal from the A and B Valleys will decrease as tailings are removed, thereby reducing in-situ hydraulic heads*

[69] YOR Document 2011-0064-015
[70] YOR Document 2011-0064-032
[71] Extensive details on this process are available in YOR Document 2011-0064-029

which could drive downward or later seepage in these valleys."[72] After closure, the groundwater quality in the valleys will be improved over existing conditions as a result of the removal of tailings.

OLD POND AREA GROUNDWATER

The identification of arsenic concentrations in excess of the standard/guideline in the humidity cell leachate from the Old Pond tailings sample is consistent with the surface water seepage concentrations identified from the Cooper Seep and Old Pond Seep (Figure 5), downgradient of the Old Pond tailings storage area. Excavation and redistribution of the tailings in the Old Pond area has the potential to enhance seepage from this area by increasing the moisture content of the tailings and increasing the hydraulic conductivity. Seepage from the Old Pond area will contribute to all three drainages, although largely the C drainage (Figure 5). As indicated in Section 2.1.2, seepage would likely contribute to the overburden aquifer flow path through the A and B drainages to the north end of the project site as noted in Figure 5. The reprocessed tailings stored in the Old Pond would become the closest tailings storage area to downgradient receptors after project activities are completed.

TAILINGS DEPOSITION IN LITTLE CHIEF PIT AND SUBSIDENCE AREAS

Deposition of the reprocessed tailings into the Little Chief open pit and subsidence areas moves mined material capable of leaching metals at concentrations harmful to freshwater aquatic life and in exceedance of drinking water standards from areas where currently there appears to be no effects from seepage to one that may offer more permeable pathways for seepage. Groundwater quality sampling suggests that currently tailings pore water in the Little Chief open pit is not currently migrating away from the site, possibly due to: a low infiltration rate, low permeability of the underlying substrate in the tailings storage areas, or by some attenuation mechanism. Excavation and redistribution of the tailings will result in tailings with lower consolidation, and thus higher conductivity and higher moisture content. This moisture will be subject to evaporation and deeper infiltration after tailings deposition. The tailings deposited into the open pit and subsidences will be placed in contact with higher hydraulic conductivity material (bedrock), at least in the upper portions, as compared with the underlying overburden where tailings are currently contained. This flow path is exclusively within the C drainage as noted in Figure 5.

Water quality sampling suggests that water quality within the catchments currently meets drinking water (Health Canada and CSR) guideline/standards in all three of the drainages downgradient of the site. None of the identified PCOC appear in the downgradient wells within this same catchment; suggesting that either: i) the groundwater wells intersecting the shallow groundwater aquifer are not hydraulically connected, or ii) natural attenuation mechanisms are occurring along the flowpaths[73]. The data also indicates that several parameters are naturally elevated and other parameters appear elevated in seepage from previously mined materials. For those constituents with background concentrations loadings, project activities may be sufficient to push concentrations to greater than the applicable standard/guideline.

[72] YOR Document 2011-0064-081
[73] YOR Document 2011-0064-032

Project activities have the potential to negatively impact the water quality via seepage water emanating from the processed and disposed tailings. Defensible water quality predictions have been provided to demonstrate the assertion that loadings of potential contaminants of concern (e.g. arsenic, molybdenum, selenium, uranium) from reprocessed tailings deposition (e.g. Pit Lake/Subsidences, Old Pond area) entering the aquifer(s) do not result in exceedances of the relevant standards/guidelines at any current or potential downgradient receptor within 100 years. Concentrations of molybdenum and selenium are predicted to be reduced by 79% and 86% respectively through pit lake treatment, natural absorption and biodegradation factors.[74]

Moderate pH values typically enhance sorption and decrease the mobility of metals, which has been suggested to explain the apparent lack of transport of elevated elements to any downgradient receivers. In oxidized environments other metals (or metalloids) form anionic (i.e. negatively charged) species. The prevalent form or speciation of these constituents, along with properties of the medium, will determine their mobility; however the tendency of all oxyanions is for greater mobility with increasing pH, unlike cations[75]. Attenuation of selenium and uranium is recognized to occur by sorption on surfaces of iron minerals that are common in aquifers. Multiple mechanisms have been suggested for removing molybdenum in aquifer flows. High iron oxide content in soils produce iron molybdate precipitates leading to rapid attenuation of molybdenum along flow paths . Both the granodiorite and basalt aquifers contain iron silicates and oxides that will provide reactive surfaces for iron molybdate co-precipitation.[76] Goldberg (2009) as referenced by the proponent: "*showed that [molybdenum] sorption in soils was pH dependent, with neutral or acidic pH conditions causing increased sorptive removal reactions. Although the skarn-mineralized area is strongly buffered by surrounding carbonates, lower near-neutral pH conditions are normal and can be expected to... increase [molybdenum] attenuation in the basalt."*[77]

NON-DISCRETIONARY LEGISLATION

The following non-discretionary legislation is applicable to the project activities:

- The Yukon *Waters Act*
- The Yukon Contaminated Sites Regulation made pursuant to the *Environment Act* (drinking water standards)
- *Guidelines for Canadian Drinking Water Quality*

[74] YOR Document 2011-0064-081
[75] Mclean and Bledose, 1992
[76] Branum, 1999, as referenced in YOR Document 2011-0064-081
[77] YOR Document 2011-0064-081 p. 15

PROPONENT COMMITMENTS

OVERVIEW

The proponent has committed to a number of measures to mitigate against the project having significant adverse effects to water quality. These measures include: pit water treatment as previously discussed, an adaptive management framework, ground and surface water monitoring and groundwater capture and treatment if exceedances are detected as a result of project activities. Groundwater and surface water monitoring commitments are summarized in the section below; further details can be found in Appendix A.

GROUNDWATER

The proponent has committed to identify and mitigate potentially contaminated groundwater resulting from tailings reprocessing through the installation "*of a series of strategically located wells and sumps*.... *located and sized so they can serve as water quality monitoring points and also serve as potential groundwater interception locations if groundwater capture and treatment is required.*"[78] These specific commitments are found in Appendix A of this report.

SURFACE WATER

Impacted surface water runoff is considered to be the most likely source of contamination from the project area, and the proponent has included in the project activities a plan to pre-treat the Little Chief open pit lake used as process water and re-treat, if required, prior to discharge. Most importantly, they have committed that "*no potentially contaminated surface runoff will leave the Project site."*[79] The proponent has further committed to conducting a surface water quality monitoring program downgradient of the project site during the period of operations and for three years following the end of operations. This three year period has been based on an estimate of the limited amount of discharge expected from the site post-operations. Monitoring downgradient of the Little Chief pit is proposed to be carried out for 5 years following the end of the project based on *the measured* [hydraulic conductivity] *value from monitoring well 1011-1 and an associated seepage velocity estimate of 63.24 m/year, this period should capture any significant trends associated with the Project*."[80]

These specific commitments are found in Appendix A under Section 5.

SIGNIFICANCE DETERMINATION

Yukon Environment, Water Resources retained SLR Consultants to conduct a detailed review and critique of the water quality prediction model provided by the proponent during the initial seeking views period in 2011. As a result, the proponent prepared a revised model in order to meet the concerns and

[78] YOR Document 2011-0064-081
[79] YOR Document 2011-0064-081
[80] YOR Document 2011-0064-081

weaknesses identified by Yukon Environment and their consultant. This revised model, monitoring and mitigation plan was developed by the proponent and reviewed by Yukon Environment, Water Resources and their consultant. Yukon Environment found the revised model reasonable and acceptable. The Chief Medical Officer of Health, Yukon stated that he was "*reassured by the plans for ongoing monitoring combined with the results of the groundwater flow analysis and monitoring to date*," after reviewing relevant documents, discussing the issue with local residents, touring the site with the project consultant and discussing issues with the project proponent.

The Designated Office believes that the reviews conducted by Yukon Environment, Water Resources and the Chief Medical Officer of Health, as well as the information provided to the Designated Office throughout the assessment process are sufficient to accept the groundwater modelling and prediction as reasonable and acceptable. For the purpose of determining the significance of project effects on water quality, the Designated Office has assessed the effects and mitigations provided.

Based on the above, the Designated Office determines that seepage from the deposition of reprocessed tailings into the open pit, subsidence areas and the Old Pond area will result in significant adverse effects to water quality at downgradient receptors. The Designated Office believes that these effects can be eliminated, reduced or controlled by the application of mitigation measures.

MITIGATION

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

1. The Adaptive Management Plan (AMP) to be submitted as part of the Yukon Lease shall be updated to include the monitoring and mitigation measures proposed by the proponent in YOR Document 2011-0064-081 and any additional commitments made by the proponent since the AMP's initial submission to YESAB on July 6, 2011.
2. The AMP shall also contain measures to contain and treat groundwater contaminated by project activities if ongoing monitoring indicates levels of a contaminant, metal or parameter above the Yukon Contaminated Sites Regulation or Health Canada Drinking Water Quality Guidelines, whichever is more stringent, after considering any background contribution to the parameter concentrations in accordance with Yukon Environmental Programs Branch Protocol #10.
3. Any modification, addition or removal, of the recommended well installation locations or surface monitoring locations shall be done in accordance with the Water Use License. Any new monitoring wells or locations proposed shall have a monitoring baseline established prior to project operations.

RESIDUAL EFFECTS

Given the short groundwater travel times, the proposed monitoring program and Adaptive Management Plan, in combination with the mitigation measures as listed above should be sufficient to detect and remediate any issues with groundwater contamination from the project site. As the Designated Office is

confident that the proponent will carry out their commitments and the mitigations as directed, there should be no residual effects from the project activities on water quality.

CUMULATIVE EFFECTS

There are no other known activities upstream in the same drainages as the project area that could introduce metal loadings into the surface or groundwater affecting the same receptors as the project. (see Figure 5). Downgradient of the project, spills, transportation of goods and industrial/commercial activities in the Mount Sima subdivision and McRae have the potential to introduce contaminants to surface and groundwater. Such contamination may affect receptors downgradient from the source, including the Yukon River. However, the majority of receptors (drinking water wells) are upgradient or not in the same drainages as other potential sources of ground or surface water contamination. The Designated Office has determined that cumulative effects to water quality based on loadings of the identified potential contaminants of concern are not significant.

6.0 ENVIRONMENTAL QUALITY

6.1 OVERVIEW

Environmental quality may be affected by project activities through the introduction of contaminants and deleterious substances into the environment from the use of powered equipment that may generate spills, leaks and wastes. If spills, leaks and wastes are improperly managed there may be significant adverse effects to environmental quality. In addition, the use of heavy equipment around and disturbance of the tailings during excavation and deposition after reprocessing has the potential to create dust. When transported by the wind beyond the project boundaries this could have significant adverse effect on environmental quality and by extension wildlife and human health.

6.2 PROJECT EFFECTS

WASTE & SPILL MANAGEMENT

The proponent provided a Waste Management Plan that details the generation, handling, storage and disposal of non-hazardous and special wastes generated from project activities. Waste generated by the proposed project activities will include non-hazardous and special waste as defined under the Yukon *Environment Act*. Non-hazardous wastes may include: worn heavy equipment parts, packaging materials, food scraps and sewage. Special wastes may include: used anti-freeze, batteries, leftover solvent, petroleum products (e.g. used engine oil), used sorbent pads/rags and materials contaminated by hydrocarbons (e.g. soil, snow or sorbents).

Section 7.2.3 of this report also addresses waste management and storage as it relates to human-wildlife conflicts.

The proponent also provided a Spill Management Plan that details measures taken to prevent and respond to spills of hazardous substances as defined under the Yukon *Environment Act*. Hazardous substances that will occur on site during project activities include: diesel fuel, motor oil, hydraulic fluid,

other lubricants, anti-freeze, solvents and other petroleum products. Diesel fuel will be stored on site in an above ground, stationary, 50,000 litre tank consistent with the *Environment Act* Storage Tank Regulations. A portable spill response kit and hand tools will be kept on site for quick and proper cleanup of spills.

PROPOSED MITIGATIONS

There are several commitments made by the proponent throughout the assessment that have been considered when determining the significance of project effects on environmental quality, specifically spills, leaks and waste management. These can be found in Appendix A under Section 6.

NON-DISCRETIONARY LEGISLATION

The following non-discretionary legislation is applicable to the project activities:

- The Yukon *Environment Act,* specifically Parts 7, 9, 10, and 11;
- the Storage Tank Regulation;
- the Special Waste Regulation;
- the Contaminated Sites Regulation; and
- the Solid Waste Regulation.

SIGNIFICANCE DETERMINATION

During the SVI period of the assessment, Environment Yukon commented on the proposed Spill Response Plan and Waste Management Plan submitted by the proponent. It was indicated that under the *Environment Act* a spill is defined in section 132 as "*a release of a substance that is abnormal in quantity or quality in light of all the circumstances of the release or in excess of an amount specified in the regulations.*" Accordingly, the Environmental Programs Branch requires that all spills be assessed and remediated in accordance with the Contaminated Sites Regulation and its protocols and standards. Only reporting spills up to "spill reporting thresholds" identified as 200 litres does not ensure the proponent has met their obligation to report and remediate spills under section 133 of the *Environment Act*.

In determining the significance of the effects of the project activities on environmental quality, specifically relating to the management of spills and wastes, the Designated Office has considered the size and scope of the proposed activities, the relevant non-discretionary legislation, the mitigations committed to by the proponent and the expert information provided by Environment Yukon. The Designated Office has determined that the project activities will result in significant adverse effects to environmental quality that can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATION

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to the management of spills, leaks and waste. These mitigation measures ensure that any residual effects of this project will not be significant and adverse:

4. The proponent shall report all spills as defined in section 132 of the *Environment Act* and ensure that all spills are assessed and remediated in accordance with the applicable non-discretionary legislation as well as the protocols and standards deemed appropriate by Yukon Environment, Environmental Programs Branch.

RESIDUAL EFFECTS

The Waste Management Plan and the Spill Management Plan, in conjunction with the mitigation measures as listed above should be sufficient to detect and remediate any issues with effects to environmental quality from spills, leaks and waste from the project. As the Designated Office is confident that the proponent will carry out their commitments and the mitigations as directed, there should be no residual effects from the project activities on environmental quality from spills, leaks and waste.

CUMULATIVE EFFECTS

Given that there a limited residual effects anticipated from the proposed project, and in consideration of project effects being limited to the footprint of the project area; interaction with spilled contaminants at other sites is unlikely. Furthermore, it is not expected that the project will significantly affect the quantity of waste products to the existing waste management stream at the City of Whitehorse waste disposal facilities.

The Designated Office has determined that this project will not result in significant adverse cumulative effects due to waste and spill management. 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.

AIR QUALITY

The upper surface layer of the tailings has been subject to evaporation since the abandonment and decommissioning of the Whitehorse Copper mine in 1982. Wind erosion has created occasional dust storms from the dry fines on the tailings impoundments[81]. The prevailing winds in the Whitehorse area are from the south-east and during the May to October period average winds range from 14 to 18 km/h, with maximum values of 63 km/h and gusts of up to 101 km/h having been recorded[82]. Blowing dust

[81] YOR Document 2011-0064-019
[82] YOR Document 2011-0064-019

from the tailings impoundment has been identified as an issue for residents of Canyon Crescent[83]. Since the cessation of mining in the early 1980s, and remediation efforts in the following decades, minimal vegetation establishment has occurred on the tailings surface. Reports on the *Vegetative Rehabilitation of Whitehorse Copper Mine* Tailings were authored by D.B. Craig between 1994 and 1996. The results of tests determined that substantial amounts of nutrients would be required to grow plants and regular watering would also be required, at least initially[84].

Laboratory mineralogical analysis was performed in conjunction with the original mine decommissioning to identify the free silicate content of the respirable portion of the dust (i.e. that portion finer than 10 microns). This analysis showed that 6.7% of the tailings sample was of a respirable particle size and that 8% of the particles were free silica[85]. Inhalation of silica can cause silicosis depending on the quantity of silica inhaled and the duration of exposure. The silicosis results in swelling in the lungs and chest lymph nodes and can cause sufferers to have difficulty breathing. Generally it takes between 10-20 years of exposure to silica dust for symptoms to appear. Complications from silicosis can include increased susceptibility to lung-related illnesses[86]. Health Canada however, indicates that there is no apparent lower threshold for adverse effects of particulate matter finer than 10 microns on human health regardless of constituents[87]. Dr. A.E. Hall of the University of B.C. department of mining and a specialist in mine ventilation stated in section 5.6.8 of the 1991 mine decommissioning plan that:

> "*There is a possibility that persons spending prolonged periods of time (several months) in dust clouds generated by wind erosion from the tailings could be exposed to dust levels above those recommended by the American Conference of Government Industrial Hygienists. It would therefore be prudent to adopt remedial action to reduce wind erosion for the long term decommissioning of the mine site until natural vegetation has moved in to stabilize the material. A cover of larger granular material would be adequate to reduce the wind erosion to obviate any risk or nuisance to adjacent sites*."[88]

The plan further recommended in section 5.6.16 that the tailings impoundment should be covered with a 3 inch thick layer of coarse granular rock from the underground rock pile to mitigate against wind erosion. This work was not performed as part of the original decommissioning, resulting in ongoing dust issues for the past 30 years since the mine closed. [89]

Comments received from numerous local residents, Kwanlin Dün First Nation, members of the public, Yukon Department of Environment and Yukon Department of Health and Social Services all identified dust as a concern with the project activities as proposed (see section 4.0).

Part of the proposed decommissioning of the site includes the placement of a 15cm deep gravel cap over the Old Pond area. This is intended to serve both as a surface to make the area useable as limited

[83] YOR Document 2011-0064-003
[84] Craig, D.B. 1996 as cited in YOR Document 2011-0064-002
[85] YOR Document 2011-0064-019
[86] US National Library of Medicine – PubMed Health website: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001191/
[87] YOR Document 2011-0064-080
[88] YOR Document 2011-0064-019
[89] YOR Document 2011-0064-019

industrial land, (i.e. suitable for parking and equipment storage but not the construction of buildings) and to cap the tailings to minimize dust generation in the future[90].

However, construction activities, tailings excavation and increased heavy equipment traffic on the site all have the potential to generate dust and dispersal during project activities prior to the gravel cap being put in place[91]. In addition, the proponent proposes to deposit tailings in the Little Chief pit and subsidences area of the project site but has not proposed to add a gravel cap to either of those areas under their reclamation plan proposal unless it is required by EMR as part of the Reclamation Plan[92]to be provided under the lease. Due to the depth of the pit, the surface area of the tailings will be smaller (17.9 hectares) than if the same quantity of tailings were placed in the Old Pond, this smaller surface area creates an overall reduction in the cost of any surface treatment for the pit.[93]

NON-DISCRETIONARY LEGISLATION

The following non-discretionary legislation is applicable to the project activities:

- The Yukon *Environment Act,*
- The Air Emissions Regulation, specifically section 6
- The City of Whitehorse *Maintenance By-law 2011-03*, specifically section 45

PROPONENT COMMITMENTS

The proponent has provided a Dust Management Plan that includes monitoring and mitigation strategies to be employed during project operations. Staff monitoring and the availability of a public report "hotline" will cause the initiation of dust mitigation measures should dust be observed or reported leaving the project site.[94] Considering that at present there is no dust mitigation, or monitoring at the Whitehorse Copper site, this is a significant improvement over status quo conditions.

There are several commitments the proponent has provided through the assessment process that have been considered when determining the significance of project effects on environmental quality, specifically air quality, including the provision of a dust monitoring strategy and mitigation plan.[95] These commitments, including provisions for dust minimization after project activities have ceased can be found in Appendix A under Section 6.

[90] YOR Document 2011-0064-002
[91] YOR Document 2011-0064-061
[92]YOR Document 2011-0064-015
[93] YOR Document 2011-0064-002
[94] YOR Document 2011-0064-097
[95] YOR Document 2011-0064-097

The implementation of these measures will serve to mitigate against the majority of the adverse effects from dust, however some effects would still remain, primarily dust from the tailings moved to the uncovered Little Chief pit and subsidence areas.

SIGNIFICANCE DETERMINATION

Dust from the Whitehorse Copper site has been an issue since the closure of the mine in the early 1980s. In the project description, the proponent indicated that with the "*small amount of free silica in the dust... human health concerns are not without foundation*."[96]

The proponent has provided a Dust Management Plan that will serve to reduce the uncontrolled dust leaving the project site during project activities. These measures have been reviewed by the Yukon Chief Medical Officer of Health, and were found to have appropriately addressed dust issues from a human health perspective.[97]

The proponent has proposed a gravel cap of 15cm in depth to mitigate against dust generation from the Old Pond area following the completion of project activities. This is consistent with the recommendation of a 3 inch deep granular surface cap in the original mine decommissioning report that was never enacted. This should serve to substantially reduce the generation of dust from wind transport from the Old Pond site. However, the deposition of tailings into the Little Chief pit and subsidence areas with no gravel cap leaves a substantial area (approx 17.9 hectares) of tailings exposed to continued evaporation, drying and generation of dust in the post-project future.

In determining the significance of the effects of the project activities on environmental quality, specifically relating to the air quality impacts from dust, the Designated Office has considered the size and scope of the proposed activities, the relevant non-discretionary legislation, the mitigations committed to by the proponent and the expert information provided by the Yukon Government and Health Canada. The Designated Office has determined that the project activities will result in significant adverse effects to environmental quality that can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATIONS

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to air quality in the form of dust. These mitigation measures ensure that any residual effects of this project will not be significant and adverse:

5. During site closure at the end of the project the proponent shall place a gravel cap to a minimum of 15cm in depth over all areas of tailings deposition, including the Old Pond, the Little Chief pit and the subsidence area. This shall be reflected in the site Reclamation Plan.

[96] YOR Document 2011-0064-002
[97] YOR Document 2011-0064-103

RESIDUAL EFFECTS

The Dust Management Plan in conjunction with the mitigation measures as listed above should be sufficient to reduce and eliminate any issues with effects to environmental quality from air pollution from the project. As the Designated Office is confident that the proponent will carry out their commitments and the mitigations as directed, there should be no residual effects from the project activities on environmental quality.

CUMULATIVE EFFECTS

The proponent's commitments and the mitigations as recommended above should serve to minimize any residual effects to air quality from dust, thereby reducing effects to the overall environmental quality from project activities.

Other activities in the area include the concrete batch plant and the McLean Lake area quarries located approximately 2km to the northwest, however the prevailing winds from the south-east would generally carry dust from those operations away from the project and residential areas. Given the distances, prevailing wind direction, minimal residual dust effects from project activities and location of residential areas relative to the project and McLean Lake area it is unlikely that there would be any significant cumulative effect to air quality from dust.

The Designated Office has determined that this project will not result in significant adverse cumulative effects due to dust. 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.

EROSION AND SEDIMENTATION

The proponent proposes that tailings will not be placed back into the A and B Valley areas of the project site once they are excavated and processed. In the A Valley, tailings presently cover a surface area of 126,500 m^2 to an average depth of 10.5 m; in the B Valley, the tailings cover 77,900 m^2 to an average depth of 9.5 m, all of which is proposed to be removed, exposing the buried natural surface.

The newly exposed ground surface "*will be scarified and allowed to re-vegetate naturally without seeding.... the Project expects that there will be some of the original organic material remaining in these valley bottoms, as this was not removed prior to the original tailings deposition. When the tailings are removed, these organic soils will be exposed, so no further organic material will be required for reclamation*[98].

This statement somewhat conflicts with information provided by the proponent in regards to the decommissioning of the tailings holding dams at the head of the A and B Valley. Initially it was proposed that the decommissioning notches (see Section 9, Public Safety) would extend to within 5m of the valley

[98] YOR Document 2011-0064-002

floor, which would allow for shallow lakes to form in both valleys.[99] However, the proponent later stated that "*part of the material taken from the notch will be placed above the dam. This material will fill in the valley to approximately the level of the bottom of the notch so there will not be a place for water to accumulate.*"[100] The dam material is engineered fill, not organic soil. Thus backfilling the valley bottom to a height of 5m in order to meet the bottom of the proposed notch would cover the organic layer as described and retard re-vegetation of a portion of the valley bottoms.

Snow melt, precipitation events and groundwater seepage can all contribute to erosion of these natural catchment areas. If natural re-vegetation does not establish quickly, the original organic materials may be eroded away to mineral soil, making vegetation re-establishment prolonged and difficult. This in turn can lead to further erosion, and instability of the bank and remaining dam. This may also result in deposition of organics along the footprint of the decommissioned tailings dam or potentially entering watercourses further downstream.

NON-DISCRETIONARY LEGISLATION

There is no directly applicable non-discretionary legislation specifically dealing with erosion issues, although erosion and sedimentation may cause the transport of sediment into waterbodies and cause exceedances of water quality guidelines and standards.

PROPOSED MITIGATIONS

The proponent has stated that they:

> "*...do not expect that erosion control will be required in these valleys because the original ground will be exposed. However, if the use of heavy equipment or other disturbance causes erosion, the Project will adopt an adaptive management plan to mitigate erosion as necessary.*"[101]

This does not substantially mitigate against the potential erosion effects from exposing the original ground prior to vegetation being able to establish and stabilize the soil.

SIGNIFICANCE DETERMINATION

In determining the significance of the effects of the project activities on environmental quality, specifically relating to erosion and sedimentation, the Designated Office has considered the nature, size and scope of the proposed activities, the degree of disturbance and the mitigations proposed by the proponent. The Designated Office has determined that the project activities will result in significant adverse effects to

[99] YOR Document 2011-0064-002
[100] YOR Document 2011-0064-015
[101] YOR Document 2011-0064-002

environmental quality that can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATIONS

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating environmental quality from erosion and sedimentation. These mitigation measures ensure that any residual effects of this project will not be significant and adverse:

6. The proponent shall scarify and seed and/or replant the natural surface of the 'A' and 'B' Valleys as soon as possible after exposure of the original organic soil layer to minimize the likelihood of erosion. Seeding/replanting shall be done with plant species native to the Yukon.
7. Fill material from the tailings dam decommissioning if deposited on the valley bottoms should be covered with a layer of organic soil material and seeded / planted in order to minimize the likelihood of erosion. Seeding/replanting shall be done with plant species native to the Yukon.
8. The proponent shall make best efforts not to increase the disturbed footprint of the site.
9. The proponent shall ensure effective temporary and permanent erosion control measures are implemented on and adjacent to disturbed areas before, during and after undertaking the project activities to prevent the erosion of organic material and the entry of sediment into creeks, wetlands and other waterbodies.

RESIDUAL EFFECTS

The mitigation measures as listed above should be sufficient to reduce and eliminate any issues with effects to environmental quality from erosion and sedimentation from the project. As the Designated Office is confident that the proponent will carry out their commitments and the mitigations as directed, there should be no residual effects from the project activities on environmental quality.

CUMULATIVE EFFECTS

Erosion and sedimentation effects are likely to be limited to the 'A' and 'B' Valley areas, although with decommissioning of the tailings dams in those valleys potential exists for eroded sediments to make their way into downstream waterbodies during a major surface-runoff event. Given the low likelihood of significant residual effects, it is unlikely that erosion effects would interact with any other projects or activities in the area.

The Designated Office has determined that this project will not result in significant adverse cumulative effects due to erosion and sedimentation. 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.

7.0 WILDLIFE AND WILDLIFE HABITAT

7.1 OVERVIEW

The proposed project activities are not likely to destroy or alter any wildlife habitat within the immediate footprint of the project given its poor habitat characteristics. The only exception to this is the proposed snowmobile trail re-route that would require some land clearing to take place and may result in destruction of nesting bird habitat. Disturbance and displacement of wildlife in adjacent habitat may occur because of the noise, smells and increased human activity associated with the project. Generation of wastes and improper storage and handling of wastes can lead to human-wildlife conflicts, particularly with bears and scavengers such as ravens. In addition, the increase in industrial traffic on the Mount Sima Road, the Alaska Highway and the South Klondike Highway from the transport activities associated with the project may result in an increase in direct wildlife mortality due to collisions.

7.2 PROJECT EFFECTS

The following project effects to wildlife and wildlife habitat have been identified:

- Destruction of nesting bird habitat through land clearing activities;
- Disturbance and displacement of wildlife from and in areas adjacent to the project site;
- Human-wildlife conflicts resulting from improper storage and handling of wildlife attractants; and
- Direct wildlife mortality from motor-vehicle collisions along the Mount Sima Road, Alaska Highway and South Klondike Highway.

BIRD NESTING HABITAT

Currently, a snowmobile trail crosses the project area and provides public access to the Trans Canada Trail directly west of the project site for winter users in the Mount Sima and Whitehorse Copper subdivisions. The proponent has proposed a re-route of this trail in order to bypass the project area and allow continued snowmobile access to the Trans Canada Trail via the Mount Sima road right-of-way. Figure 8 shows the existing trail through the project area and the proposed trail along the road right-of way. The yellow line segment shows the area to be cleared for the trail (approximately 180m in length).

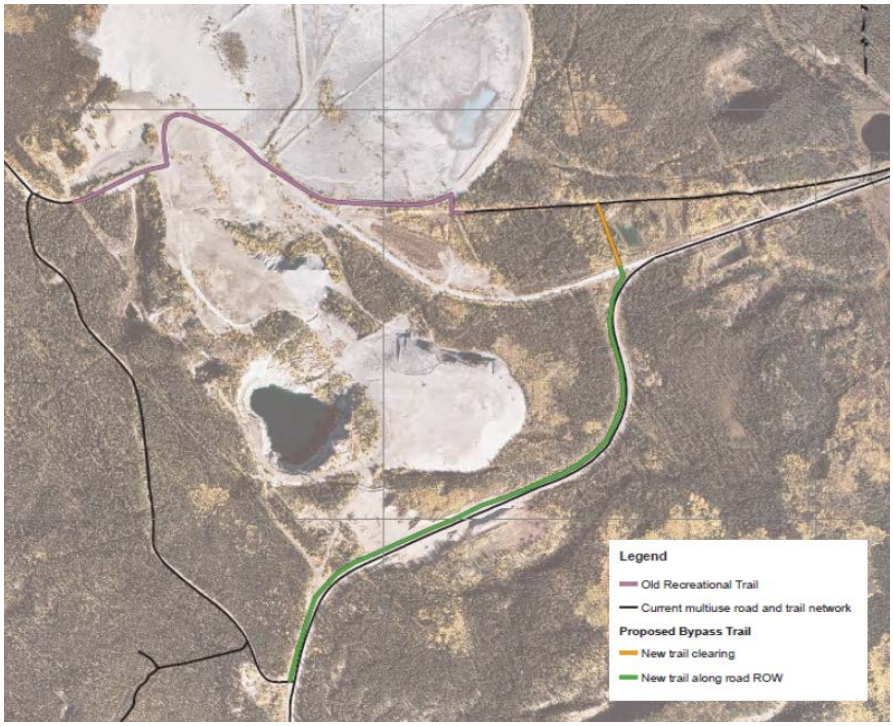

Figure 8. Proposed snowmobile trail re-route**.**

A variety of bird species may be found in and around the project area and the removal of trees has the potential to destroy active nests and limit nesting in the immediate vicinity while clearing work is underway.

PROPONENT COMMITMENTS

There are key commitments the proponent has indicated in the project proposal documents that have been considered when determining the significance of project effects on wildlife and wildlife habitat, specifically bird nesting habitat. This includes completing all clearing prior to bird nesting season. These can be found in Appendix A under Section 7.

NON-DISCRETIONARY LEGISLATION

The following non-discretionary legislation is applicable to the project activities:

- The *Migratory Birds Convention Act* and Migratory Birds Regulations which speak to deposition of substances harmful to migratory birds and the disturbance or destruction of their eggs or nests.

- The Yukon *Wildlife Act* specifically Part 4.

SIGNIFICANCE DETERMINATION:

In determining the significance of the effects of the project activities on wildlife and wildlife habitat, specifically clearing of land for the snowmobile trail re-route, the Designated Office has considered the size and scope of the proposed activities, the relevant non-discretionary legislation and the mitigations committed to by the proponent. The Designated Office has determined that the proposed mitigation measures and compliance with the applicable non-discretionary legislation are sufficient to mitigate the adverse project effects to bird nesting habitat such as they are not significant.

MITIGATION:

No additional mitigation is required.

CUMULATIVE EFFECTS:

Given that the likelihood of significant adverse residual effects is low, it is anticipated that no adverse cumulative effects on bird nesting habitat are expected from project activities.

WOODLAND CARIBOU DISTURBANCE AND DISPLACEMENT

In its present state, the project location receives sporadic human use at various times of the year, including recreational off-road vehicle use in the summer and snowmobiling in the winter. The proposed project activities will increase human presence to 24 hours a day 7 days a week for approximately 9 months of the year and will include the construction of buildings, the operation of heavy equipment and the corresponding noise, smells, vibration and other disturbance associated with those activities.

Environment Yukon has identified woodland caribou as being of particular concern for potential sensory disturbance should the project activities coincide with caribou use in or around the site[102]. The project site is within 3km of the Southern Lakes woodland caribou winter range Wildlife Key Area[103] and it was noted in the proponent's baseline report that caribou have been observed around the project site in winter[104]. In addition, the trucks hauling ore along the South Klondike Highway to port in Skagway will travel through primary wintering habitat for the Carcross caribou herd and increased truck traffic may result in increased caribou collisions and mortality on the highway.

Over the last century, market hunting associated with the Klondike gold rush, resident meat hunting and non-resident sport hunting and the construction of the Alaska Highway with its influx of new residents

[102] YOR Document # 2011-0064-072
[103] YESAB Geolocator, 2011
[104] YOR Document # 2011-0064-002

severely depleted the Southern Lakes caribou population. In the last half century, the winter range of the Southern Lakes caribou population has experienced increasing levels of landscape change associated with timber harvest, residential growth and industrial development. These caribou habitually winter in close proximity to heavily populated areas in the Southern Lakes area presenting a significant management challenge.[105]

The project proponent has been reluctant to provide a defined season of operation for the project and has stated that they expect "*to operate approximately seven to eight months per year, closing during the winter months. The exact start-up and shut-down dates will be largely weather-dependent. For example, if spring starts early, project operations may start early, and if winter starts early, project operations may end early*."[106] Environment Yukon provided information indicating that caribou would be most at risk from project activities during the period from December 1st to March 31st.[107]

NON-DISCRETIONARY LEGISLATION:

The following non-discretionary legislation is applicable to the project activities:

- The Yukon *Wildlife Act*, specifically section 92 in regards to the harassment of wildlife;

PROPOSED MITIGATIONS:

There are commitments the proponent has indicated in the project proposal documents that have been considered when determining the significance of project effects on wildlife and wildlife habitat, specifically woodland caribou disturbance and displacement. This includes giving wildlife crossing the project area right-of way and providing them suitable time to transit the project site without causing unnecessary stress. These can be found in Appendix A under Section 7.

SIGNIFICANCE DETERMINATION:

In determining the effects of this project on wildlife and wildlife habitat, specifically disturbance and displacement of woodland caribou, the Designated Office has considered the nature and timing of the proposed activities, mitigations proposed by the proponent, the relevant non-discretionary legislation and the expert information and proposed mitigations provided by Environment Yukon. The Designated Office has determined that the project will result in significant adverse effects to wildlife and wildlife habitat, specifically woodland caribou due to disturbance and displacement. These effects can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

[105] Florkiewicz et al., 2007
[106] YOR Document #2011-0064-015
[107] YOR Document #2011-0064-072

MITIGATION:

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to the disturbance and displacement of woodland caribou. These mitigation measures ensure that any residual effects of this project will not be significant and adverse:

10. To avoid disturbance to caribou during winter, no project activity should occur from December 1st to March 31st of each year.
11. If project activities are planned during the above noted dates, the proponent shall contact the Environment Yukon Southern Lakes Regional Biologist for advice on additional mitigation.

RESIDUAL EFFECTS

Project activities take place outside of the critical winter season for caribou as noted by Yukon Environment and will not result in the removal of or damage to caribou habitat as the project takes place in areas that are already disturbed by previous mining activity. Given the proponent commitments and recommendations above, the project will not have any significant residual effects on woodland caribou.

CUMULATIVE EFFECTS:

It is expected that compliance with the mitigations recommended by Yukon Environment in the above section will be sufficient to mitigate any cumulative effects from the project on woodland caribou such that they are not significant. Other quarry and industrial activities in the area of Mount Sima, McLean Lake and the Copper Haul Road either shut down or significantly curtail operations during the winter months due to the impracticalities of operating during winter conditions and as such their operations do not overlap with the critical winter season either. While development of new quarry and aggregate operations in the area means a decrease in the overall available caribou habitat, the proposed project takes place within an already disturbed footprint and will not add to the area of disturbed or removed habitat.

Therefore, the Designated Office has determined that this project will not result in significant adverse cumulative effects to woodland caribou and habitat. 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

HUMAN-WILDLIFE CONFLICTS

Wildlife can become attracted to an area as a result of improperly stored wastes. Human-generated garbage tends to be of a high caloric value and if improperly stored requires very little calorie expenditure for wildlife such as bears to acquire. This can include human foodstuffs as well as other wastes and garbage generated by human activities. Motor oil, diesel, gas and anti-freeze and other similar synthetic materials can also be attractants for bears. Once habituated to easily attainable, high calorie food, wildlife will continue to frequent an area, may become unwilling to return to natural forage and become “nuisance” wildlife that may become dangerous to humans. 70% of all reported human-bear conflicts are

due to garbage odour attraction, and overall, 30-40 black bears and 10-15 grizzly bears are reported killed each year due to conflicts with humans in the Yukon[108]. The project area is adjacent to country residential areas and bears that may become habituated or "problem" bears as a result of gaining access to human waste at the project site may also become a threat to human health and safety if they attempt to gain access to wastes or cooking smells generated by nearby residences.

NON-DISCRETIONARY LEGISLATION:

The following non-discretionary legislation is applicable to the project activities:

- The Yukon *Wildlife Act*

PROPOSED MITIGATIONS:

There are key commitments the proponent has indicated in the project proposal documents that have been considered when determining the significance of project effects on wildlife and wildlife habitat, specifically human-wildlife conflicts. These include the storage of waste in bear-proof containers and ensuring Conservation Officers are promptly notified of problem wildlife issues. These can be found in Appendix A under Section 7.

SIGNIFICANCE DETERMINATION:

In determining the effects of this project on wildlife and wildlife habitat, specifically human-wildlife conflicts, the Designated Office has considered the nature and timing of the proposed activities, mitigations proposed by the proponent, the relevant non-discretionary legislation and other relevant information, including established guidelines. The Designated Office has determined that the project will result in significant adverse effects to wildlife and wildlife habitat, specifically due to human-wildlife conflicts. These effects can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATION:

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

12. Waste shall be removed from the site to the Whitehorse landfill on a regular basis so as not to build up a source of odours that may attract wildlife to the site.

[108] MPERG, 2008.

RESIDUAL EFFECTS

Compliance with the recommended mitigations, proponent commitments and non-discretionary legislation directly relevant to human-wildlife conflicts will minimize the potential for human-wildlife conflicts to occur as a result of project activities. As such, residual effects are considered by the Designated Office to be minimal and not significant.

CUMULATIVE EFFECTS

The highest potential for the creation of human-wildlife conflicts in the immediate project area arises from attractant management at individual residences in the surrounding country residential subdivisions. While habituated wildlife such as bears may travel across the project area to feed on various sources of human food, it is expected that the measures taken above would minimize the potential for such wildlife to interact with food sources from the project operations. The proponent has already committed to notifying the Conservation Officer Service in such situations. As such, the Designated Office does not expect any adverse cumulative effects to wildlife from human-wildlife conflicts because of project activities.

8.0 NOISE

8.1 OVERVIEW[109]

The project is located within the City of Whitehorse and adjacent to several different types of land uses, including: industrial quarrying activities to the north along the Copper Haul and McLean Lake Roads; country residential housing developments in the Canyon Crescent, Squatters Road and Whitehorse Copper subdivisions; service industrial development in the Mount Sima subdivision that include one residence per lot; commercial recreation facilities at the Mount Sima ski hill; and a variety of recreational trails.

Project activities have the potential to adversely affect other land uses in a variety of ways as they take place over a large area, involve the use of heavy equipment, the creation noise is proposed to occur 24 hours a day, 7 days per week over an 8 month period for 7 years.

SOUND LEVEL, SPECTRA AND CHARACTER

The human ear interprets sound in terms of the intensity of how many times greater one sound is to another. It is commonly measured in terms of the sound pressure level, or what is better known as the decibel (dB) range. This is represented by a logarithmic scale. It goes from 0 to 140dBA in relation to what a human ear can register. The 'A' added to dB refers to a common filter that corresponds to a

[109] Portions of this section have been adapted to this project from the Project #2009-0030 Evaluation Report prepared by the YESAB Mayo Designated Office. (YOR Document # 2009-0030-124)

frequency range recognized by the human ear. A 10dBA increase in sound represents a doubling of the sound intensity; this highlights the logarithmic nature of the scale. In order to provide further context for sound, the following dBAs provides some reference points for various sound pressure levels:

0 – threshold of hearing

20 – whisper

40 – quiet residential neighbourhood

60 – normal speech

80 – busy office

90 – lawnmower

100 – heavy city traffic

120 – rock concert

140 – gunshot or firecracker

160 – medium jet engine

Another factor for understanding sound is how it acts across a spectrum of frequencies. This ranges from 50 – 20,000 Hz. For example, equipment may exhibit different sound pressure levels at different operating frequencies. For the most part high frequency noises cause greater health effects than low frequency noises[110]. This is an important consideration for this project as it involves a diverse set of equipment likely operating at a variety of frequencies.

Sound pressure level and spectra help to define the sound character, or the 'acoustical signature'. The most common sound character in industry is a 'discrete frequency noise'. It is known for pure tones and is generated mostly from rotating machinery (*e.g.* pumps, gears, internal combustion engines). The second most common sound character in industry is 'broadband noise'. It is known by a rumble, roar or hiss – for example, exhaust from a jet engine. The third most common is 'impulse noise', or impact noise. These are transient events of a short duration such as a gunshot, or intense repeat machinery. This project is associated mostly with discrete frequency and broadband noise. In terms of tones, the human ear and mind discern pure tones more easily than random white noise. Since heavy machinery often results in pure tones this characteristic is important to consider when determining the likelihood of effects.

SOUND PROPAGATION

Sound travels as energy represented by sound waves. Theoretically these waves are ruled by the 'inverse square law', meaning the energy in sound waves (and thus the sound intensity) will drop with the square of the distance to the sound source. For example, if you move 200m away from a D6 Dozer, the

[110] Singal, S.P., 2000

sound level will generally be a ¼ of what it is 100m away. However there are a number of environmental factors that make it difficult to accurately predict how sound will propagate over specific distances. Key factors include the following:

- Ground impedance (*e.g.* surface roughness, ground elasticity).
- Outdoor noise barriers (*e.g.* diffraction of sound by barriers, gaps).
- Effects of vegetation, trees and turbulence.
- Effects of local meteorology (*e.g.* prevailing wind speed, character and direction; temperature; humidity).

COMBINING SOUNDS

Sounds rarely act in isolation. The soundscape is a result of numerous sources of sound combining to be discerned by the human ear. Theoretically, two identical sounds in close proximity will produce a sound level that is 3dB higher. Therefore if two D6 Dozers are operating close to one another, and each of them is emitting 90dB of noise, the combined noise would be 93dB.

AMBIENT SOUND LEVELS AND MAXIMUM EMISSIONS

In general terms, where ambient noise limits are in place, they relate to the sound level from a source as measured at the nearest sensitive receiver. Typically, these limits are defined as the equivalent continuous sound pressure level at a receiver location. Variations in noise levels between day and night are important because background noise levels drop at night and individuals are generally more sensitive to noise during the night.

In Alberta, the legislated ambient sound level for an industrial activity located in a rural location is 40dB from the property line and 56dBA in a townsite.[111] No specific limits exist in British Columbia or Yukon for ambient sound, though most municipalities address the issue through nuisance control bylaws.

In a cross-section of states and municipalities in the United States, "*specified maximum daytime construction noise levels range from 50 – 90dBA in residential areas with about 75dBA as an average. Construction nighttime noise limits range from 45 – 75dBA with an average of about 55 dBA.*"[112]

The Queensland Government Environmental Protection Agency in Australia recommends that noise emission planning levels for developments should be set 10dBA below the relevant recommended level for the receiving land type. For purely residential areas with an average of less than 40 vehicles per hour (such as Squatter's Road), the Queensland EPA recommends a maximum sound emission level of 40 dBA for daytime, 35 dBA for evening and 30dBA for overnight. For areas with mixed use and low-density transportation (average of less than 80 vehicles per hour) such as Mt. Sima Road, Queensland EPA recommends 50 dBA for daytime, 45 dBA for evening and 40 dBA for overnight hours.[113]

[111] Alberta Energy Resources Conservation Board, 2007
[112] Schexnayder, D.J. and J.J. Ernzen., 1999
[113] Queensland Government EPA, 2004

NOISE POLLUTION

The 'sounds' we hear on a daily basis generally become 'noise' when they are too loud, unexpected, uncontrollable, have annoying pure tones, occur at undesirable times of the day and/or interrupt people's activities.[114] Generally a 5dB change is required before there is a perceptible change in the ambient sound level.[115] Noise pollution tends to occur when the change from natural ambient conditions becomes disruptive to normal functioning. A survey of the Department of Transportation for 50 U.S. states found that the greatest cause for complaint, specific to night time construction, was with back-up alarms (41%).[116] Coincidentally this is a safety feature common to large vehicles. It purposely produces an impulse noise in the range of 82 – 107dBA at a distance of 4'. Slamming tailgates (27%), milling (24%), earthmoving equipment (14%) and crushers (6%) rounded out the top noise generators that were a cause for complaint and therefore source noise pollution. The United States Environmental Protection Agency (US EPA) has identified levels of 40dB to 50dB as making it difficult to initiate sleep, and that at levels of 70dB or greater behavioural wakening (i.e. a specific motor or verbal response) will most likely occur.[117]

Activities that create point or non-point sources of noise may result in the following effects to the health and safety of residents, and visitors:

- annoyance;
- sleep disturbance;
- disruption of normal functions (*e.g.* communication and interaction, activities);
- distraction and reduced task performance;
- anxiety and stress;
- startle reflex (*e.g.* reactions ranging from mild surprise to severe shock);
- physiological changes (*e.g.* blood pressure, heart beat, constriction of blood vessels); and
- physiological impacts (*e.g.* nausea, headache, insomnia, loss of appetite, hypertension, heart disease, tinnitus, hearing damage, noise-induced hearing loss).[118]

Residents and visitors may experience quite strong acute effects if the sound is of an impulse nature. Such acute effects could develop into chronic effects if there is repeated incident. Ultimately these effects lead to a reduction in a person's quality of life.

[114] Schexnayder, D.J. and J.J. Ernzen., 1999
[115] Bell, L.H. 1994
[116] Schexnayder, D.J. and J.J. Ernzen., 1999
[117] US EPA, 1981
[118] Singal, S.P. 2000

WORKER EXPOSURE VS. RESIDENT EXPOSURE

Of the potentially affected parties, workers are at the greatest risk for significant health effects. This is due to the fact that they work in close proximity to the sources of noise for long periods of time. However the Occupational Health and Safety Regulations include non-discretionary provisions that will ensure that these effects do not become significant and adverse. Specifically sections 4 – 6 of the Regulations (1986/164) and Part 1 – General, section 1.25.

Workers willingly enter a workplace for the purposes of employment and are aware of the risks. In contrast, local residents are not willing participants. The ambient levels they are used to do not include noise associated with this project and they are usually not informed of when noise risks are highest.

Second, workers are trained and provided with the means to avoid hearing risks. Residents are not provided with this same level of support. Despite the distances, one might argue that residents are at greater risk of health effects compared to workers.

Third, while workers likely have the highest exposure levels to noise and at source, they also are most prepared for that noise given the duration of exposure. Also, they do not work 24/7. Residents will be continuously exposed to varying levels of noise 24/7, depending on their lifestyle. Though these levels will be proportionately much lower, they will still exist. The main point of this discussion is that even if workers are protected from the effects of noise, this does not mean that residents and visitors are equally protected.

The sections below will demonstrate some of the effects that residents and visitors may experience.

8.1 PROJECT EFFECTS

Noise from project activities was raised as a concern during the proponent's pre-application consultations and also in comment submissions from the Yukon Conservation Society, KDFN, TKC and many local residents. The proponent maintains that the:

> "*...main source of noise during project construction and operation will be associated with excavating and transporting the tailings using trucks and heavy equipment. Diesel engines and backup alarms on the vehicles will be the primary sources of noise. Backup alarms typically produce sounds between 87 and 100 decibels and only operate when trucks or heavy machinery are engaged in reverse gear. The processing facility operation would generate minimal noise associated with its operations because the plant will be a partially enclosed structure. Although continuous, the noise generated by the reprocessing plant is not expected to reach excessive noise levels*."[119]

The project and associated activities have the potential to produce noise above natural ambient levels. Ambient sound refers to sound in the outdoors or at locations removed from a noise source. This is in

[119] YOR Document # 2011-0064-003

contrast to occupational noise within or adjacent to a work place. For the purposes of exploring the health effects of noise, this assessment will consider the local 'soundscape'. This references the combination of the current natural ambient levels of the area and the occupational noise introduced by this project. The proponent has indicated that:

> *"There are no quantitative data on noise levels within the Project Area and it is difficult to predict how project sounds will travel or be perceived in the area because a number of factors affect noise emissions. Many of the factors are dynamic and unpredictable (e.g. wind speed and direction, air temperature, topography, background noise)."*[120]

Humans are most sensitive to noise when it occurs between the hours of 10pm and 7am. This is of course due to the fact that most people are trying to sleep. The importance of this should not be understated. Sleep is a "*restorative process during which the organs of the body renew their supply of energy and nutritive elements. Exposure to noise may cause difficulty in falling asleep when retiring, disrupt sleep patterns (i.e,. the five stages of sleep) and awaken people who are asleep*."[121]

At night, ambient noise tends to drop as the level of activity decreases. This is particularly true of two other primary sources of noise to local residents – the Alaska Highway and approach/take off path for the Whitehorse airport.

The proponent has noted that residences in the Mt. Sima and Canyon Crescent subdivisions are "*closer to the Alaska Highway than the project site* [and] *the highway has large transport truck activity 24 hours/day*."[122] Furthermore, the proponent has argued that these properties are already subject to "*varied and continuous noise sources*" concluding that the noise impacts from the project are insignificant.

However, the Alaska Highway is a known and existing source of noise that anyone purchasing or constructing a residence in these areas prior to the commencement of the proposed project would take into account (i.e. it would be a component of the ambient background noise). In addition, current vehicle traffic during the overnight hours is much lower. While aircraft taking off and landing at the Whitehorse airport overfly these areas they do so on a predictable schedule between approximately 6am and 1am. Any new noise from the project would be above and beyond the current level that is accepted and perceived as normal by residents.

The direction of noise is also important in this case as noise from the Alaska Highway would be on the opposite side of any residence from project noise. For example, a resident who uses their house to block highway traffic noise while enjoying their property (i.e. primarily recreating in the back yard with the house between the yard and the highway noise) may be exposed to project noise on the previously "quiet" side of their property.

[120] YOR Document # 2011-0064-003 p.55
[121] Singal, S.P. 2000
[122] YOR Document # 2011-0064-003

TEMPORARY ACTIVITIES

There are a number of proposed activities that are temporary and thus pose short-term noise effects. These include: the construction of the processing plant, re-routing of the snowmobile trail, improving and elevating roads around the project site, spreading of the gravel cap over reprocessed tailings in the Old Pond area and the decommissioning of the A and B Valley tailings dams. The decommissioning of the A and B Valley tailings dams are the project activities that will occur closest to existing residences and will be short term (2-3 months of daily work) near the end of the project.

This type of activity is similar in nature to YG or city road maintenance and construction projects that residents would experience periodically (*e.g.* grading, realignments). However there is a distinction in that those are necessary for public infrastructure whereas this is a private enterprise.

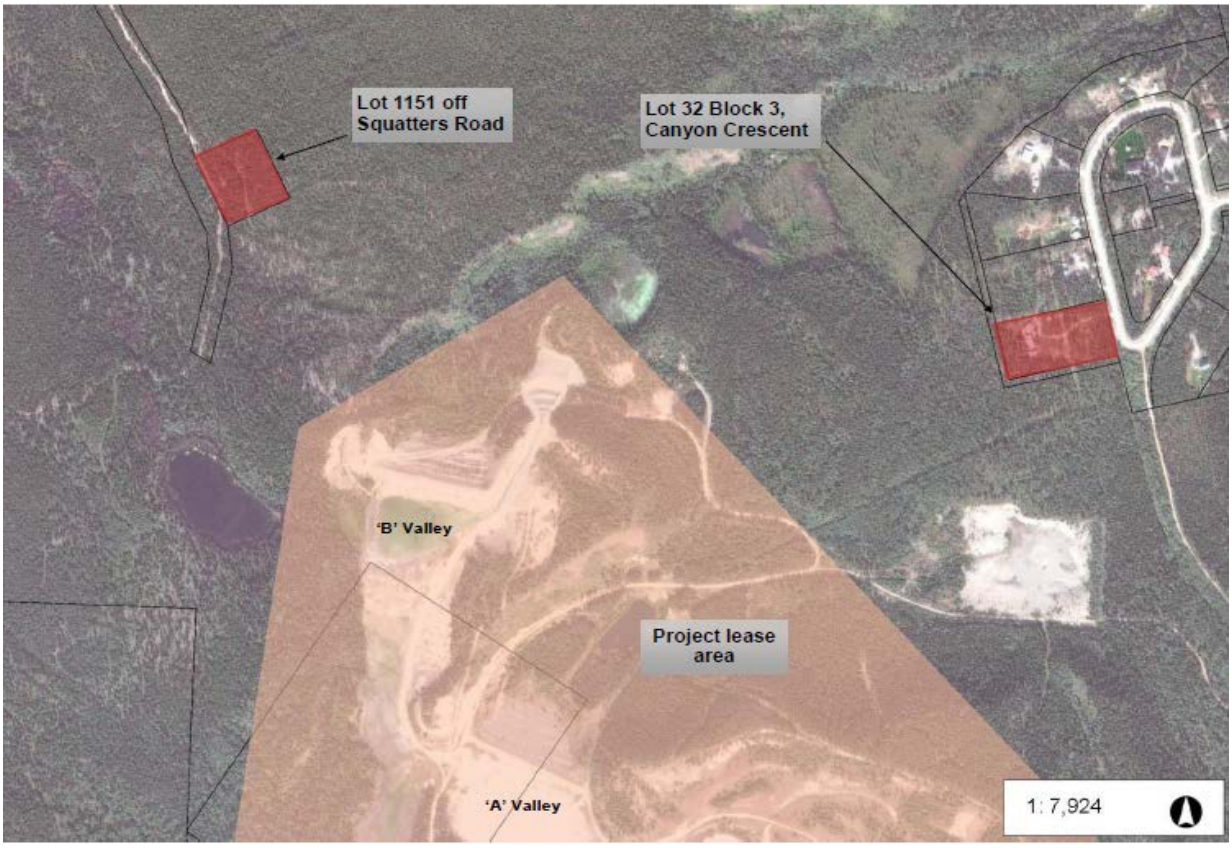

Figure 9. North end of the project area showing the nearest residential lots.

ONGOING ACTIVITIES

Sound generating activities that will be ongoing throughout the operation of the project include the use of an excavator for removal of tailings, transportation of tailings to the processing site (either by dump truck or slurry pipeline), processing, deposition of re-processed tailings and loading/transport of tailings to port

in Skagway. The proponent has also indicated that the use of hydraulic excavation with an in-situ slurry pipeline would be employed where possible in the saturated tailings of the 'A' and 'B' Valley as wet conditions make excavator use hazardous. The proponent estimates that 2-3 dump trucks would be in operation with each truck making 5-6 round trips from the excavation site to the processing site per hour for a total of anywhere from 10 to 18 round trips per hour, 24 hours a day[123]. The proponent has indicated that the loudest noises generated will in all likelihood be the backup alarms used on heavy equipment for safety purposes. These are designed to emit a high pitched beeping noise in the range of 87-100 db. An operating excavator will generate approximately 100 db as well, but at a lower frequency than the alarm. Use of hydraulic excavation equipment and in-situ pipeline in the heavily saturated tailings area would not require the use of backup alarms and would be quieter than diesel powered heavy machinery. It is proposed that the project would have one heavy haul truck transiting the Mt. Sima Road past residences every 48 minutes for 24hrs per day enroute to the Alaska Highway and Skagway. The proponent has made no indication that the extent or level of project activity would decrease during night-time operations, so it is assumed that aside from brief periods of transition between day and night shifts and equipment maintenance, these activities would be more or less continuous 24/7 during the operational season.

NOISE ESTIMATES

The proponent estimated that average noise from an operating excavator at the B Valley dam would be approximately 42 dB at the closest residence 375m away on Squatter's Road. Using the US Federal Highway Administration Road Construction Noise Model (RCNM) software it was estimated that the noise from an operating excavator at the same distance to be 48.9 dB. The noise from the accompanying dump truck the excavator would be loading would be 44.7 dB and the combined noise would be 50.3dB, exclusive of the noise from back-up alarms.

Similarly, the RCNM model predicts the noise from an excavator and dump truck operating at the B Valley dam would produce a combined level of noise of 46 dB at the closest Canyon Crescent residence (600m). Figure 9 shows the location of the two described lots in relation to the project area. These predictions do not take into account differences in topography or the forested ground cover between the project area and residences. Equipment operating at a higher elevation would allow sound to carry further, and contiguous forest would act as a partial buffer to some of the sound. Estimates are based on only one excavator and one dump truck operating at a time – which may not be the case when the project is in operation. They also do not include noise from backup alarms. These estimates come within the lower range of what the US Environmental Protection Agency notes may cause some people difficulties in falling asleep and exceed the Alberta threshold of 40 dB at the property line for industrial activity in a rural area. As these are only estimates, they should be treated with caution.

The project activity with the highest likelihood to generate the most disturbing noise to the nearest residents of Squatters Road and Canyon Crescent, is the decommissioning of the A and B Valley tailings dams due to proximity, the type and size of equipment in use, and equipment operating at higher

[123] YOR Document 2011-0064-032

elevations on the tailings dam. During tailing excavation the elevated roads and tailings dams around the project area may serve as a sound buffer. That is not to say that the excavation of tailings in those areas and the ongoing operation of heavy equipment and back-up alarms may not also be disturbing to residents, particularly at night.

There is no other information available to further qualify this estimate aside from the comment submission provided by Marriane Darragh, who is the closest resident to the 'B' Valley tailings dam at Lot 1151 on Squatter's Road:

> "*I know what it sounds like when material is being moved around the tailings ponds. When decommissioning work was underway in the 1990s, it sounded like machinery was in my driveway, and as I recall, it was only one loader, and one or two dump trucks. But the contractors worked regular hours, and not even until 11 o'clock at night, as allowed under the City of Whitehorse maintenance bylaw. The perception of noise was similar when a loader was operating north of my property, the same distance or further*."[124]

What is known is that the effects of noise at night can be significant since this is the most sensitive time for people. It is feasible that more significant health effects could be attributed to a lower noise emission at night than to the higher noise emissions anticipated for the daytime. These may prove as disruptive to residents and visitors as other sources of noise in the area, primarily as other noises (i.e. airplane takeoffs / landings, Alaska Highway traffic and other industrial activities) drop off in activity during the overnight hours. Given the context of the project area being essentially unused over the last 20-25 years as residential areas have developed around it, any potential for noise emissions that might disrupt the residents or visitors at night can be viewed as significant and adverse, until proven otherwise. Other major sources of industrial noise in the area are the quarry leases along the McLean Lake and Copper Haul Roads which are restricted to the 7am to 11pm operating hours as set out in the City of Whitehorse *Maintenance Bylaw*.

In addition to the potential effects of tailings excavation and the dam decommissioning, the transport truck activity on the Mt. Sima Road associated with the project may be disturbing to residents in the Mt. Sima subdivision. There are at least three commercial properties with attached caretaker residences on Mt. Sima Road, as indicated in Brenda Gadsby's comment submission. In addition, there is an uphill slope from the project area as the road enters the subdivision where noises from trucks gearing up and down are already a concern for Mt. Sima Road residents.[125] If truck noise on Mt. Sima Road occurs during the overnight hours when industrial noises from activities within the subdivision and heavy truck traffic off the Alaska Highway are generally reduced, it may be disturbing to those residents.

[124] YOR Document 2011-0064-063
[125] YOR Document 2011-0064-107

PROPOSED MITIGATIONS:

There are several key commitments the proponent has indicated in the project proposal documents that have been considered when determining the significance of project effects on noise. These can be found in Appendix A under Section 8.

The proponent has indicated that even "...*after mitigation, there may be residual effects that adversely affect the local aesthetics of Canyon Crescent residential lots because of project excavation noise in the A and B valleys outside normal work hours.*"[126]

NON-DISCRETIONARY LEGISLATION

Non-discretionary provisions from the following legislation speak to the requirements for noise safety equipment, maximum daily exposure time to steady state noise and public nuisance.

- *Occupational Health and Safety Act*
- Occupational Health and Safety Regulations
- The City of Whitehorse *Maintenance Bylaw 2011-03*

Sections 42 to 44 of the City *Maintenance Bylaw 2011-03* deal specifically with noise issues:

> *42. Everyone who makes or causes noises or sounds in or on a highway or elsewhere in the City which disturbs or tend to disturb the quiet, peace, rest, enjoyment, comfort or convenience of the neighbourhood or of persons in the vicinity, shall upon warning from any Peace Officer cease making or causing such noises forthwith, or shall be deemed to have contravened the provisions of the bylaw.*
>
> *43. Construction equipment shall not be operated between the hours of eleven o'clock at night and seven o'clock in the morning (11:00 p.m. to 7:00 a.m.) except with the permission of the City Manager or the City Engineer.*
>
> *44. No person shall shout or use a megaphone or other noise-making devices in, or at, or on the streets or other public places of the City without having first obtained a permit from the City Manager or the Manager of Bylaw Services.*

Correspondence with the City of Whitehorse during the course of the assessment indicated that:

> "*If an exemption to the time restriction is granted, the Maintenance Bylaw allows the City to require Eagle Industries to cease any activities that disturb or tend to disturb local*

[126] YOR Document # 2011-0064-003

> *residences. Note the exemption in 43 is to approve extended operation, not to approve disturbance of residences. Therefore, if an exemption is granted in section 43, section 42 can still be enacted to stop the disturbance.*
>
> *In making a decision to provide the exemption the City could refer to Official Community Plan Policies, specific mitigations provided by the applicant as well as natural conditions such as topography and vegetation among other things that may address concerns regarding noise*."[127]

It is worth noting that Section 8.3.5 of the City of Whitehorse *Official Community Plan* limits the operation of quarries to hours consistent with the City of Whitehorse Maintenance Bylaw (see legislation section below) in order to "*mitigate against any perceived or real nuisances to residences near quarry areas.*"[128] This would include the McLean Lake Road and Copper Haul Road quarry leases adjacent to the project and generally serve to preclude them from exemption under the bylaw.

The proponent has indicated that they intend to seek approval for 24-hour operation when they apply for a Development Agreement with the City[129].

SIGNIFICANCE DETERMINATION

In determining the effects of this project on other land uses, specifically noise disturbance, the Designated Office has considered the nature and duration of the proposed activities, mitigations proposed by the proponent, the applicable legislation and other relevant information, including established guidelines and comment submissions from nearby residents. The Designated Office has determined that the project will result in significant adverse effects due to night time noise disturbance. These effects can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATION:

Due to the number of resident concerns raised regarding noise impacts from industrial development close to residential areas within the City of Whitehorse, the Designated Office has determined that it is appropriate to exercise the provisions of section 110 of the *Yukon Environmental and Socio-economic Assessment Act* (Act) that allow for effects monitoring and reporting. Specifically:

...[a Designated Office] may recommend that a project audit or that effects monitoring be conducted in respect of the project.

Section 110(2) of the Act goes on to state that the reporting on the effects monitoring must be provided to the Designated Office.

[127] YOR Document #2011-0064-106
[128] City of Whitehorse, 2010.
[129] YOR Document # 2011-0064-077

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

13. The proponent shall develop and implement a noise monitoring plan to determine baseline ambient noise levels that exist during their proposed operating season. The study shall encompass all hours and seasons of the year during which the project will operate at:
    - the project site,
    - at nearby residences on Squatter's Road, Mt. Sima Road and Canyon Crescent.

    The results of the monitoring shall be provided to the Whitehorse Designated Office.
14. The proponent shall monitor noise levels from project activities during construction and operation, including the shipping of magnetite along the Mt Sima Road. This shall encompass all hours of the day and all seasons of the year during which the project proposes to operate. The monitoring report shall be provided to the Whitehorse Designated Office.
15. If monitoring results show that noise levels at the lease property line exceed 40dBA or the baseline ambient noise level for that time of day and season-whichever is higher of the two values during overnight hours (11 o'clock pm to 7 o'clock am), the proponent shall limit the operation of heavy equipment and other noise-generating activities as necessary to reduce noise levels at the property line from any aspect of ongoing project activities to 40dBA or the baseline ambient noise level for that time of day and season.
16. If monitoring results show that regularly scheduled, project-related haul truck traffic on the Mt. Sima Road during overnight hours (11 o'clock pm to 7 o'clock am) is found to exceed 40dBA or the baseline ambient noise levels at existing residences on the road, project-related haul truck traffic shall be restricted to take place between the hours of 7 o'clock am and 11 o'clock pm.
17. Temporary work including road improvements and dam decommissioning or any other work at higher elevations involving heavy equipment shall only take place between the hours of 7 o'clock am and 11 o'clock PM.
18. Trucks hauling magnetite to Skagway or returning from Skagway shall refrain from using engine retarding brakes on the Mt. Sima Road or within 1km of residences along the Alaska or Klondike Highways.

Monitoring results provided to the Designated Office may be used as per section 110(3) of the Act to provide decision bodies with advice on the basis of the results.

RESIDUAL EFFECTS:

Noises associated with the project construction and operation will still occur. The recommended mitigations shall ensure that overnight noise will not exceed 40dB or the determined ambient noise level at the property line, whichever is higher. Daytime noise will still occur and may exceed 40dB or the daytime ambient level. However, given the industrial zoning of the land this is appropriate for the time and

place and will still be subject to the non-discretionary legislation (i.e. the City of Whitehorse maintenance bylaw noise provisions) and thus not considered significantly adverse. Project activity during the overnight hours may still include the operation of the processing plant and, periodic truck traffic to/from Skagway, provided these activities do not exceed 40dB or ambient levels. Vehicle traffic on the Alaska Highway and Mt. Sima Road is reduced at night, however the project would add heavy truck traffic. Given the mitigations provided, these measures shall ensure that heavy truck noise from the project will not present a significantly adverse noise disturbance to residents along the Mt. Sima Road.

CUMULATIVE EFFECTS

There are 10 quarry leases, the McLean Lake Land Treatment Facility, the McLean Lake Concrete Batch Plant, various light service industrial activities throughout the Mt. Sima subdivision, traffic from the Alaska Highway and aircraft on approach / take-off from the Whitehorse airport that all contribute in part to noise in the general project area (See Figure 10).

All of these activities except for highway and aircraft traffic are generally limited to regular working hours if not the Whitehorse noise bylaw hours. Section 8.3.5 of the Whitehorse Official Community Plan requires all quarry hours of operation be consistent with the City of Whitehorse Maintenance Bylaw (that is 7 o'clock am to 11 o'clock pm) in order to "*mitigate against any perceived or real nuisances to residences near quarry areas."*[130] Airport related noise occurs between approximately 6am and 1am only and highway traffic noise is significantly reduced in the overnight hours. Thus, these activities would not contribute to night time noise disturbance.

During daylight hours, there is a higher level of acceptable noise disturbance and residents may have a reduced exposure to daytime noise in the area depending on their lifestyle (i.e. being away at work, school etc. during regular working hours). That being said, with industrial traffic in the Mt. Sima subdivision, multiple quarries, the concrete batch plant, highway traffic and occasional aircraft traffic on approach ambient noise in the area would be much higher than during night time. However, given the industrial zoning of the land they are appropriate for the time and place and will still be subject to the non-discretionary legislation. If the monitoring and mitigation measures set out in the previous section are enacted as proposed, the project activities should not significantly contribute to cumulative adverse noise effects.

[130] City of Whitehorse, 2010

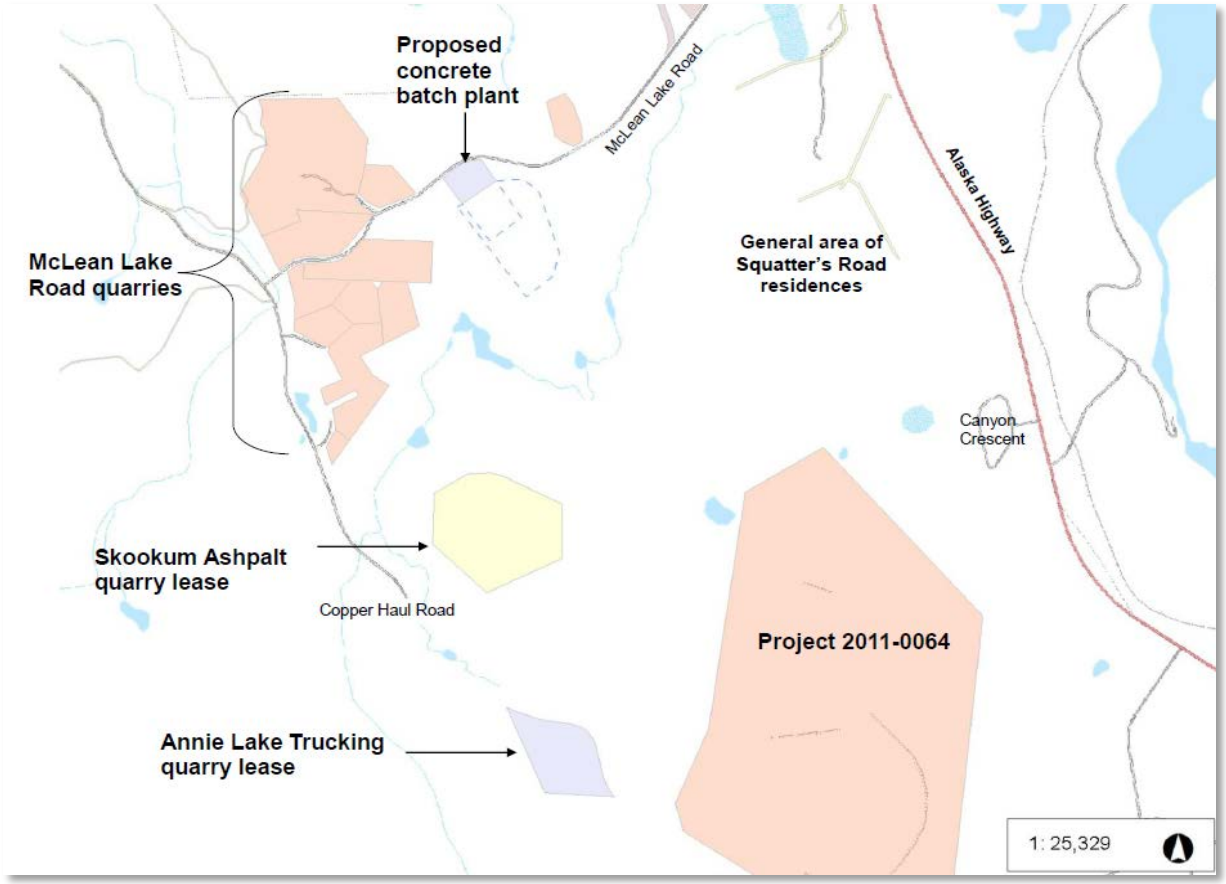

Figure 10. Potential sources of industrial noise in the project area.

9.0 PUBLIC SAFETY

9.1 OVERVIEW

The Whitehorse Copper site has been inactive as a mine since the early 1980s and decommissioned since the early 1990s. In that time, the City of Whitehorse has expanded country residential subdivisions into nearby areas and the site has been used by its neighbours to varying degrees. This includes transiting the project site to access other trails as well was using the project site as a location for dog walking etc. There are various hazards associated with the site and public access has not been restricted in any way since decommissioning of the mine. Turning the site from an empty former mine into an active industrial site will involve activities and equipment that will pose a risk to the safety of the public. There are also safety considerations with traffic on the Mt. Sima road interacting with haul trucks from the project. Mt. Sima has recently opened summer attractions including a zip line and adventure park which will increase summer recreational traffic on the access road.

There are additional safety considerations around the two tailings dams proposed to be deconstructed at the head of the A and B valleys. A potential exists for breach and collapse if the deconstruction work is not performed in the proper manner. Excavation and re-deposition of tailings in the Old Pond area will make use of existing perimeter berms to contain the tailings during project activities. According to the Canadian Dam Association, *"structural failure can cause severe damage to the environment and may result in loss of life."*[131] Thus, it is important to ensure risks to public safety from the use and deconstruction of these dams is minimized.

9.2 PROJECT EFFECTS

SITE ACCESS

Local residents have identified continued access through the tailings deposition area in order to access other trails and to recreate in the area (i.e. dog walking) as an important concern. It is not in the interest of public safety to allow public access to active industrial areas, which include excavation and processing areas, given the use of heavy equipment and the potential for constant landscape changes. New areas are being excavated and refilled with slurry tailings on an ongoing basis throughout project operations and excavation "*will be completed systematically to efficiently access all tailings, so the potential hazard areas will be focused in specific areas that will be reclaimed as the project progresses.*"[132]

NON-DISCRETIONARY LEGISLATION

The Yukon Territory has no trespass legislation, unlike most of the provinces in Canada. As a result, the only non-discretionary legislation regarding trespass in effect is the *Criminal Code* which is federal law. Section 41(1) of the *Code* has provisions to allow for reasonable amounts of force to be used when

[131] Yukon Water Board / YESAB – Dam Guide, 2012
[132] YOR Document 2011-0064-002

removing a trespasser from private property. Section 177 of the *Code* is the only offence related to trespass and stipulates that to trespass at night is a summary conviction offence.

PROPONENT COMMITMENTS

There are several key commitments the proponent has indicated in the project proposal documents that have been considered when determining the significance of project effects on public safety related to project area access. These include construction of the snowmobile bypass trail, posting signage, filling current safety hazards in the subsidence and pit areas, excavation planning to minimize hazard areas and contouring of slopes prior to seasonal shutdowns. These can be found in Appendix A under Section 9.

SIGNIFICANCE DETERMINATION

Proponent commitments around signage may not be sufficient to keep members of the public out of unsafe areas, or areas where they could potentially be exposed to unsafe conditions (i.e. working heavy equipment, unstable landscape features etc.). Of particular concern are all-terrain and off-road vehicles which can access the site via numerous trails and roads. Due to the speed at which these vehicles can travel, they are much less likely to observe signage or potential hazards than pedestrians. While efforts have been made to re-route the snowmobile trail in order to prevent conflicts with winter users, there exists a great potential for summer and spring/fall season conflicts between project activities and recreational users either making use or transiting through the project site. The Designated Office has determined that the project will result in significant adverse effects to public safety, specifically due to access by pedestrians and off-road vehicles during project operations. These effects can be eliminated, reduced or controlled by the application of mitigation measures such that they will not be significant.

MITIGATIONS

19. The proponent shall, in addition to signage, implement appropriate traffic control measures to prevent all terrain and off-road vehicle access to the site during project activities.
20. The proponent shall work with local residents to identify trails through the project area and assist in providing alternate continued access to recreational values such as the Copper Haul Road TransCanada Trail by way of establishing a perimeter trail. This will reduce the likelihood of local residents accessing the project area for recreational purposes and exposing themselves to safety risks on site.

RESIDUAL EFFECTS

Given the proponent's mitigation measures, and adherence to the proposed mitigation measures, it is not anticipated that there will be any significantly adverse residual effects. The proposed snowmobile trial re-route and proposed mitigation for the provision of a perimeter trail will allow continued access to recreational values by local residents and thereby negate any negative effect to the overall number of

trails or public access to trails in the area. Bypassing the project site via these trails will mean that people will be less inclined to trespass across the project area and be exposed to on site hazards.

CUMULATIVE EFFECTS

There are numerous quarries, aggregate pits and other industrial and natural resource extraction activities occurring along the Copper Haul Road and McLean Lake Road areas that could affect public safety. However, these sites are all bound by permit conditions to restrict access and existing trails are routed around active quarrying areas.

The Designated Office has determined that this project will not result in significant adverse cumulative effects due to site access or to public access to recreational trails. This is in consideration of the lack of residual effects of this project, and the interaction with the effects of other projects (for which proposals have been submitted) or other existing or proposed activities.

TRAFFIC

The project proposes to ship magnetite via haul truck to Skagway estimating that there would be approximately 15 round trips per day resulting in one truck approximately every 48 minutes during the period of operation from March to December. This will result in a significant increase in traffic over present conditions on the Mount Sima Road. Noise considerations of the traffic increase have already been addressed in section 8. Potential adverse effects of this increase in heavy truck traffic to public safety include: lack of visibility for heavy trucks merging from the project site, conflict with traffic travelling to residences and commercial establishments on the Mt. Sima Road, and an increase in heavy truck traffic on the Alaska and Klondike Highways. This could result in potentially more collisions as well as wear and tear on the road surfaces. In addition, the Klondike Trail of '98 International Road Relay running race will take place each September along the Klondike Highway, adding a significant number of pedestrians and support vehicles on the South Klondike Highway during the two day period of the race.

NON-DISCRETIONARY LEGISLATION

Heavy trucks transporting ore to Skagway will be subject to the same non-discretionary safety legislation as all other commercial carriers on the Yukon's highways including:

- *Highways Act* (Yukon);
- *Motor Vehicles Act* (Yukon);
- *Dangerous Goods Transportation Act* (Yukon);
- *Transportation of Dangerous Goods Act* (Canada);
- *Commercial Vehicle Drivers Hours of Service* (Canada); and

- the *National Safety Code* administered by the Canadian Council of Motor Transport Administrators.

PROPONENT COMMITMENTS

The proponent has committed to suspending haul traffic to Skagway during the Klondike Trail of '98 International Road Relay in order to mitigate against potentially significant adverse effects to public safety due to traffic.

SIGNIFICANCE DETERMINATION

An increase in heavy vehicle traffic on the Mt. Sima Road will nonetheless be subject to the same safety requirements and rules of the road as existing traffic. Speed limits, signage and road engineering are all in place and the City of Whitehorse OCP directs that:

> "*Heavy equipment and trucks shall access industrial development at the Whitehorse Copper mine site via Mt. Sima Road, to be upgraded as required. Other roads in this area may be used for access for employees and light service vehicles*."[133]

The Designated Office has determined that the increase in heavy truck traffic, while representing an adverse effect to public safety in that it increases potential risk of collisions, does not represent a significantly adverse effect to public safety in consideration of the proponent's commitments, existing non-discretionary legislation, road design and traffic safety measures. In addition, the roads to be used are designated for the purpose and at least in the case of the Alaska and South Klondike Highways already subject to heavy truck traffic.

MITIGATION

No further mitigation required.

CUMULATIVE EFFECTS

Heavy trucks on the Alaska Highway are responsible for providing the vast majority of all goods to residents and businesses in the Yukon as well as some goods to Alaska in the United States. As well, the Minto Mine presently ships ore to port in Skagway via heavy trucks on the Alaska and Klondike Highways.

The port of Skagway, Alaska is the northernmost ice-free deep water port in North America and its cruise ship terminal handles upwards of 900,000 passengers per summer as of the end of 2008.[134] Many of

[133] City of Whitehorse, 2010 p. 51
[134] Skagway Development Corporation, 2011. www.skagwaydevelopment.org/portofskagway.html

these passengers continue their journey via coach bus along the Klondike Highway to attractions in the Yukon and Alaskan cities such as Fairbanks and Anchorage via the Alaska Highway. This makes the South Klondike Highway between Skagway through Carcross and on to the junction with the Alaska Highway south of Whitehorse a major tourist route during the summer. Slow moving coach buses, motorhomes and passenger cars frequently use the South Klondike Highway and pull over at its many attractions including: Log Cabin on the Chilkoot Trail, the suspension bridge, Tutshi Lake, Windy Arm of Tagish Lake, the community of Carcross, the Carcross Desert and Emerald Lake. In addition, tourists taking the White Pass and Yukon Route scenic railway board and disembark from coach buses at the Fraser Customs station in BC and Carcross in the Yukon.

The peak season for tourism traffic on the Klondike Highway directly overlaps with the operational season of the proposed project. The Skagway ore terminal is already the destination of haul trucks from the Minto and Bellekeno mines and is strategically placed to be a major port in future construction, resource extraction and other industrial activities in the north. The cumulative effect of heavy truck traffic on public safety on the Klondike Highway between Whitehorse and Skagway may become significantly adverse if the proposed project and other projects proposing to use the port become a reality.

Yukon Economic Development has provided three traffic scenarios in their *Yukon Ports Access Strategy* for near, medium and long terms. In the short term, it is anticipated that:

> "... *a number of smaller mines are likely to be developed*... [with approximately] *one half million tonnes of mineral ore or concentrate annum will be shipped using standard B-Train highway truck combinations carrying 50 net tonnes per load, 35 one-way (and 70 two-way) truck movements would be required over a 300-day year. 40 one-way movements (80 two-way) would be required over a 250-day year (5 days per week and a two-week Christmas break.) If one truck is equivalent to three passenger vehicles, 80 two-way truck movements would be the equivalent of adding 240 vehicles to the highway system. The number of trucks could be reduced if B-Train bulk carriers carrying larger loads were to be used. Pavements may have to be further strengthened to carry these heavier loads. Any of the Yukon highways can accommodate this volume. Therefore, the short-term impact on the Yukon road system will not be significant as a result of the additional movement of trucks."*[135]

It is important to note that the above quote from the *Strategy* is in relation to required surface infrastructure (i.e. highway design) not impacts to traffic safety or tourism.

Medium term estimates from the *Yukon Ports Access Strategy* are based on likely developments across the Yukon producing 1.5 million tonnes per year. According to the strategy *"if all this volume is moved by truck, the number of two-way truck movements would be in the order of 210 to 240 trucks per day. With passenger car equivalence of 3.0 this equates to about 600-700 passenger car equivalents per day – still well below the capacity of existing highways.*"

[135] KPMG and Gartner Lee, 2006 p. 12

The long term scenario developed in the *Strategy* involves the development of all other anticipated ore deposits (excluding the Crest deposit in the Peel region) as well as pipeline projects and estimates that the development, operation and export commodities of these mines is about 2.5 million tonnes per year.

> "*If all this volume is moved by truck, the number of two-way truck movements would be in the order of 350 to 400 trucks per day. With passenger car equivalence of 3.0 this equates to about 1,050 to 1,200 passenger car equivalents per day. The presence of 350 two-way truck movements per day on a highway represents approximately one truck passing a given point every three minutes. This number of trucks could tend to form convoys that may inhibit the movement of other road users.... if existing summer general traffic increases at 7% per annum due to increased economic activity, baseline traffic on Yukon highways will double in 10 years. If the mineral and project traffic is added to this mix, the total traffic will increase significantly, but all highways will still be well below capacity."*[136]

The *Strategy* long-term, high-volume scenario is based on production of 27 million tonnes per year across the Yukon (including the Crest deposit) requiring 3,600 two-way truck movements equivalent to 11,000 passenger cars per day. This would require the "*construction and reconstruction of roads to very high standards and the logistics of loading, hauling and unloading this many trucks would not be economical. Therefore, consideration would have to be given to a rail spur following the Dempster Highway and connecting the Crest Deposit to Haines at a distance of 970km."*[137]

Anticipated project volumes are in the range of 250,000 to 300,000 tonnes of magnetite per year over a period of six or seven years.[138] As the previous quote shows, this would represent 50 to 60% of the short-term tonnage estimate developed in 2006 in the *Yukon Ports Access Strategy,* which did not consider this project.

Current shipments from Minto Mine were estimated in the *Strategy* as being 11,000 tonnes per year and current publically available information indicates that in 2011, 37.1 million pounds (approximately 16,828 tonnes) of copper in concentrates were shipped from Minto, and they plan to increase production.[139] This equates to 673 round trip 50-tonne truck movements per year from Minto.

Ore from the Bellekeno mine is also hauled via truck to port in Skagway. According to information provided in Alexco Keno Hill Mining Corp.'s project proposal for development of the Lucky Queen and Onek deposits there is estimated to be a total of 52 round-trip ore truck movements from the three mines per day.[140] No information was provided as to the length of the shipping season, but based on temporal overlap with the proposed project that equates to 12,740 round trip truck movements over the approximate 35 weeks (end of March to beginning of December) that the proposed project would be shipping.

[136] KPMG and Gartner Lee, 2006 p. 13
[137] KPMG and Gartner Lee, 2006 p. 13
[138] YOR Document 2011-0064-002
[139] Capstone Mining Corp, 2012. Website: http://capstonemining.com/s/Minto.asp
[140] YOR Document # 2011-0315-032

Given the proponent's estimates of 30 round trips per day, 24/7 for an approximate 35 week operating season (end of March to beginning of December) this equates to 7,350 round trip truck movements per annum. Combined with estimates from Capstone's and Alexco's operations estimated cumulative traffic would be over 20,000 round-trip truck movements per year, concentrated around the busy summer months when tourist traffic would also peak. This falls into the near-term estimates from the *Yukon Ports Access Strategy* as noted above.

Although there is a large increase in the volume of traffic and that will increase potential safety conflicts with other road users, the *Yukon Ports Access Strategy* has indicated that cumulative traffic of 80 truck movements per day would be below existing highway capacity. That being said, delays at border crossings, slow moving and frequently stopping coach bus and recreational vehicle traffic is considerable on the highways involved. Speeding, tailgating, and many other unsafe driving practices are all possible from both haul trucks and personal vehicles on the road. Resources available to the RCMP for highway-related enforcement along the South Klondike Highway are unknown but are assumed to be adequate and any additional resource requirements to ensure public safety on the highways would be identified by the RCMP.

Given the small incremental change in the overall annual highway use by heavy industrial trucks, and the standards to which trucks must travel and roads are designed, the Designated Office has determined that the project will not result in significant adverse cumulative effects to traffic safety on the Alaska and South Klondike Highways. 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.

DAM SAFETY

Once the 'A' and 'B' Valleys are left empty of tailings, there is potential for storm water or heavy snowmelt to form standing surface water behind the tailings dams. As these dams were engineered to hold tailings, not water, they may not be sufficiently strong to retain water (see Figure 11). An engineering study conducted by AECOM classified failure of both the 'A' and 'B' Valley dams as being of significant consequence for environmental and core values, low consequence for loss of life and low consequence for infrastructure and economics as per the Canadian Dam Association 2007 standards.[141]

The proponent proposes to decommission the dams following tailing excavation by excavating out a V-shaped notch in each to prevent the formation of "*anything more than shallow lakes*."[142] These notches are proposed to extend to within approximately 5 metres of the valley floor. It is proposed that material excavated from the dams will fill in the valley approximately to the level of the bottom of the notch in order to prevent the storage of water behind the structures. However, as noted in Section 6 of this report, this directly conflicts with the reclamation objectives of ensuring natural re-vegetation in the upstream areas. Yukon Environment, Water Resources has indicated that notching and moving fill upstream of the dam

[141] YOR Document 2011-0064-017
[142] YOR Document 2011-0064-002

locations will "*not return the valleys to their natural state. These rather large dams were put into a decommissioned state by previous operators.* [Water Resources] *was satisfied with the work that was done and the AECOM report commissioned by YG shows they are in good condition. If this condition is to be changed it should be to improve the situation.*" [143]

While surface ponding and resulting hydraulic pressure shows no signs of endangering the dykes and dams on site, the proponent has recognized that "*potential exists for future problems. The A Valley and B Valley dams were constructed with somewhat impervious layers, so moisture seepage through the dams is restricted. This is especially true of the B Valley dam, plus the B Valley has several water inputs from springs, so the B Valley tailings pond is mostly covered with persistent surface ponds of up to a metre in depth. This lack of de-watering of the tailings in B Valley exacerbates the dam stability issue…."*[144]

The 'A' Valley dam is approximately 150m long and 34 m high. The dam crest is about 8m wide and provides 4m of available freeboard between the tailings and the crest on the upstream side (Figure 11). The bottom of the proposed notch will be 28m below current dam height and will be approximately 80m wide.

The 'B' Valley dam is approximately 150m long and 22m high, with the downstream slope consisting of a series of benches with a two level rip rap buttress on the east half. The rip rap benches are approximately 2m high by 3.5m wide (lower) and 4m high by 8m wide (upper bench). The main bench which extends the full length of the dam is about 15m wide and extends about 18m below the crest of the dam (Figure 11). According to AECOM, "*the dam appears to have been constructed using locally available gravel with cobbles and boulders*."[145] The proposed notch in the 'B' Valley dam will be 18 metres deep and 55m wide.

If the international market price for iron ore or other negative economic conditions occur, this could cause the project to cease operating. The proponent has made comments in regards to the current price of iron ore on the international market driving up supply as it becomes economically viable for more mines to come into production. The potential increase in supply may reduce market prices in upcoming years. The proponent has further indicated that if prices drop to a level of around $80 per ton it may be economically unviable to continue the project.[146]

According to the proponent "*depending on when this happens, the valleys might still be wholly or partially full of tailings."* Partial excavation of the tailings would change the conditions behind the dam and potentially allow for significant ponding of water upstream which could compromise the integrity of the dam structures. However, "*the Project expects that the reclamation bond required under the Yukon Lease will be sufficient to reclaim the site in the event of unexpected closure*."[147]

[143] YOR Document 2011-0064-036
[144] YOR Document 2011-0064-002
[145] YOR Document 2011-0064-017
[146] YOR Document 2011-0064-105
[147] YOR Document 2011-0064-015

Yukon Environment, Water Resources submitted the following recommendations in regards to the issue of dam removal:

> "[Water Resources] *would like the dams completely removed. If this will not be happening and can be justified using an engineering approach we would at minimum like the breach to be designed by an engineer and be to natural valley elevation...*.
>
> *What* [Water Resources] *would be looking for here... is an engineered plan to breach the dams down to streambed or ground level.* [WR] *would not necessarily be asking for total removal of the structure so long as a sound stamped plan was put forward... The proponent pushed his plan as something positive for the local environment and one of the major parts was restoring the A and B valleys to their original condition. Without breaching to ground levels this could not be done.*
>
> *The proponent could limit concerns* [in regards to incomplete excavation of the valley tailings due to changes in economic circumstances] *by processing the A and B valley tailings first rather than waiting until the end of the project. A recommendation... to include the cost of this tailings removal and valley naturalization in the security money would aid in this regard*."[148]

At present, the A and B Valley areas are proposed to be the last areas excavated as infrastructure costs and operational practicalities make excavating tailings in closer proximity to the processing plant a more viable business strategy for the proponent. During excavation of the Old Pond, it is proposed that it will be divided into six individual cells that will allow both excavation and deposition simultaneously. Cells are proposed to be separated by internal berms made of coarse, compacted tailings. According to the proponent: "*constraining slurry deposition to smaller cells in this fashion gives the Project greater control over beach development and decant pond formation and minimizes water loss through evaporation. The initial cell will be emptied via deposition of tailings into the north subsidence area, which will hold almost one year's volume of barren tailings."*[149]

NON-DISCRETIONARY LEGISLATION

There is no legislation that speaks to dam construction, however the Canadian Dam Association Dam Safety Guidelines set out the following guiding principles which can be considered industry best practices:

> a) *The public and the environment shall be protected from the effects of dam failure, as well as release of any or all of the retained fluids behind ha dam, such that the risks are kept as low as reasonably practicable.*
>
> *b) The standard of care to be exercised in the management of dam safety shall be commensurate with the consequences of dam failure.*
>
> *c) Due diligence shall be exercised at all stages of a dam's life cycle.*

[148] YOR Document 2011-0064-036 pp. 17 and 23
[149] YOR Document 2011-0064-032

d) A dam safety management system, incorporating policies, responsibilities, plans and procedures, documentation, training, and review and correction of deficiencies and nonconformances, shall be in place. [150]

PROPONENT COMMITMENTS

The proponent has maintained that the final details of the decommissioning of the A and B dams will be part of the Reclamation and Closure plan that will be submitted to Energy, Mines and Resources as per the Yukon Lease. In addition, it has been recognized by the proponent that "*if a detailed engineering plan is required by EMR, it will be submitted as part of the Operations Plan submitted for review… as required by the Yukon Lease as part of the regulatory process.*" The proponent has also recognized that "*placing barren tailings behind the existing containment structures in the Old Pond area will require additional engineering studies to determine what, if any, work will be required to stabilize or enhance those structures and ensure that they meet current Canadian Dam Association Guidelines*."[151]

a. Aerial view

[150] Canadian Dam Safety Association, 2007
[151] YOR Document 2011-0064-002

b. A Valley dam downstream slope c. B Valley dam downstream slope

Figure 11. A and B Valley tailings dams (Source: AECOM, 2010. YOR Document 2011-0064-017)

SIGNIFICANCE DETERMINATION

The Designated Office has determined that proper management and deconstruction of tailings dams on the project site is important for public safety and environmental protection. Project activities will change the loadings behind the existing dams by removing and re-depositing tailings material and potentially create situations which could cause dam failure and inherent significant adverse effects to public safety, including the safety of project employees. The expert opinion provided by Yukon Government, Water Resources in regards to the current good condition of the dams and the point made that should changes be made, it should be to improve the situation is important to consider; as is the potential for international economic factors, primarily the price of iron ore, to make the project unviable economically. If project activities cease prematurely leaving tailings in a partially excavated state this could lead to a situation which compromises the dams and could increase the risk of dam failure. It is also recognized that the Yukon Water Board has a significant level of expertise on the issue of dam management and will provide further direction to the proponent as to the maintenance, re-engineering and deconstruction of the dams as necessary.

The Designated Office has determined that the project will result in significant adverse effects to public safety from the management and deconstruction of the tailings dams, including if the project is left in a partially completed state. These effects can be eliminated, reduced or controlled by the application of mitigation measures.

MITIGATION

The following mitigations are specified to eliminate, reduce or control significant adverse effects of the project relating to the management and deconstruction of the tailings dams:

21. The proponent shall be required to stabilize or enhance the dam structures and ensure they meet current Canadian Dam Association guidelines. This includes containment structures in both in the Old Pond area and modifications to A and B valley dams.

22. An appropriately engineered and stamped deconstruction plan shall be developed for the A and B Valley tailings dams.
23. The A and B Valley dams shall be breached down to streambed or natural elevation upon deconstruction.
24. Security provided for reclamation under the applicable provisions of the *Quartz Mining Act* shall be adequate to reclaim the site in the event of unexpected closure. Development of security shall include consideration of managing the A and B Valley dams if all or part of the tailings have been removed when the unexpected closure occurs.

RESIDUAL EFFECTS

The tailings containment dykes and dams in the Old Pond area will remain following project activities, however the Designated Office has determined that if they have been properly engineered and managed as per the proponents commitments, the recommended mitigations and any direction provided by the Yukon Water Board, there will be no significantly adverse residual effects relating to dam safety. If the A and B Valley dams are deconstructed in a similarly consistent manner, there will be no dams in place at the end of the project and as such, no significantly adverse residual effects relating to dam safety.

CUMULATIVE EFFECTS

Safety issues related to the tailings dams are localized to the project site and residual effects are considered to be not significant. The Designated Office has determined that there will be no significantly adverse cumulative effects due to dam safety.

CONCLUSION OF THE ASSESSMENT

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

In conclusion, the Designated Office has 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 report and/or proposal information documents provided by the proponent.

These mitigations are important because they help to mitigate significant adverse effects of the project. I have confidence that the proponent will implement these mitigations and I expect that the decision body and regulators will ensure that these activities are undertaken as proposed.

SECTION 5 WATER QUALITY

- Adaptive Management Plan Framework to guide water quality monitoring and management activities including thresholds for implementation of responses and planned contingency measures
- Reporting of monitoring results and all actions to Water Resources
- Wells and sumps strategically located and sized so they can serve as water quality monitoring points and groundwater interception locations if capture and treatment is required. See table below from YOR Document 2011-0064-081.

Table 7 Whitehorse Copper Mitigation and Groundwater Containment Monitoring and Collection Points

Monitoring Point	Location	Rationale	Installation Timing
A Sump	Copper Seep at head of A Valley Tailings Impoundment	Collect seepage from the northern portion of the Old Pond. This sump would be designed to collect and allow for passive treatment of contaminated waters as required.	Prior to Start-up of Tailings reprocessing
W1	A Valley	This well will be used to monitor, intercept and pump A Valley groundwater for treatment. The well will be located in the paleo-channel feature below the A Valley.	Prior to operations commencing in the A Valley
B Sump	Head of B Valley Tailings Impoundment	Seepage from the western portion of the Old Pond currently discharges to the B Valley. This sump would be designed to collect and allow for passive treatment of contaminated waters as required.	Prior to Start-up of Tailings reprocessing
W2	B Valley	This well will be used to monitor, intercept and pump B Valley groundwater for treatment. The well will be located in the paleo-channel feature below the B Valley.	Prior to operations commencing in the B Valley
Old Pond Sump	Old Pond Seepage Area	This sump would collect seepage from the eastern margin of the Old Pond. Historical reports indicate that water discharged from the Old Pond during active tailings placement at this location. A bedrock ridge located along the northern extent of the Old Pond effectively limits groundwater flows in that direction. This sump would be designed to collect and allow for passive treatment of contaminated waters as required.	Prior to Start-up of Tailings reprocessing
W3	Below Pit Lake	Two additional bedrock groundwater wells located on either side of existing MW1011-1 below the Pit Lake. These wells will serve as a network of interception wells to capture potentially contaminated groundwater.	Prior to Start-up of Tailings reprocessing
W4	Below Pit Lake		
W5 S and D	Between Old Pond/Pit Lake and Crater Lake	Shallow overburden well (W5S) and adjacent deeper bedrock well (W5D) located downgradient of the Old Pond and Pit Lake so groundwater quality below potential sources and upgradient of potential groundwater users can be monitored.	Prior to Start-up of Tailings reprocessing

- All process water will be obtained from the open pit, recycled and treated, if required prior to discharge. All surface run-off from tailings repositories, roads and other site works will be captured using trenches and routed to settling basins for reuse in project operations or for possible treatment and disposal. No potentially contaminated surface runoff will leave the project site.
- Pre-treatment of the Pit Lake with sugars and alcohols to increase oxygen consumption and decrease dissolved metal loadings, and a secondary pumping system to capture and pump potentially contaminated water from monitoring and interception wells and sumps at the pit lake.

- Surface water monitoring will be conducted downgradient of the site during the period of operations and for three years following operations.
- Groundwater in the area of the A and B Valley is intended to be conducted for a two year period following the end of the project (due to higher permeability sediments and shorter travel times).
- Groundwater downgradient of the Little Chief Pit is proposed for a period of 5 years following the end of the project based on observed permeability of the bedrock in this area.
- See the table from YOR Document 2011-0064-081 below for the proposed water quality monitoring locations and schedule:

Table 8 Proposed Water Quality Monitoring Locations and Schedule

Monitoring Location	Sample Type	Sampling Locations	Monitoring Frequency
Nearby Surface Locations	Surface Water	91-5, 91-6, Pit Lake, Old Pond, Big Chief Lake, A Valley, B Valley, B Valley 2, B2 Springs, Beaver Pond, Copper Lake	a) Monthly during Seasonal Operations. b) Quarterly when no Seasonal Operations. c) Bi-annually for two years following end of Project
Distant Surface Locations	Surface Water	Lower Crater Lake, Crater Lake, Highway Weir, Miles North, Miles South	a) Quarterly during Seasonal Operations. b) None when not operating
Sumps	Surface Water / Seepage	A Sump, B Sump, Old Pond Sump	a) Monthly during Seasonal Operations. b) Quarterly when no Seasonal Operations. c) Bi-annually for two years following end of Project
Nearby Wells	3Groundwater	W1, W2, W3, W4, MW1011-1, MW1012-1 A + B, MW1013-1	a) All wells to be sampled bi-annually during Operations. b) MW1013-1 and MW1012-1 A+B will be sampled quarterly during reprocessing activities in the A and B Valleys. These wells will then be monitored bi-annually for two years following end of the Project. c) MW1011-1, W3 and W4 will be monitored bi-annually for 5 years following end of the Project.
Distant/Upgradient Wells	Groundwater	W6 S + D	a) Quarterly during Operations. b) Bi-annually for 5 years following end of the Project

SECTION 6 ENVIRONMENTAL QUALITY

WASTE & SPILL MANAGEMENT

- Any recyclable or compostable materials generated on site will be stored with other waste materials but in specially marked and organized bins. These will be transported to an appropriate recycling/composting facility by a commercial solid waste collection service.
- Used tires will be collected and stored in the waste storage area and disposed of in accordance with the Yukon Used Tire Management Program.
- All special waste will be stored in closed, labelled containers. The project will minimize the amount of special waste that is stored on site, and all special waste will be transported to a permitted special waste treatment/disposal facility in Whitehorse by a local waste disposal company or the local contractors hired to service project machinery.

- One or more portable toilets will be rented from a local business that will provide regular servicing and waste disposal.
- During fuel transfer, valves shall be secured before and after fuelling, under no circumstances will the pump be left unattended and there shall be no smoking while fuelling.
- Heavy equipment on site will be inspected and maintained on an ongoing basis. All maintenance including changing of motor oil and other lubricants will take place at a designated maintenance area with oil absorbing pads placed under the machinery during maintenance to minimize any contamination.
- Used lubricants and other fluids will be transported off site for disposal to minimize on site storage. Used oil and lubricants may be briefly stored at a designated hazardous material storage area.
- All hazardous substances will be stored more than 30m from any surface water body.
- Employees will receive training in spill prevention, response and reporting and will become familiar with the Spill Response Plan, equipment and procedures.
- Spills of 200 litres or more of diesel, gasoline, hydraulic oil or special waste will be reported to the Yukon Spill Report Centre.

AIR QUALITY

- Dust Management Plan in place which sets out thresholds for enacting dust control (fugitive dust observed or reported leaving the project site).
- Employ dust erosion control measures (water trucks);
- Use hydroelectricity from the grid to power the re-processing plant operation rather than relying on diesel generators;
- Employ hydraulic excavation and limit use of excavators/trucks where possible.
- Gravel cap to be placed on the Old Pond tailing storage once project activities are completed.

SECTION 7 WILDLIFE AND WILDLIFE HABITAT

BIRD NESTING HABITAT

- To mitigate the destruction of bird nests, the Project will complete all clearing prior to the bird nesting season (1 May – 15 July)

WOODLAND CARIBOU DISTURBANCE AND DISPLACEMENT

- The project will ensure that wildlife moving across the project are given the right-of-way and will allow animals suitable time to travel across the site without causing unnecessary stress.

HUMAN-WILDLIFE CONFLICTS

- Solid waste, as defined under the Yukon *Environment Act*, will be stored in containers that are either bear proof or inaccessible to bears until properly disposed of, in accordance with the Yukon

Solid Waste Regulations. Solid waste will be transported by a local waste disposal company to an acceptable disposal or recycling facility in Whitehorse.

- The project will notify conservation officers at Yukon Environment about any problem wildlife.

SECTION 8 NOISE

- Construction of a turnaround at the re-processing plant and, when possible, at location where tailings are excavated;
- The project will establish communication channels for residents living close to the project so they are able to provide feedback on project concerns, including noises;
- The project will seek a variance from WCB to replace backup alarms with strobe lights during night time operations;
- Regular maintenance of machinery;
- Daytime scheduling of activities that will occur close to residences or are only intermittent (i.e. barren tailings management);
- Managing potential (noise) effects will be done through noise monitoring and through residents providing feedback to noise issues.

SECTION 9 PUBLIC SAFETY

SITE ACCESS

- Construction of a new snowmobile trail that bypasses the project site
- Excavation planning that will result in a small hazard area and contouring of slopes pre-seasonal shutdowns.
- Signs will be posted at all access routes to the site indicating the presence of industrial activities.
- Signs will be posted as needed near areas where there have been substantial changes to the landscape.
- Little Chief Pit and subsidence areas will be filled with tailings

TRAFFIC

- Redesign of the project access onto the Mt. Sima Road to improve visibility.
- Shutdown of trucking during the Klondike International Road Relay

DAM SAFETY

- Tailings containment areas will meet Canadian Dam Association Guidelines.

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
Yukon *Waters Act*
Yukon *Environment Act*
Yukon Storage Tank Regulation
Yukon Special Waste Regulation
Yukon Contaminated Sites Regulation
Yukon Solid Waste Regulation
Yukon Air Emissions Regulation
City of Whitehorse *Maintenance Bylaw* 2011-45
Yukon *Wildlife Act*
Canada *Migratory Birds Convention Act*
Canada Migratory Birds Regulations
Yukon *Occupational Health and Safety Act*
Yukon Occupational Health and Safety Regulations
Yukon *Highways Act*
Yukon *Motor Vehicles Act*
Canada *Commercial Vehicle Drivers Hours of Service*
National Safety Code (motor transport)
Criminal Code (Canada)

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
City of Whitehorse	Comment	2011-0064-050	Dec 7 2011
Joyce & Irwin Bachli	Comment	2011-0064-053	Dec 16 2011
Yukon Conservation Society	Comment	2011-0064-054	Dec 23 2011
Marianne Darragh	Comment and provision of relevant documents	2011-0064-055, -056, -057 and -063	Jan 4 2012, Jan 5 2012,
Ian Church	Comment	2011-0064-059	Jan 4 2012
KDFN	Comment	2011-0064-060	Jan 5 2012
Yukon Government • Community Services • Energy, Mines and Resources • Environment • Health and Social Services • Tourism & Heritage	Compiled comments	2011-0064-061	Jan 5 2012
TKC	Comment	2011-0064-062	Jan 5 2012
Pauline Craig	Comments	2011-0064-066	Jan 11 2012

Isabelle Gagnon	Comments	2011-0064-088	May 10, 2012
Yukon Government • Environment	Comments	2011-0064-091	May 14, 2012
Chief Medical Officer of Health, Yukon	Request for SV&I extension Comment	2011-0064-092 2011-0064-103	May 14, 2012 May 28, 2012
Yukon Conservation Society	Comment	2011-0064-093	May 14, 2012
Blaikies & Lowrey	Comment	2011-0064-098	May 28, 2012
Marc Pronovost (M.E.P.)	Comment	2011-0064-099	May 28, 2012
Marianne Darragh	Comment	2011-0064-100	May 28, 2012
Brenda Gadsby	Late Comment (via Note-to-File)	2011-0064-107	June 7, 2012
Marc Pronovost	Late Comment (via Note-to-file)	2011-0064-110	June 8, 2012

Appendix D REFERENCES

Alberta Energy Resources Conservation Board. 2007. Directive 038 – Noise Control. Calgary, Alberta.

Bell, L.H. 1994. Industrial Noise Control. CRC Press.

Canadian Dam Safety Association, 2007. Dam Safety Guidelines. Toronto, Ontario.

City of Whitehorse, 2010. Official Community Plan. Whitehorse, Yukon.

Florkiewicz R., R. Maraj, T. Hegel, M. Waterreus. 2007. The effects of human land use on the winter habitat of the recovering Carcross woodland caribou herd in suburban Yukon Territory, Canada. Rangifer No 17. Pp. 181-197.

Guidelines for Canadian Drinking Water Quality (Health Canada 2010) *Prepared by the* Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. December 2010. Available at http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2010-sum_guide-res_recom/index-eng.php

Health Canada, 1987. Environmental and Workplace Health: Manganese http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/manganese/index-eng.php

KPMG and Gartner Lee, 2006. Yukon Ports Access Strategy for Yukon Economic Development. Whitehorse, YT.
http://www.economicdevelopment.gov.yk.ca/pdf/executive_summary_yukonportsaccessstrategy.pdf

McLean, J.E. and Bledsoe, B.E.,1992. Behavior of Metals in Soils.US Environmental Protection Agency. EPA/540/S-92/018.

Mining and Petroleum Environmental Research Group (MPERG). 2008. Guidelines for Industrial Activity in Bear Country. Whitehorse, YT, Canada. Available online:
http://www.env.gov.yk.ca/mapspublications/documents/Guidelines_for_Industrial_Activity_in_Bear_Country.pdf

Opportunities North, 2011. Mt. Sima – Changing our Game
http://opportunitiesnorth.com/Documents/Presentations/opps-north.sima-final.pdf

Pearson, F.K., Hart, C.J.R. and Power, M., 2001. Distribution of Miles Canyon basalt in the Whitehorse area and implications for groundwater resources. *In:* Yukon Exploration and Geology 2000, D.S. Emond

and L.H. Weston (eds.), Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, p. 235-245.

Queensland Government Environmental Protection Agency, 2004. Guideline: Planning for Noise Control. Brisbane, Queensland, Australia.

Schexnayder, D.J. and J.J. Ernzen. 1999. Mitigation of Nighttime Construction Noise, Vibration and Other Nuisances. Transportation Research Board, Washington D.C.

Singal, S.P. 2000. Noise Pollution and Control. Alpha Science International Ltd., Oxford, UK.

Skagway Development Corporation, 2011. Website: Port of Skagway. www.skagwaydevelopment.org/portofskagway.html.

United States Federal Highway Administration. 2006. Road Construction Noise Model. Washington, DC.

United States Environmental Protection Agency, 1981. Noise Effects Handbook: A Desk Reference to Health and Welfare Effects of Noise. Fort Walton Beach, Florida. http://www.nonoise.org/library/handbook/handbook.htm

US National Library of Medicine – PubMed Health: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001191/

Yukon Environmental and Socio-economic Assessment Board. 2012. [Interactive maps of biophysical and socio-economic geographic data]. Geo-Locator Report for Project Location, Geo-Locator. Retrieved from http://geolocator.yesab.ca/geolocator/queryFeaturesByCoords.do

YESAB, 2009. Designated Office Evaluation Report for Type A Water License and Quartz Mining License Applications – Bellekeno Mine Development. Project #2009-0030. Mayo, Yukon.

YESAB & Yukon Environment, 2012. Dam Guide: Design Expectations and Required Information. Whitehorse, Yukon.