December 7, 2018

Ms. Wendy Randall,
Chair, Executive Committee,
Yukon Environmental and Socio-economic Assessment Board (YESAB),
Suite 200-309 Strickland Street Whitehorse, Yukon
Y1A 2J9

Dear Ms Randall,

**Regarding: Kudz Ze Kayah Response Report No. 4 – YESAB Project 2017-0083**

BMC Minerals (No. 1) Ltd. (BMC) received the Kudz Ze Kayah Information Request Report No.4 (IR No. 4) from Mr. Dale Eftoda on May 3, 2018. BMC has reviewed and considered the above noted report and we are pleased to provide responses to all of the requests contained therein. Our report, entitled: *Kudz Ze Kayah Project: Response #4 to YESAB Executive Committee Information Request KZK (Response Report #4)* has been provided to your office in digital and hard copy form.

The Response Report #4 contains carefully considered responses to each of the nine IRs. In developing these responses BMC followed YESAB's direction provided in IR No.4:

a. *"All information supplied by the Proponent in response to Information Request No. 4 should be informed by traditional knowledge where possible.*

b. *Information provided in the project proposal often is identified as being relevant to the "Kaska". LFN has indicated this information does not necessarily reflect its views. The Executive Committee is required to understand the effects of the Project on both Ross River Dena Council (RRDC) and LFN. Additionally, the Executive Committee needs some clarity as to what information submitted by the Proponent relates to RRDC and what relates to LFN.*

   *If some of the information requested in Information Request No.4, specific to LFN and specific to RRDC, is currently in the project proposal, the Proponent should:*

   - *Identify that information; and*
   - *Extract it from the project proposal.*

   *The extracted information should be organized in a manner that clearly demonstrates to the Executive Committee what the information is, how and where BMC obtained the information, how it specifically relates to LFN and separately to RRDC, and how it was taken into account when informing project design and the effects assessment inclusive of mitigations."*

For clarity and ease of understanding, BMC has listed the Information Requests from YESAB's Information Request No.4 (in black text) followed BMC's response (in blue text). The requests and responses follow the same order as YESAB's IR No.4.

Sincerely,

[Signature Redacted]

Kelli Bergh, Environmental Manager
BMC Minerals (No.1) Ltd.

# BMC MINERALS (NO.1) LTD

## KUDZ ZE KAYAH PROJECT

## RESPONSE #4 TO YESAB EXECUTIVE COMMITTEE INFORMATION REQUEST KZK

## PROJECT PROPOSAL

December 2018

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| Acronym | Definition |
|---|---|
| BMC | BMC Minerals (No 1.) Ltd. |
| CAC | Criteria Air Contaminants |
| CEA | Cumulative Effects Assessment |
| CO | carbon monoxide |
| COPC | contaminant of potential concern |
| COPI | contaminant of potential interest |
| CRA | Commercial, Recreational, and/or Aboriginal |
| DSR | Dump Stability Rating |
| EI | Environmental Impact |
| FMEA | Failure Modes Effects Assessment |
| FOP | Fish Offsetting Plan |
| FOS | Factor of Safety |
| ha | hectare |
| HDPE | high-density polyethylene |
| HHRA | human health risk assessment |
| HSI | habitat suitability index |
| IR | Information Request |
| km | kilometre |
| $km^2$ | square kilometre |
| KZK | Kudz Ze Kayah |
| LFN | Liard First Nation |
| LNG | Liquified Natural Gas |
| LWMP | Lower Water Management Pond |
| m | metre |
| $m^2$ | square metre |
| $m^3$ | cubic metre |
| $m^3/s$ | cubic metre per second |
| mg/L | milligram per litre |
| $NO_2$ | nitrogen dioxide |
| NTU | nephelometric turbidity unit |
| pWQO | preliminary water quality objective |
| $PM_{10}$ | coarse particulate matter less than 10 microns in diameter |
| $PM_{2.5}$ | fine particulate matter less than 2.5 microns in diameter |
| PQRA | Preliminary Quantitative Risk Assessment |
| QA/QC | Quality Assurance / Quality Control |
| RCH | Robert Campbell Highway |

| | |
|---|---|
| RRDC | Ross River Dena Council |
| SEPA | Socio-economic Participation Agreement |
| $SO_2$ | sulphur dioxide |
| t | tonne |
| TK | Traditional Knowledge |
| TLU | traditional land use |
| TSP | total suspended particulates |
| TSS | total suspended solids |
| VC | valued component |
| WMP | Water Management Pond |
| WPP | Wildlife Protection Plan |
| YAAQS | Yukon Ambient Air Quality Standards |
| *YESAA* | *Yukon Environmental and Socio-economic Assessment Act* |
| YESAB | Yukon Environmental and Socio-economic Assessment Board |
| YG | Yukon Government |
| µm | micrometre |
| $\mu g/m^3$ | micrograms per cubic metre |

# 1. INTRODUCTION

BMC Minerals (No.1) Ltd. (BMC) has submitted the Kudz Ze Kayah (KZK) Project Proposal to the Yukon Environmental and Socio-economic Assessment Board (YESAB) for a Screening level assessment (BMC, 2017a). On January 9th 2018, after a full and thorough review, BMC received confirmation from YESAB that the Executive Committee considered the Project Proposal to be adequate for screening:

> *The Executive Committee has reviewed the information, including the consultation record by BMC Minerals (No. 1) Ltd., contained in the Kudz Ze Kayah project proposal. Based on this review and in accordance with s.57(1) and (2) of the Yukon Environmental and Socio-economic Assessment Act (YESAA), and Rule 19 of the Rules for Screening Conducted by the Executive Committee, the Executive Committee considers the project proposal to be adequate* YESAB File No.2017-0083.

A 60-day public comment period occurred from January 16th to March 16th, 2018. The Executive Committee reviewed the comments received during the public comment period as part of the Screening and determined that supplementary information was required from BMC before YESAB would prepare the Draft Screening Report *(Request for Supplementary Information Request No. 3)* (YESAB, 2018a). BMC responded to Information Request No. 3 (BMC, 2018a and BMC, 2018b). The Executive Committee reviewed the supplementary information provided in response to Information Request No.3 and has determined it was satisfactory (YESAB File No.2017-0083)

The Executive Committee subsequently developed a supplementary Information Request *(Request for Supplementary Information Request No. 4 dated May 3rd 2018)* (YESAB, 2018b). This Response Report #4 provides the additional information requested by YESAB.

For clarity and ease of understanding, BMC has listed the Information Requests (IRs) from YESAB's Information Request No.4 (in black text) followed BMC's response (in blue text). The requests and responses follow the same order as YESAB's IR No.4.

## 1.1 CONTEXT

In YESAB's IR No.4, BMC was provided with: *"Further Information for Proponent Consideration in Addressing the Information Request"* which included the following:

*"The Proponent shall follow the directions below when responding to this Information Request:*

a. *All information supplied by the Proponent in response to Information Request No. 4 should be informed by traditional knowledge where possible.*

b. *Information provided in the project proposal often is identified as being relevant to the "Kaska". LFN has indicated this information does not necessarily reflect its views. The Executive Committee is required to understand the effects of the Project on both Ross River*

*Dena Council (RRDC) and LFN. Additionally, the Executive Committee needs some clarity as to what information submitted by the Proponent relates to RRDC and what relates to LFN.*

*If some of the information requested in Information Request No.4, specific to LFN and specific to RRDC, is currently in the project proposal, the Proponent should:*

- *Identify that information; and*
- *Extract it from the project proposal.*

*The extracted information should be organized in a manner that clearly demonstrates to the Executive Committee what the information is, how and where BMC obtained the information, how it specifically relates to LFN and separately to RRDC, and how it was taken into account when informing project design and the effects assessment inclusive of mitigations."*

BMC has carefully considered these directions from YESAB and offers the following information for context.

### 1.1.1 USE OF TRADITIONAL KNOWLEDGE IN BMC RESPONSES TO IR4

With respect to the first point above, the information provided by BMC in this Response Report has been informed (to the extent possible) by the Traditional Knowledge (TK) that was made available to BMC at the time of report preparation.

It is noted that where RRDC considered it to be appropriate, BMC has provided capacity funding and supported RRDC in compiling existing TK and other information and collecting new TK information for the Project since 2015. In addition, in 2017 BMC and RRDC entered into a Traditional Knowledge Protocol agreement which sets out obligations for each party regarding the collection and sharing of TK. That agreement states that RRDC is the owner of the TK and that any TK knowledge shared by RRDC with BMC (i.e. in order to inform the mine design or additional mitigation measures), must be kept confidential and not to be shared it with other parties. Consequently, although the responses in this Response Report were informed by TK (to the extent possible), site specific TK provided by RRDC is not and cannot be included in this Response Report without breaching our confidentiality agreements with RRDC. Further, BMC would like to clarify that RRDC's collection and sharing of TK with BMC over the Project area is ongoing. As per the TK Protocol with RRDC, when new TK is shared, both parties will collaboratively identify any new potential effects as well as any additional mitigation measures that may be required based on the new information. This information will be used in any future design modifications, management plans, and/or operating changes that are deemed appropriate during the life of the Project.

More recently, BMC and LFN negotiations for an integrated commercial agreement include a Traditional Knowledge Protocol component. This agreement will set out obligations for each party regarding the collection and sharing of TK and other matters. Under the proposed TK Protocol, LFN will undertake a TK study over any area within LFN territory where BMC seeks to carry out development activities with funding for this work to be provided by BMC. The proposed protocol is

designed to ensure that relevant LFN citizens will be involved with TK studies in relation to any development activities BMC wishes to undertake in LFN Territory. In this TK Protocol all TK is also confidential. While the negotiation of this agreement is on going and the details are confidential, BMC and LFN have discussed the option of LFN preparing a non-confidential TK summary for use by BMC in discussions with government bodies at some point in the future if appropriate. However, in practical terms, BMC will only be able to use this data if doing so does not breach our agreements with other members of the Kaska Nation. Pending the level of information provided in this non-confidential summary, there may be additional mitigation measures that BMC will commit to in order further minimize adverse potential Project effects. If so, these mitigation measures will be incorporated into BMC's detailed designs, operating management and monitoring plans that will be submitted to the appropriate decision body for regulatory review during permitting and which will be adopted during the life of the proposed Project.

### 1.1.2 SEPARATION OF "KASKA EFFECTS" INTO "LFN EFFECTS" AND "RRDC EFFECTS"

With respect to the second point above, where possible, BMC has prepared these responses in a way that separates "Kaska effects" into "LFN effects" and "RRDC effects". For clarity in the Project Proposal, BMC did not distinguish between LFN and RRDC as the existing Socio-economic Participation Agreement (SEPA) is with "*Ross River Dena Council for and on behalf of Ross River Dena Council Membership and the Kaska Nation*". BMC was also advised by LFN Chief and Council in 2015 and 2016 that all matters with respect to the Kudz Ze Kayah Project were to be directed through Ross River Dena Council who would then brief LFN. All of the commitments and benefits of BMC's SEPA with Kaska relate to all "*Kaska Nations and is not limited to Ross River Dena Council*". Further, the component of the SEPA related to TK does not differentiate between "LFN TK" and "RRDC TK", it is referred to as "Kaska TK". Subsequently, at the time that BMC prepared the Project Proposal, the concept of YESAB requesting the differentiation between Kaska or LFN or RRDC Project effects or Project TK into "LFN" and "RRDC" had not been raised with BMC. Consultation with RRDC and LFN also did not identify a requirement to differentiate the Project effects.

Also important in the determining of effects of the proposed Project on Kaska land use is the concept and approach among Kaska people that their Traditional Territory is viewed as a whole with distinct yet interdependent parts. This is explained further in the KDC court submission to support their Comprehensive Land Claim: "*It is difficult to view the lands used by the Kaska Dena as being in some way divisible. Rather, the image that comes across most clearly is that the Yukon area harvested by the Kaska Dena form as a whole an integral and integrated part of the resource base upon which their sociocultural integrity relies* (KDC, 1982:58 in Exhibit 3).")

Nevertheless, BMC has reviewed the Project Proposal and the recent YESAB Information Requests and where possible have separated the "Kaska effects" into "LFN" and "RRDC" and where possible

identified (within the existing contractual limitations as noted above) "*what the information is, how and where BMC obtained the information, how it specifically relates to LFN and separately to RRDC".*

## 2. TRADITIONAL KNOWLEDGE / TRADITIONAL USE

### 2.1 YESAB ISSUE

The project proposal does not contain traditional land use (TLU) information specific to the Liard First Nation (LFN). The assumption made that RRDC represents LFN is misplaced, as indicated through LFN's recent letter. YESAB needs to understand the effects of the Project on TLU of the area and how the Proponent considered traditional knowledge in developing the project proposal specific to LFN.

The VESECs selected appear confined predominantly to include traditional economy and does not fully address the impact on past, current and future use of the project area by LFN. Specifically, LFN TLU/TK consideration in VESECs needs to be represented.

#### 2.1.1 R4-1

Provide comprehensive information on Liard First Nation's traditional land use (i.e., past and current) including but not limited to traditional economic activities gathered through primary data collection. This information should be in reference to local and regional study areas relevant to the Project. This information is to be presented in the format of a traditional land use study or work of equivalent depth and breadth.

As described in Section 1.1.1 of this Response Report, LFN and BMC are currently negotiating an agreement that will include a Traditional Knowledge Protocol component which will cover any future activity by BMC within LFN traditional territory. This may result in a non-confidential TK summary report for the proposed Project area that could assist BMC in future discussions with relevant government bodies provided it does not create a confidentiality issue with existing agreements. BMC understands that this document will probably be of sufficient level of detail to assist in addressing the information requested in R4-1; however, given that this agreement does not currently exist it is not possible to predict the likely timing of any future report from LFN.

#### 2.1.2 R4-2

Demonstrate how traditional land use information has been incorporated into the consideration of effects and how traditional land uses may be impacted by the Project.

Throughout the Project Proposal and previous Response Reports, traditional land use was considered and incorporated into the assessments of effects. As requested by YESAB where the

information: "*is currently in the Project Proposal, the Proponent should: Identify that information; and Extract it from the project proposal*". In order to satisfy this request, this response endeavours to summarize how the potential impacts to traditional land use were assessed and extracts the specific sections of the proposal.

Information used to support the effects assessments was based on traditional land use issues that were identified through consultation and engagement with LFN citizens, professional judgement, and through existing literature. The categories of these issues are summarized in Table 2-1, with the summaries of the effects assessments in the proceeding sections.

**Table 2-1: Summary of LFN Land Use Issues Identification**

| LFN Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| Air Quality | Consultation Record in the Project Proposal | Chapter 6 | Chapter 6 of Response Report #1 (BMC, 2017b)<br>Appendix 3 of Response Report #1 (BMC, 2017b)<br>Appendix R2-N of Response Report #2 (BMC, 2017c)<br>Chapter 8 of Response Report #3A (BMC, 2018A) |
| Surface Water Quality | Consultation Record in Project Proposal | Chapter 8 | Chapter 8 of Response Report #1 (BMC, 2017b)<br>Appendix 3 of Response Report #1 (BMC, 2017b)<br>Appendix 4 of Response Report #1 (BMC, 2017b)<br>Chapter 8 of Response Report #2 (BMC, 2017c)<br>Appendix R2-C, R2-D, and R2-N of Response Report #2 (BMC, 2017c)<br>Chapter 2 of Response Report #3A (BMC, 2018a<br>Response Report #3B (BMC, 2018b) |
| Fish | Ongoing Consultation | Chapter 10 | Chapter 10 of Response Report #1 (BMC, 2017b)<br>Appendix 3 of Response Report #1 (BMC, 2017b)<br>Chapter 17 of Response Report #1 (BMC, 2017b) |

| LFN Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| | | | Chapter 10 of Response Report #2 (BMC, 2017c)<br><br>Chapter 17 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-N and R2-0 of Response Report #2 (BMC, 2017c)<br><br>Chapter 6 of Response Report #3A (BMC, 2018a)<br><br>Chapter 8 of Response Report #3A (BMC, 2018A)<br><br>Response Report #3B (BMC, 2018b) |
| Terrain and Soils | Professional judgement | Chapter 11 and Appendix H (Reclamation and Closure) | Chapter 11 of Response Report #1 (BMC, 2017b)<br><br>Chapter 11 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-H and R2-I of Response Report #2 (BMC, 2017c) |
| Vegetation | Ongoing Consultation | Chapter 12 and Appendix H (Reclamation and Closure) | Chapter 8 of Response Report #3A (BMC, 2018A) |
| Wildlife | Consultation Record in Project Proposal | Chapter 13 and Appendix H (Reclamation and Closure) | Chapter 13 of Response Report #1 (BMC, 2017b)<br><br>Appendix 5 of Response Report #1 (BMC, 2017b)<br><br>Chapter 13 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-J through R2-M of Response Report #2 (BMC, 2017c)<br><br>Chapter 4, 5 and 7 of Response Report #3A (BMC, 2018a)<br><br>Appendix R3-F of Response Report #3A (BMC, 2018a)<br><br>Chapter 8 of Response Report #3A (BMC, 2018A) |

| LFN Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| Access | Consultation Record in Project Proposal | Chapter 15 | Chapter 9 of Response Report #3A (BMC, 2018a) |
| Heritage | Ongoing Consultation | Chapter 14 | Chapter 14 of Response Report #1 (BMC, 2017b)<br>Appendix 6 of Response Report #1 (BMC, 2017b) |
| Contamination of Land from Spills | Consultation Record in Project Proposal | Chapter 18 and Appendix H (Reclamation and Closure) | Chapter 20 of Response Report #1 (BMC, 2017b)<br>Chapter 10 of Response Report #3A (BMC, 2018a)<br>Appendix R3-G of Response Report #3A (BMC, 2018a) |
| General Land use Post Closure | Consultation, Literature | Appendix H (Reclamation and Closure) | Chapter 2 of Response Report #1 (BMC, 2017b) |
| Cumulative impacts (wildlife, water, road) | Ongoing Consultation | Chapter 13 (Wildlife), Chapter 6 (Water) and Appendix H (Reclamation and Closure) | Chapter 13 of Response Report #1 (BMC, 2017b)<br>Chapter 13 of Response Report #2 (BMC, 2017c) |

#### *2.1.2.1 Overview*

**Geographic Location (modified from Section 3.1 of the Project Proposal)**

The Project is located approximately 260 km northwest of Watson Lake (home community of LFN). Access to the Project is via a 24 km existing single lane gravel Tote Road (that is proposed to be upgraded to an Access Road) that connects the Project to the Robert Campbell Highway.

### Land Tenure (modified from Section 3.2 of the Project Proposal)

The Project is located within outfitting concession #20 (held by Yukon Big Game Outfitters) and within Game Management Subzone 10-07. The Project boundary overlaps with two trapping concessions; these trapping concessions are not held by LFN citizens.

### Project Area, Land and Resource use (modified from Section 15.3.1 of the Project Proposal)

The region has long been used by the Kaska (including both RRDC and LFN citizens) to hunt, trap, fish, gather plants, and seek shelter. There are also traditional trails in the area used by Kaska citizens (including both LFN and RRDC citizens) to travel between key traditional use locations. There are two main access routes to the proposed Project area, including from the west starting at Frances Lake along Money Creek as well as from the north at Pelly Banks through Finlayson Creek. The area in and around the proposed Project has been of particular importance for hunting for big game, such as caribou, moose, and sheep, especially in the North Lakes area (south of the Project). There are several Kaska cabins in the region, including nearby locations along North Lakes, Money Peak, and Wolverine Lake with more distant locations along Frances Lake, Pelly Banks, and Money Creek. These cabins were identified during the Traditional Knowledge study conducted for the Project in the 1990s. During the interviews the owners/families of the cabin's were not identified. BMC has not sought to distinguish which cabins were used by RRDC or LFN; however, it assumed that it is a mix of both - as Kaska (regardless of the whether they were RRDC or LFN) used the trails in the area and potentially the various cabins too.

### Acknowledgment

BMC understands that LFN assert various Aboriginal rights and title within their asserted traditional territory, including hunting, fishing, and harvesting rights and rights to the land itself (title). Aboriginal rights and title stem from pre-contact occupancy and longstanding use, and are protected by the *Constitution Act, 1982*.

### Focus of Assessment

By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for traditional land use activities (i.e., hunting, fishing, and harvesting berries and traditional medicines, travel etc.) until the post closure period. This disruption of land use accounts for approximately 0.05% of the Kaska Traditional Territory in the Yukon (this is based on a 2 km boundary extending from the mine site infrastructure and a 500 m boundary extending from the centre line of the proposed access road). Beyond this boundary no residual effects to the traditional land users are predicted, due to Project activities assessed in response to this IR. The existing SEPA with BMC and Kaska provides measures to compensate and/or offset (in part) the impacts of the Project area not being available for traditional land use purposes. BMC has agreed to modernize the existing SEPA and as part of this modernization, BMC has put a proposal in writing (to both RRDC and LFN) that would see significant economic benefits of over $100 million being delivered to Kaska from the Project over its 10 year operations phase. This is in

addition to direct jobs and training. Subsequently, the summaries of the effects assessments (presented below) related to the construction, operation and active closure phases is largely focussed on the areas outside of the Project footprint, where there is the potential for land use to continue. The effects assessments for the post closure phase assumes that the land is once again available for use.

#### *2.1.2.2 Air Quality*

The text in this section is modified from Chapter 6 of the Project Proposal (BMC, 2017a); Appendix R2-N of Response Report #2 (Preliminary Quantitative Risk Assessment) (BMC, 2017c) and BMC's responses information requests in IR Report No. 3 (BMC, 2018a).

Air quality was selected as a valued component (VC) due to its importance to the health and well-being of humans, wildlife, vegetation, and other biota. It is understood that LFN citizens use the area in and around the proposed Project and therefore impacts to air quality could result in a secondary impact of LFN citizens avoiding use of the area, for traditional use purposes due to perceived health concerns; however, this is not certain.

Air dispersion modelling was conducted using CALPUFF, a Gaussian puff model that can account for time- and space-varying meteorological conditions, different source configurations and contaminants, and chemical transformations. CALPUFF is recommended in the *Guidelines for Air Quality Dispersion Modelling* in British Columbia (BC MOE, 2008) and by the US Environmental Protection Agency (U.S. EPA, 2014). Details of the air dispersion are provided in the Air Dispersion Model Report (Appendix E-1 of the Project Proposal).

Criteria Air Contaminants (CACs) were selected for assessment as a valued subcomponent of the air quality VC. These included: sulphur dioxide ($SO_2$); total suspended particulates (TSP); carbon monoxide (CO); fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$); coarse particulate matter less than 10 microns in diameter ($PM_{10}$); and nitrogen dioxide ($NO_2$). Theses CACs were selected because they are known to be associated with human health issues and/or because they are subject to ambient air quality standards in Yukon.

More specifically, both $SO_2$ and $NO_2$ in high concentrations can cause adverse effects on respiratory systems of humans and animals, as well as damage to vegetation (Environment and Climate Change Canada, 2013). Numerous studies have linked TSP to aggravated cardiac and respiratory diseases such as asthma, bronchitis, emphysema, and to various forms of heart disease. TSP can also have adverse effects on vegetation and structures, and can contribute to visibility deterioration and regional haze (Environment and Climate Change Canada, 2013). $PM_{10}$ and $PM_{2.5}$ represent the coarse and fine fractions of TSP, respectively. $PM_{10}$ (aerodynamic diameter of less than 10 µm) is the fraction of TSP that is inhalable, and therefore, has the potential to cause adverse health effects. Fine particles (aerodynamic diameter of less than 2.5 µm) are able to penetrate deeper into the lungs and are generally considered a stronger risk factor than the coarse fraction of $PM_{10}$ (particles in the 2.5 to 10 µm range) (WHO, 2013). Carbon monoxide (CO) can also affect human health. At elevated concentrations, it enters the bloodstream through the lungs and forms carboxyhemoglobin, a

compound that inhibits the blood's capacity to carry oxygen to organs and tissues. Persons with heart or respiratory diseases, infants, and elderly persons are especially sensitive to effects from CO. CO can also affect healthy individuals, impairing exercise capacity, visual perception, manual dexterity, learning functions, and the ability to perform complex tasks (Environment and Climate Change Canada, 2013).

Yukon Government (YG) implemented Ambient Air Quality Standards (YAAQS) for $SO_2$, TSP, CO, $PM_{2.5}$ and $NO_2$ in 2010, and more recently for $PM_{10}$ (Yukon Government, 2014). The YAAQS and averaging periods are presented in Table 2-2.

Mitigation measures to minimize air emissions are presented in Section 6.4.2 of the Project Proposal and the conceptual Air Quality Management Plan is presented in Section 18.11 of the Project Proposal.

**Table 2-2: Yukon Ambient Air Quality Standards (YAAQS) [i]**

| Parameter | Standard (µg/m³)[ii] | Standard (ppm)[iii] | Standard (ppbv)[iv] |
|---|---|---|---|
| **Sulphur Dioxide ($SO_2$)** | — | — | |
| 1-hour average | | | 172 |
| 24-hour average | | | 57 |
| Annual arithmetic mean | | | 11 |
| **Total Suspended Particulates (TSP)** | | — | — |
| 24-hour average | 120 | | |
| Annual geometric mean | 60 | | |
| **Carbon Monoxide (CO)** | — | | — |
| 1-hour average | | 13 | |
| 8-hour average | | 5 | |
| **Fine Particulate Matter ($PM_{2.5}$)** | | — | — |
| 24-hour average (calendar day) | 28 | | |
| Annual mean (calendar year) | 10 | | |
| **Coarse Particulate Matter ($PM_{10}$)** | | — | — |
| 24-hour average | 50 | | |
| **Nitrogen Dioxide ($NO_2$)** | — | — | |
| 1-hour average | | | 213 |
| 24-hour average | | | 106 |
| Annual arithmetic mean | | | 32 |

[i] All ambient air quality measurements will be referenced to standard conditions of 25 degrees Celsius and 101.3 kilopascals.
[ii] µg/m³ – micrograms per cubic metre
[iii] ppm = parts per million
[iv] ppbv = parts per billion by volume

The study area boundaries (Table 2-3) were selected to include areas where measurable changes in ambient air quality might be caused by the Project.

**Table 2-3: Study Area for Air Quality Model**

| Study Area | Air Quality Specific Study Area Description |
|---|---|
| Local Study Area | The local study area is 5 km by 5 km, centered on the mine footprint, including the camp as a receptor. |
| Regional Study Area | The regional study area is 40 km by 40 km and encompasses the mine footprint and the entire Tote Road/Proposed Access Road. Grid spacing is smaller in the local study area than in the regional study area. |

The modelling results presented in Chapter 6 of Project Proposal (BMC, 2017a) and Appendix R2-N of Response Report #2 (Preliminary Quantitative Risk Assessment) (BMC, 2017c) focussed on the predicted concentrations at the KZK camp as people in the camp (off-shift) would be people closest to the mine activities and would receive the longest duration of exposures to the CACs. However, for the purposes of assessing potential impacts to LFN land use associated with CACs, it is more realistic to evaluate the concentrations in the areas around the Project that LFN may use during the Project phases. Therefore, the modelled concentrations presented in this Response Report are the maximum 24 hr concentrations and mean annual concentrations at an approximate distance of 2 km from the proposed mine infrastructure and 500 m from the Access Road alignment. The mine and Access Road activities are at the centre of this boundary and as we move outward from these activities the environmental effects are reduced. These boundaries were selected for this assessment as it was anticipated that at these distances there would be no residual Project effects to the VCs. The modelled concentrations presented here have been extracted from the model run presented in Chapter 6 of the Project proposal and the model run that was conducted in response to R3-25 (BMC, 2018a). These concentrations are assumed to be the predicted highest concentrations in the useable area surrounding the Project. It was assumed that at this distance LFN citizens could use the land for hunting, fishing and gathering during construction, operations and active closure.

Temporal boundaries are defined to include all Project phases in which effects are expected to occur. The Project phases considered in the air quality EA include the following:

- **Construction Phase**: will last approximately two years and includes Project site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: will last approximately 10 years and includes open pit and underground mining and ore processing; and
- **Decommissioning, Reclamation and Active Closure Phase** (referred to as Closure Phase): will last approximately three years.

As there are minimal or no physical activities during the transition closure period and the post-closure period, minimal air emissions are expected during these phases (i.e., less than those assessed for Closure Phase) and they have not been included in the assessment of air quality.

## Total Suspended Particulates (TSP)

Predicted maximum 24-hour and mean annual ambient concentrations at 2 km from the mine site infrastructure for all Project phases are presented in Table 2-4 below. No exceedances of the YAAQS are predicted.

### Table 2-4: Predicted TSP Concentrations

| Land User | Maximum 24-hr Concentration (µg/m3) | | | Mean Annual Concentration (µg/m3) | | |
|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 120 | | | 60 | | |
| Baseline | 7 | | | 1 | | |
| 2 km from mine infrastructure (Project) | 36 | 113 | 20 | 2 | 5 | 2 |
| 500 m from Tote Road/Proposed Access Road | 31 | 108 | 20 | 1 | 8 | 2 |

## Coarse Particulate Matter ($PM_{10}$)

Predicted maximum 24-hour and mean annual ambient concentrations at 2 km from the mine site infrastructure for all Project phases are presented in Table 2-5. No exceedances of the YAAQS are predicted.

### Table 2-5: Predicted $PM_{10}$ Concentrations

| Land User | Maximum 24-hr Concentration (µg/m³) | | | Mean Annual Concentration (µg/m³) | | |
|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 50 | | | N/A | | |
| Baseline | 6 | | | 1 | | |
| 2 km from mine infrastructure (Project) | 17 | 36 | 12 | 1 | 2 | 2 |
| 500 m from Tote Road/Proposed Access Road | 16 | 35 | 13 | 1 | 3 | 1 |

## Fine Particulate Matter ($PM_{2.5}$)

Predicted maximum 24-hour and mean annual ambient concentrations at 2 km from the mine site infrastructure are presented in Table 2-6. No exceedances of the YAAQS are predicted.

### Table 2-6: Predicted $PM_{2.5}$ Concentrations

| Land User | Maximum 24-hr Concentration (µg/m³) | | | Mean Annual Concentration (µg/m³) | | |
|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 28 | | | 10 | | |
| Baseline | 4 | | | 1 | | |
| 2 km from mine infrastructure (Project) | 9 | 8 | 7 | 1 | 1 | 1 |
| 500 m from Tote Road/Proposed Access Road | 8 | 8 | 8 | 1 | 1 | 1 |

## Carbon Monoxide (CO)

Predicted maximum 1-hour and 8-hour ambient concentrations at 2 km from the mine site infrastructure for all Project phases are presented in Table 2-7. No exceedances of the YAAQS are predicted.

### Table 2-7: Predicted CO Concentrations

| Receptor | Maximum 1-hr Concentration(ppm) | | | Maximum 8-hr Concentration (ppm) | | |
|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 13 | | | 5 | | |
| Baseline | 0 | | | 0 | | |
| Project | <1 | <1 | <1 | <1 | <1 | <1 |

## Nitrogen Oxides ($NO_X$)

The modelling results presented in Chapter 6 of Project Proposal (BMC, 2017a) and Appendix R2-N of Response Report #2 (Preliminary Quantitative Risk Assessment) (BMC, 2017c) presented $NO_X$ concentrations. Given that $NO_2$ is the contaminant of interest due to its effects on human health and the environment, and for which ambient standards exist in Yukon (YAAQS) a conversion factor was applied to convert $NO_X$ concentration to $NO_2$ concentrations. The Ambient Ratio Method (ARM2) developed by Podrez (2015) was used for conversion of the 1-hr, 24-hr, and annual $NO_X$ CALPUFF outputs. Predicted maximum 1-hour, 24-hour, and mean annual ambient concentrations at 2 km from the mine site infrastructure for all Project phases are presented in Table 2-8.

**Table 2-8: Predicted $NO_2$ Concentrations**

| Receptor | Maximum 1-hour Concentration (ppbv) | | | Maximum 24-hour Concentration (ppbv) | | | Mean Annual Concentration (ppbv) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 213 | | | 106 | | | 32 | | |
| 2 km from mine infrastructure (Project) | 78 | 79 | 68 | 31 | 28 | 17 | 1 | 1 | 1 |
| 500 m from Tote Road/ Proposed Access Road | 79 | 75 | 67 | 38 | 26 | 10 | 3 | 1 | 1 |

## Sulphur Oxides ($SO_X$)

Assuming 100% conversion of $SO_X$ to $SO_2$ as a conservative estimate, predicted maximum 1-hour, 24-hour, and mean annual ambient $SO_2$ concentrations at 2 km from the mine site infrastructure for all Project phases are presented in Table 2-9. No exceedances of the YAAQS are predicted.

### Table 2-9: Predicted $SO_2$ Concentrations

| Land User | Maximum 1-hour Concentration (ppbv) | | | Maximum 24-hour Concentration (ppbv) | | | Annual Concentration (ppbv) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase | Construction Phase | Operations Phase | Closure Phase |
| YAAQS | 172 | | | 57 | | | 11 | | |
| Baseline | 0 | | | 0 | | | 0 | | |
| Project | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

**Summary**

All of the concentrations of the CACs modelled (at two km from the mine site infrastructure and 500 m from the proposed Access Road) meet the Yukon Ambient Air Quality Standards. Therefore, no adverse health effects due to exposure of the LFN traditional land users to the CACs are predicted. The LFN traditional land users may safely use the area surrounding the Project and thus no impacts to traditional land use are predicted. During the post closure phase all areas including the Project area will again be available and safe for use by the LFN traditional land users.

#### *2.1.2.3 Surface Water Quality*

BMC has demonstrated how LFN traditional land use information has been incorporated into the effects assessment for water quality in response to R4-8 "*Thoroughly demonstrate how Traditional Knowledge and traditional land use have been incorporated into the consideration of effects to water in the proposal or the identification of mitigations*". The response to this IR includes an assessment of how traditional land uses of the waterbodies in the study area may impacted by the Project.

#### *2.1.2.4 Fish*

Traditional use waterbodies that have been specifically identified by LFN citizens to BMC as being important in the Project area are Finlayson Lake and Francis Lake. These waterbodies are not predicted to be impacted by the Project. Additional waterbodies were identified as being important through the Kaska Ethnographic review (Appendix F-3 of the Project Proposal); however, for the most part, it was not deemed possible in this study to differentiate between LFN and RRDC traditional land use. It is anticipated that any additional land use information that is made available by LFN in the future will be incorporated into BMC's management and operating plans at that time. In the interim, a detailed assessment of the potential effects to the land users who use the traditional land use waterbodies for fishing (as identified by RRDC) is presented in Section 2.2.2.5 of this Response Report. It may be these waterbodies are also important to LFN for fishing.

#### *2.1.2.5 Soils*

LFN has indicated that contamination at other projects in their traditional territory have resulted in the traditional land users never using the land in the vicinity of the particular project again. By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for some LFN traditional land use activities (i.e., hunting, fishing, travel, harvesting berries and traditional medicines etc.) until the post closure period. However, soils at the site will be managed through all Project Phases in order to ensure that it does not have the potential to prevent the traditional land users from using the area in the post closure period. To date, no information has been provided to BMC that would indicate that the effects to the LFN land users would be different that the effects to the RRDC land users (with respect to the protection of soil quality). Therefore, in order to reduce repetition, a summary of the soils assessment as it relates to potential impacts on the RRDC traditional land users is presented in Section 2.2.2.6. This assessment is also considered applicable to the LFN traditional land users. It is anticipated that

any additional land use information that is made available by LFN in the future will be incorporated into BMC's management and operating plans at that time.

#### *2.1.2.6 Vegetation*

By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for LFN traditional land use activities (such as harvesting berries and traditional medicines) until the post closure period. However, vegetation at the site will be managed through all Project phases in order to ensure that it does not have the potential to prevent the traditional land users from using the area for harvesting vegetation in the post closure period. Details on the mitigation and management measures are presented in Section 2.2.2.8.

Through the Project design; mitigation measures; monitoring programs; adaptive management; and the development of the final reclamation and closure plan, the LFN traditional land users should be able to resume harvesting vegetation from the Project area in the post closure period. It is anticipated that any additional land use information related to culturally important plants at KZK, that is made available by LFN in the future, will be incorporated into BMC's management and operating plans at that time.

#### *2.1.2.7 Wildlife*

LFN have specifically informed BMC the caribou are a particularly important animal harvested for traditional use purposes. Other culturally important species identified during the Kaska Ethnographic Study (Appendix F-3 of the Project Proposal) include: moose, sheep, bear, and wolves, muskrat, beaver, marten, mink, porcupine, squirrel, fox, lynx, and gopher. As noted above for the most part, it was not deemed possible from the ethnographic study to differentiate between LFN and RRDC traditional land use. At this time the only differentiation that BMC can make between the potential effects to LFN vs RRDC traditional land users harvesting wildlife from the Project is that it is RRDC that holds the group trapping rights to the Project Area. Therefore, no effects to LFN due to trapping are predicted (because only RRDC traps in this area).

A summary of the potential effects to the RRDC traditional land users from potential effects to wildlife is presented in Section 2.2.2.8. At this time, this assessment is also considered applicable to the LFN traditional land users. It is anticipated that any additional land use information that is made available by LFN in the future will be incorporated into BMC's management and operating plans at that time.

#### *2.1.2.8 Access*

LFN have long used the region for traditional purposes (i.e., to hunt, trap, fish, gather plants, and seek shelter). By the nature of the proposed development, access to the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for traditional land use activities until the post closure phase. This disruption of land use accounts for approximately 0.05% of the Kaska Traditional Territory in the Yukon. The existing SEPA with BMC and Kaska provides measures to compensate and/or offset (in part) the impacts of the Project area not being available for traditional land use purposes. BMC has agreed to modernize the existing BMC/Kaska SEPA and

as part of this modernization, BMC has put a proposal in writing (to both RRDC and LFN) that would see significant economic benefits of over $100 million being delivered to Kaska from the Project over its 10-year operations phase in addition to direct jobs and training. Due to compensation and offsetting measures that are in the existing SEPA and/or will be in the modernized SEPA, significant adverse effects due to lack of access for traditional use purposes are not predicted.

#### *2.1.2.9 Heritage*

The Geona Creek Valley and the alignment of the proposed Access Road have been traditionally used by LFN and any identified heritage sites need to be carefully managed on a site by site basis. Under the *Yukon Historic Resources Act* and Yukon Archaeological Sites Regulations, effects to the heritage resources will be avoided, and if they cannot be avoided, they will be minimized where possible, or mitigated through systematic data recovery efforts.

Protecting and visiting sacred sites (sacred site will be defined in the draft TK Protocol that is currently being negotiated) and/or grave sites are activities that have been identified as being important to the LFN land users. To date no such sites have been identified in the Project area. However, as mentioned previously, any additional heritage information at KZK, that is made available by LFN in the future, will be incorporated into BMC's management and operating plans at that time.

The existing Project chance find procedure and the proposed Heritage Resource Management Plan (Appendix F-2 of the Project Proposal) requires that RRDC be notified of a chance find and that the assessment of potential significance of the materials will be assessed by a qualified archaeologist in collaboration with the YG Archaeology Department and RRDC Representative(s) and mitigative options will be identified. This will be updated to include notification to both RRDC and LFN. BMC will work collaboratively with these groups to ensure that any further action needed is taken. This will ensure that impacts to heritage resources and subsequent impacts to the traditional land users are mitigated to the extent practicable.

#### *2.1.2.10 Contamination of Land from Spills*

LFN has indicated that contamination at other projects in their traditional territory have resulted in the traditional land users never using the land in the vicinity of the project again. BMC's Project design mitigations, management plans; reclamation and closure plan; and the proposed Environmental, Cultural & Heritage Management Program have all been developed to ensure that the area in post closure is *"compatible with a healthy environment and with traditional land use activities*". Therefore, there will be no contamination of the land that will prevent the land users from returning to the KZK project area in post closure.

#### *2.1.2.11 General Land use Post Closure*

See section 2.2.2.10.

#### *2.1.2.12 Cumulative Impacts*

The assessment of cumulative impacts is presented in response to IR4-5.

## 2.2 YESAB ISSUE

While the project proposal and supporting appendices, including Appendix F-3, contain information pertaining to traditional knowledge and traditional land use for RRDC within the project area, it lacks detail and specificity. Kaska members interviewed to produce various studies are quoted in Appendix F-3, identifying extensive use of the project area for hunting, fishing and trapping.

The proposal does not elaborate on how the effects of the Project, such as avoidance by First Nation hunters, or other traditional land use will be addressed. The proposal focusses on traditional economy and does not discuss the specific effects of the Project on traditional land use discussed in Appendix F-3.

A lack of clarity around VESEC determination, as informed by traditional land use.

Traditional land use information presented does not appear to be fully carried forward or considered as part of the effects characterization.

### 2.2.1 R4-3

Provide additional comprehensive information, above that which was provided through Appendix F-3 on Ross River Dena Council's traditional land use (i.e., past and current) including but not limited to traditional economic activities, to be gathered through primary data collection.

As described in Section 1.1.1, where RRDC considered it to be appropriate, BMC has provided capacity funding and supported RRDC in compiling existing TK and other information and collecting new TK and other information for the Project since 2015. The TK agreement with RRDC states that RRDC is the owner of the TK and if RRDC shares their TK with BMC (in order to inform the mine design, operation or additional mitigation measures), BMC is to keep it confidential and not to share it with other parties. Subsequently, although the response to this information request is informed by TK (to the extent possible) BMC is not in a position to provide specific TK from RRDC or other "non public" sources in this Response Report. Further, BMC would like to clarify that TK provided by RRDC Elders over the Project area will be an ongoing process. In accordance with the RRDC TK Protocol, when new TK is shared, both parties will collaboratively identify any new potential effects as well as any additional mitigation measures that may be required based on the new information.

### 2.2.2 R4-4

Demonstrate how traditional land use information has been incorporated into the consideration of effects and how traditional land uses may be impacted by the Project.

Throughout the Project Proposal and previous Response Reports traditional land use was considered and incorporated into the assessments of effects. As requested by YESAB where the information: "*is currently in the Project Proposal, the Proponent should: Identify that information; and Extract it from the project proposal*". In order to satisfy this request, this response endeavours to summarize how the potential impacts to traditional land use were assessed and extracts the specific sections of the Project Proposal and BMC's responses to IRs to date.

Information used to support the effects assessments was based on traditional land use issues that were identified through consultation and engagement with RRDC citizens, professional judgement, the ethnographic study (Appendix F-3 of the Project Proposal) and the TK study (Rutherford, 1995). The categories of issues are summarized in Table 2-10.

**Table 2-10: Summary of RRDC Land Use Issues Identification**

| RRDC Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| Air Quality | Consultation Record in the Project Proposal | Chapter 6 | Chapter 6 of Response Report #1 (BMC, 2017b)<br><br>Appendix 3 of Response Report #1 (BMC, 2017b)<br><br>Appendix R2-N of Response Report #2 (BMC, 2017c)<br><br>Chapter 8 of Response Report #3A (BMC, 2018A) |
| Noise | Consultation Record in the Project Proposal | Chapter 7 | Chapter 7 of Response Report #1 (BMC, 2017b) |
| Surface Water Quality | Consultation Record in Project Proposal | Chapter 8 | Chapter 8 of Response Report #1 (BMC, 2017b)<br><br>Appendix 3 of Response Report #1 (BMC, 2017b)<br><br>Appendix 4 of Response Report #1 (BMC, 2017b)<br><br>Chapter 8 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-C, R2-D, and R2-N of Response Report #2 (BMC, 2017c) |

| RRDC Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| | | | Chapter 2 of Response Report #3A (BMC, 2018a<br><br>Response Report #3B (BMC, 2018b) |
| Fish | Consultation Record in Project Proposal | Chapter 10 | Chapter 10 of Response Report #1 (BMC, 2017b)<br><br>Appendix 3 of Response Report #1 (BMC, 2017b)<br><br>Chapter 17 of Response Report #1 (BMC, 2017b)<br><br>Chapter 10 of Response Report #2 (BMC, 2017c)<br><br>Chapter 17 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-N and R2-0 of Response Report #2 (BMC, 2017c)<br><br>Chapter 6 of Response Report #3A (BMC, 2018a)<br><br>Chapter 8 of Response Report #3A (BMC, 2018A)<br><br>Response Report #3B (BMC, 2018b) |
| Terrain and Soils | Professional judgement | Chapter 11 and Appendix H (Reclamation and Closure) | Chapter 11 of Response Report #1 (BMC, 2017b)<br><br>Chapter 11 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-H and R2-I of Response Report #2 (BMC, 2017c) |
| Vegetation | Consultation Record in Project Proposal | Chapter 12 and Appendix H (Reclamation and Closure) | Chapter 8 of Response Report #3A (BMC, 2018A) |
| Wildlife | Consultation Record in Project Proposal | Chapter 13 and Appendix H (Reclamation and Closure) | Chapter 13 of Response Report #1 (BMC, 2017b)<br><br>Appendix 5 of Response Report #1 (BMC, 2017b) |

| RRDC Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| | | | Chapter 13 of Response Report #2 (BMC, 2017c)<br><br>Appendix R2-J through R2-M of Response Report #2 (BMC, 2017c)<br><br>Chapter 4, 5 and 7 of Response Report #3A (BMC, 2018a)<br><br>Appendix R3-F of Response Report #3A (BMC, 2018a)<br><br>Chapter 8 of Response Report #3A (BMC, 2018A) |
| Access | Consultation Record in Project Proposal | Chapter 15 | Chapter 9 of Response Report #3A (BMC, 2018a) |
| Heritage | Consultation Record in Project Proposal | Chapter 14 | Chapter 14 of Response Report #1 (BMC, 2017b)<br><br>Appendix 6 of Response Report #1 (BMC, 2017b) |
| Contamination of Land from Spills | Consultation Record in Project Proposal | Chapter 18 and Appendix H (Reclamation and Closure) | Chapter 20 of Response Report #1 (BMC, 2017b)<br><br>Chapter 10 of Response Report #3A (BMC, 2018a)<br><br>Appendix R3-G of Response Report #3A (BMC, 2018a) |
| General Land use Post Closure | Consultation Record in Project Proposal | Appendix H (Reclamation and Closure) | Chapter 2 of Response Report #1 (BMC, 2017b) |
| Cumulative Impacts | Consultation Record in | | Chapter 13 of Response Report #1 (BMC, 2017b)<br><br>Chapter 13 of Response Report #2 (BMC, 2017c) |

| RRDC Land Use Issue | Identified Through | Project Proposal Section in Which Issue was Considered | Response Report Where Additional Information was Provided and the Issue further Considered |
|---|---|---|---|
| | Project Proposal | | |

#### *2.2.2.1 Overview*

**Geographic Location (modified from Section 3.1 of the Project Proposal)**

The Project is located approximately 115 km southeast of Ross River (home community of Ross River Dena Council). Access to the Project is via a 24 km existing single lane gravel Tote Road (that is proposed to be upgraded to an Access Road) that connects the Project to the Robert Campbell Highway.

**Land Tenure (modified from Section 3.2 of the Project Proposal)**

The Project is located within outfitting concession #20 (held by Yukon Big Game Outfitters) and within Game Management Subzone 10-07. The Project boundary overlaps with two trapping concessions; the Tote Road and the west portion of the claims overlap with group trapline concession #405 (held by Ross River group), and the eastern portion of the claims overlap trapline concession #250 (held by two RRDC citizens).

**Project Area, Land and Resource use (modified from Section 15.3.1 of the Project Proposal)**

The region has long been used by RRDC to hunt, trap, fish, gather plants, and seek shelter. There are also traditional trails in the area used by RRDC to travel between key traditional use locations. There are two main access routes to the proposed Project area, including from the west starting at Frances Lake along Money Creek as well as from the north at Pelly Banks through Finlayson Creek. The area in and around the proposed Project has been of particular importance for hunting for big game, such as caribou, moose, and sheep, especially in the North Lakes area (south of the Project). There are several Kaska cabins in the region, including nearby locations along North Lakes, Money Peak, and Wolverine Lake with more distant locations along Frances Lake, Pelly Banks, and Money Creek. These cabins were identified during the Traditional Knowledge study conducted for the Project in the 1990s.

Note that trails, camps, fishing, and hunting areas within an approximate 30 km radius from the proposed mine site were identified, mapped, and provided in the TK report (Rutherford, 1995). There is also a map of the general land use by Kaska. When preparing Appendix F-3 of the Project Proposal, BMC did not provide detailed information from the TK study due to the confidentiality obligations contained within the TK agreement with RRDC. The intent of summarizing the

information and providing specific quotes from the interviews in Appendix F-3 was to acknowledge the extensive use of the area by RRDC without releasing confidential information. The only direct overlap with the Project components and the items shown on the maps is a traditional trail that winds back and forth over the existing Tote Road. It is understood that this trail is currently used by the guide outfitter seasonally during hunting season and therefore the use and existence of the trail is not considered confidential.

**Acknowledgment**

BMC understands that RRDC assert various Aboriginal rights and title within their asserted traditional territory, including hunting, fishing, and harvesting rights and rights to the land itself (title). Aboriginal rights and title stem from pre-contact occupancy and longstanding use, and are protected by the *Constitution Act, 1982*.

**Focus of Assessment**

By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for RRDC traditional land use activities (i.e. hunting, fishing, and harvesting berries and traditional medicines, travel etc.) until the post closure period. This disruption of land use accounts for approximately 0.05% of the Kaska Traditional Territory in the Yukon. The existing SEPA with BMC and Kaska provides measure to compensate and/or offset (in part) the impacts of the Project area not being available for traditional land use purposes. BMC has agreed to modernize it the existing SEPA and as part of this modernization, BMC has put a proposal in writing (to both RRDC and LFN) that would see significant economic benefits of over $100 million being delivered to Kaska from the Project (in addition to jobs and training) over its 10 year operations phase. Subsequently, the summaries of the effects assessments (presented below) related to the construction, operation and active closure phases is largely focussed on the areas outside of the Project footprint, where there is the potential for land use to continue. The effects assessments for the post closure phase assumes that the land is once again available for use.

#### *2.2.2.2 Air Quality*

RRDC citizens use the area in and around the proposed Project. Impacts to air quality could theoretically result in a secondary impact of RRDC citizens no longer using the area, due to perceived health concerns; however, this is not certain. The modelling results presented in Chapter 6 of Project Proposal (BMC, 2017a) and Appendix R2-N of Response Report #2 (Preliminary Quantitative Risk Assessment) (BMC, 2017c) found no unacceptable risks to exposure of the CACs based on the predicted concentrations at the KZK camp (i.e. exposure to off-shift workers). For further re-assurance that the RRDC land users (while conducting their traditional use activities) in the vicinity of the Project won't have adverse health effects from exposure to the CACs, BMC has summarized the model results at 2 km from the mine site and 500 m from the centre line of the Access Road alignment. The results are presented in Tables 2-4 to 2-9 for total suspended particulates, coarse particulate

matter, fine particulate matter, carbon monoxide, nitrogen oxide, and sulphur oxides (respectively). These present the predicted highest concentrations in the useable area surrounding the Project. It was assumed that at this distance RRDC citizens could use the land for hunting, fishing and gathering during construction, operations and active closure. All of the concentrations of the CACs modelled (at two km from the mine site infrastructure and 500 m from the proposed Access Road) meet the Yukon Ambient Air Quality Standards. Therefore, no adverse health effects due to exposure of the RRDC traditional land users to the CACs are predicted. The RRDC traditional land users may safely use the area surrounding the Project during construction, operations and active and transitional closure and thus no impacts to traditional land use are predicted. During the post closure phase all areas including the Project area will again be available and safe for use by the traditional land users.

#### *2.2.2.3 Noise*

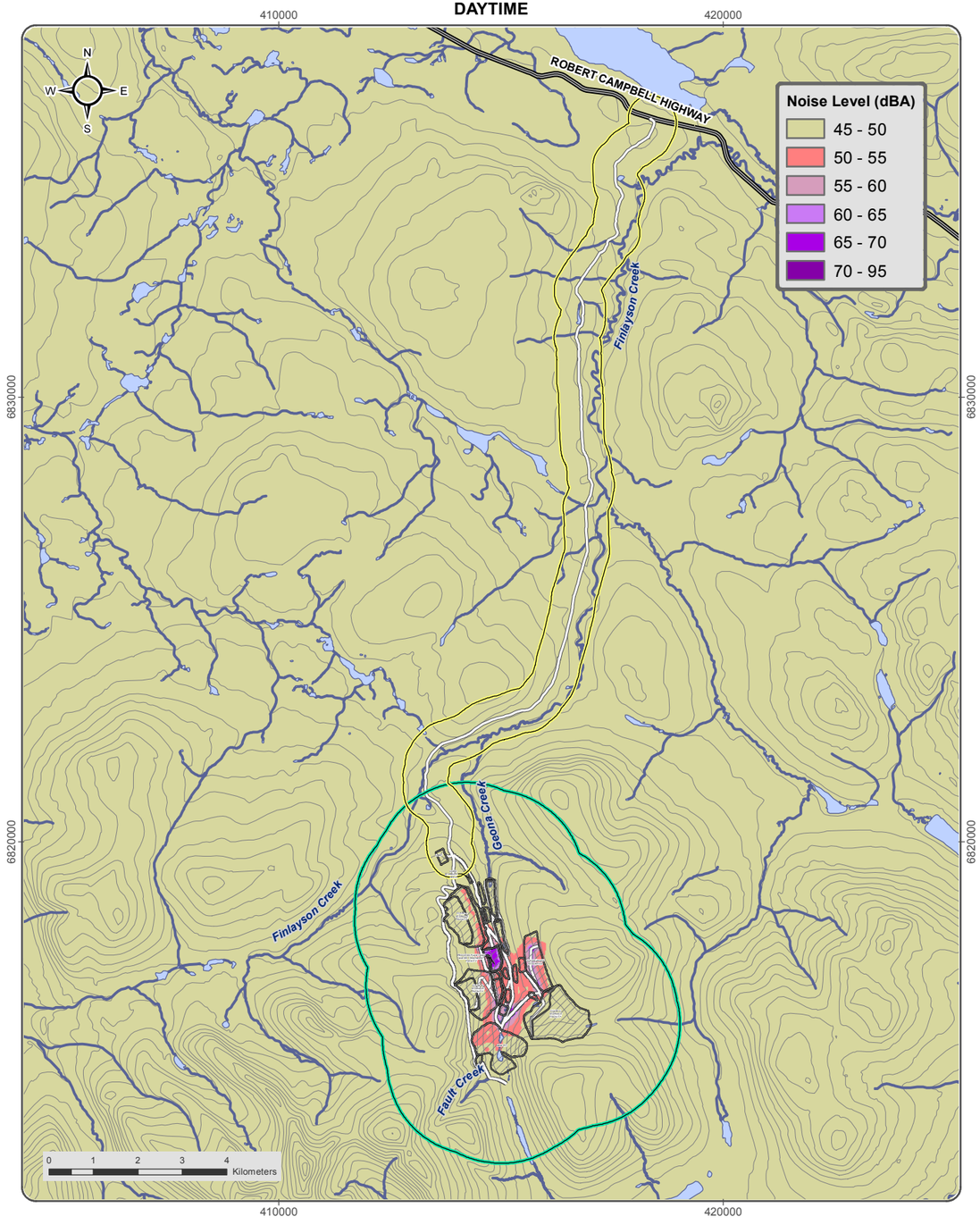
The text in this section is modified from Chapter 7 of the Project Proposal (BMC, 2017a).

Noise was selected as a VC because of its fundamental importance to the quality of life for humans and wildlife in the vicinity of the Project. Elevated noise levels may lead to annoyance, stress, sleep disruption, decreased ability to concentrate, lowered learning performance, and other adverse health effects in humans (enHealth Council, 2004). For wildlife, noise may lead to habitat avoidance as well as unfavourable physiological and behavioral responses (Turina and Barber, 2011). The assessment in Chapter 7 focussed on potential effects to humans, while potential effects to wildlife as assessed in Chapter 13 of the Project Proposal.

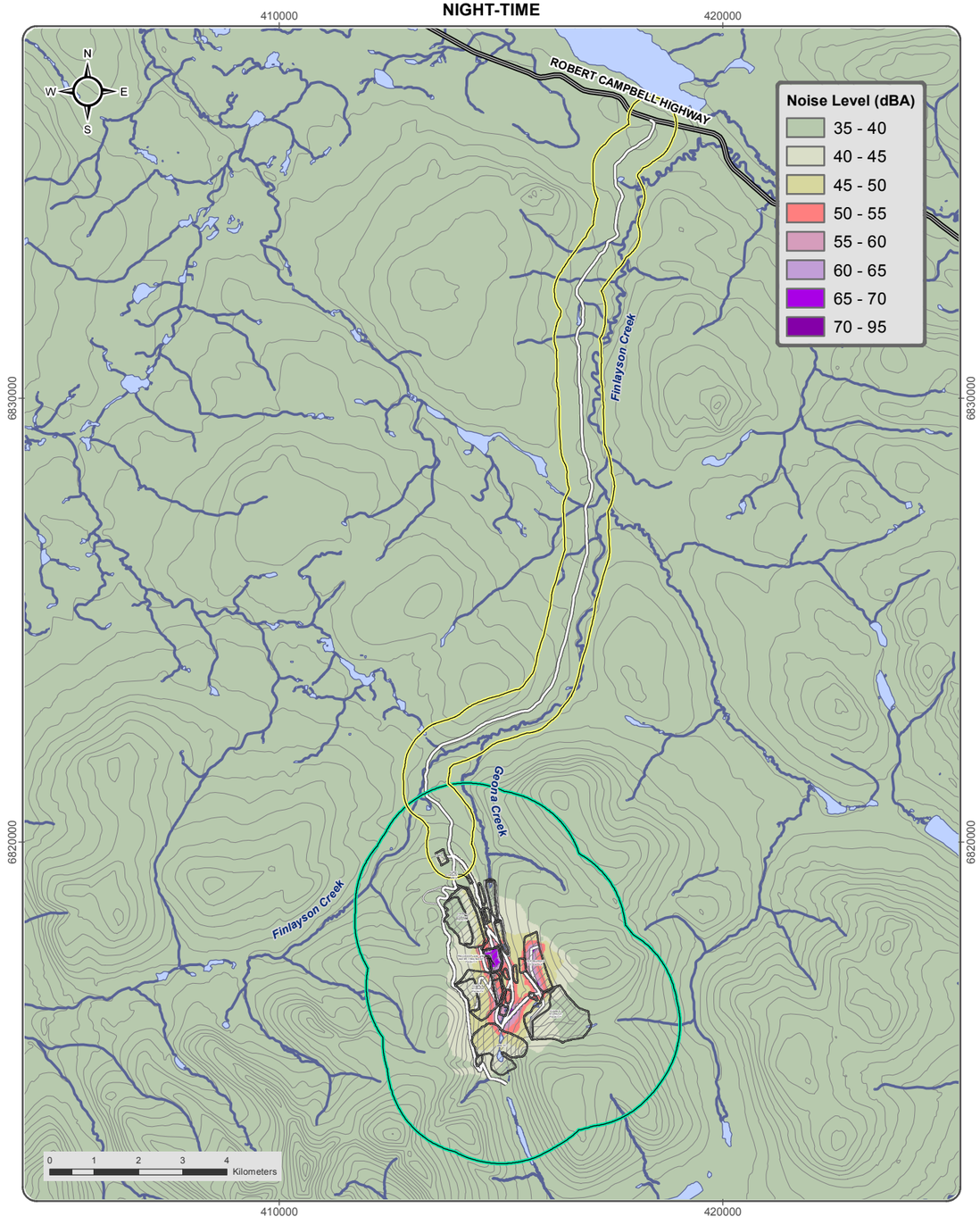
The modelling results presented in Chapter 7 of Project Proposal (BMC, 2017a) focussed on the predicted changes in noise at the KZK camp as people in the camp would be people closest to the mine activities and noise generated from the site. However, for the purposes of assessing potential impacts to RRDC land use (associated with increases in noise) it is more realistic to evaluate the levels of noise in the areas around the Project that RRDC may use during the Project phases. Therefore, the modelled changes in day-time and night-time noise presented in this Response Report are at an approximate distance of 2 km from the proposed mine infrastructure and 500 m from the Access Road alignment. The results are presented for construction, operations and Active Closure (Figure 2-1, Figure 2-2 and Figure 2-3). The results show that within 2 km of the mine site and 500 m from the Access Road alignment the day-time and night-time noise levels are at baseline during construction, Active Closure. Baseline levels are also predicted during operations in these areas with the exception of a very small area along the road alignment just south of the Finlayson creek crossing (Figure 2-2). Based on these results, the RRDC traditional land users may safely use the area surrounding the Project during construction, operations and active and transitional closure and thus no impacts to traditional land use are predicted due to changes in noise levels. During the post closure phase all areas including the Project area will again be available and safe for use by the traditional land users.

Mitigation measures to reduce noise are presented in Section 7.4.2 of the Project Proposal.

## DAYTIME




## NIGHT-TIME




Noise Levels Predictions shown on this map were produced with SoundPLAN Essential 3.0

Datum: NAD 83; Map Projection: UTM Zone 9N



AEG

- Location of Proposed Infrastructure (Year Ten)
- Tote Road/Proposed Access Road 500m Buffer Area
- Location of Proposed Infrastructure 2km Buffer Area
- Tote Road/Proposed Access Road and Project Site Roads
- Contours (40 m)
- Watercourse
- Waterbody

**Standard Noise Levels:** Daytime - 50 dBA; Night-Time - 40 dBA

BMC MINERALS

# KUDZ ZE KAYAH PROJECT

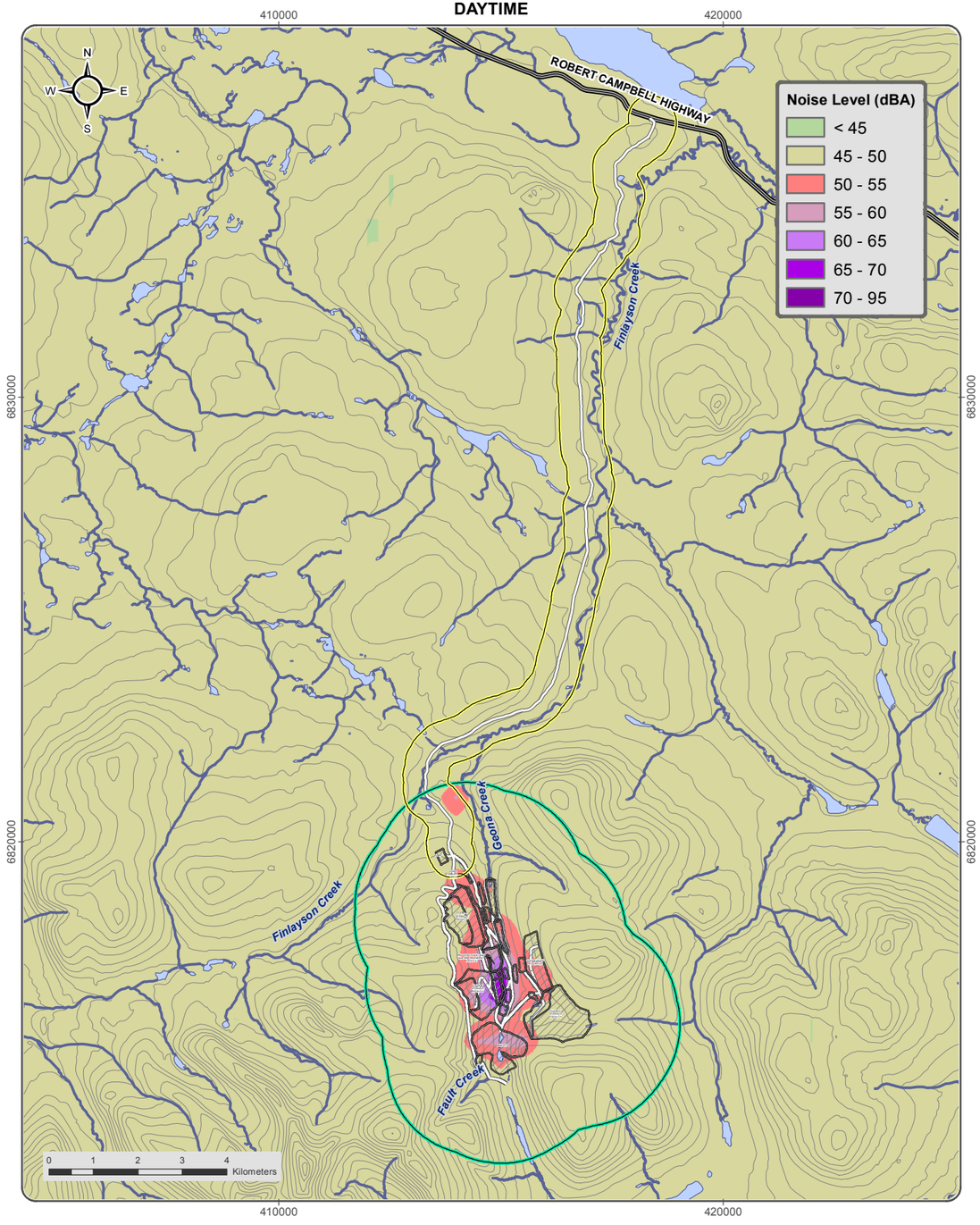
## FIGURE 2-1

## CONSTRUCTION PHASE PREDICTED NOISE LEVELS (WITH DESIGN MITIGATIONS)

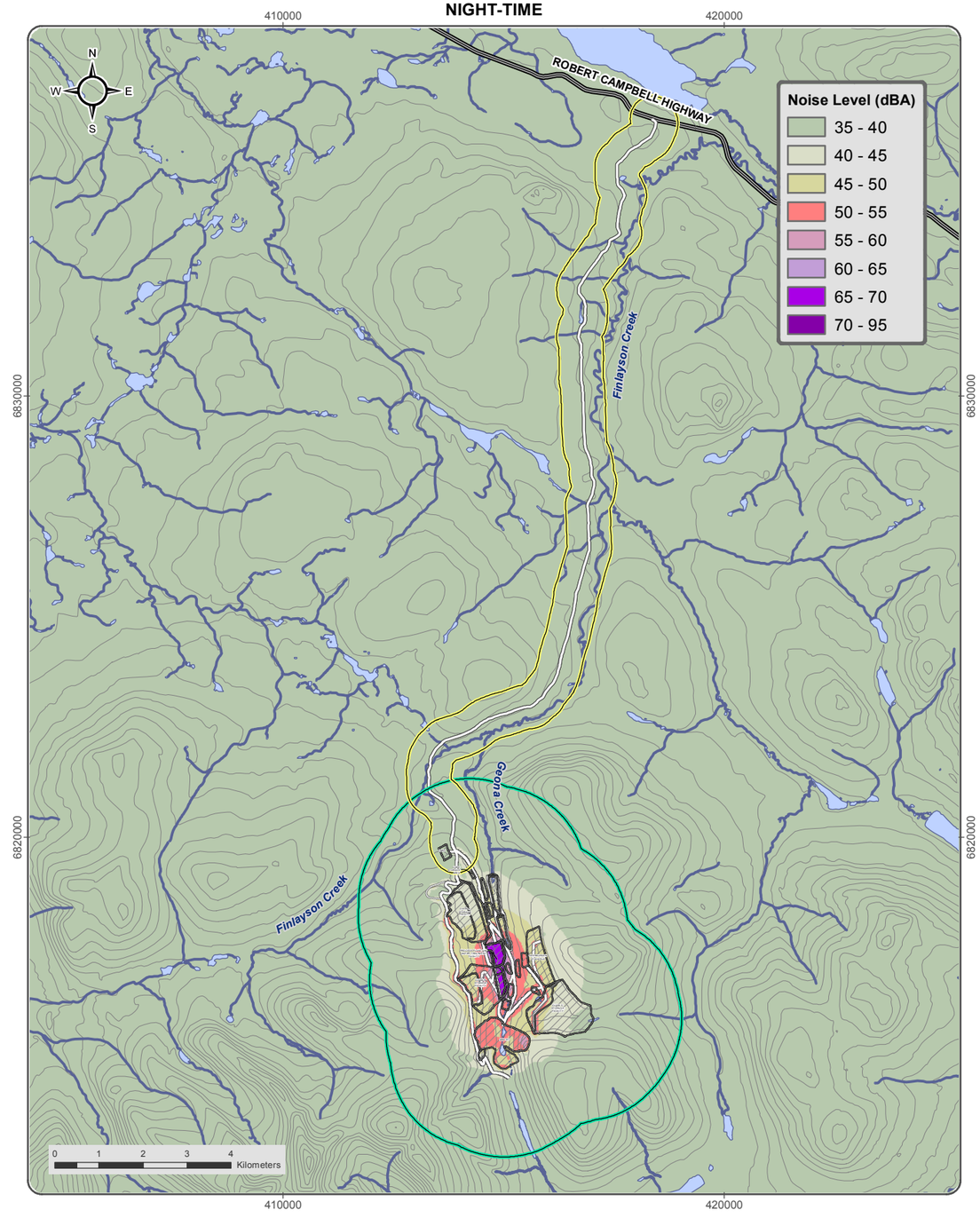
NOVEMBER 2018

D:\Project\AllProjects\Kudz_Ze_Kayah\Maps\03_Study\Noise\Noise_Constr_20181129.mxd
(*Last edited by: amatlashevska;29/11/2018/15:33 PM*)

## DAYTIME




## NIGHT-TIME




Noise Levels Predictions shown on this map were produced with SoundPLAN Essential 3.0

Datum: NAD 83; Map Projection: UTM Zone 9N



AEG

- Location of Proposed Infrastructure (Year Ten)
- Tote Road/Proposed Access Road 500m Buffer Area
- Location of Proposed Infrastructure 2km Buffer Area
- Tote Road/Proposed Access Road and Project Site Roads
- Contours (40 m)
- Watercourse
- Waterbody

**Standard Noise Levels:** Daytime - 50 dBA; Night-Time - 40 dBA

BMC MINERALS

# KUDZ ZE KAYAH PROJECT

## FIGURE 2-2

## OPERATION PHASE PREDICTED NOISE LEVELS (WITH DESIGN MITIGATIONS)

NOVEMBER 2018

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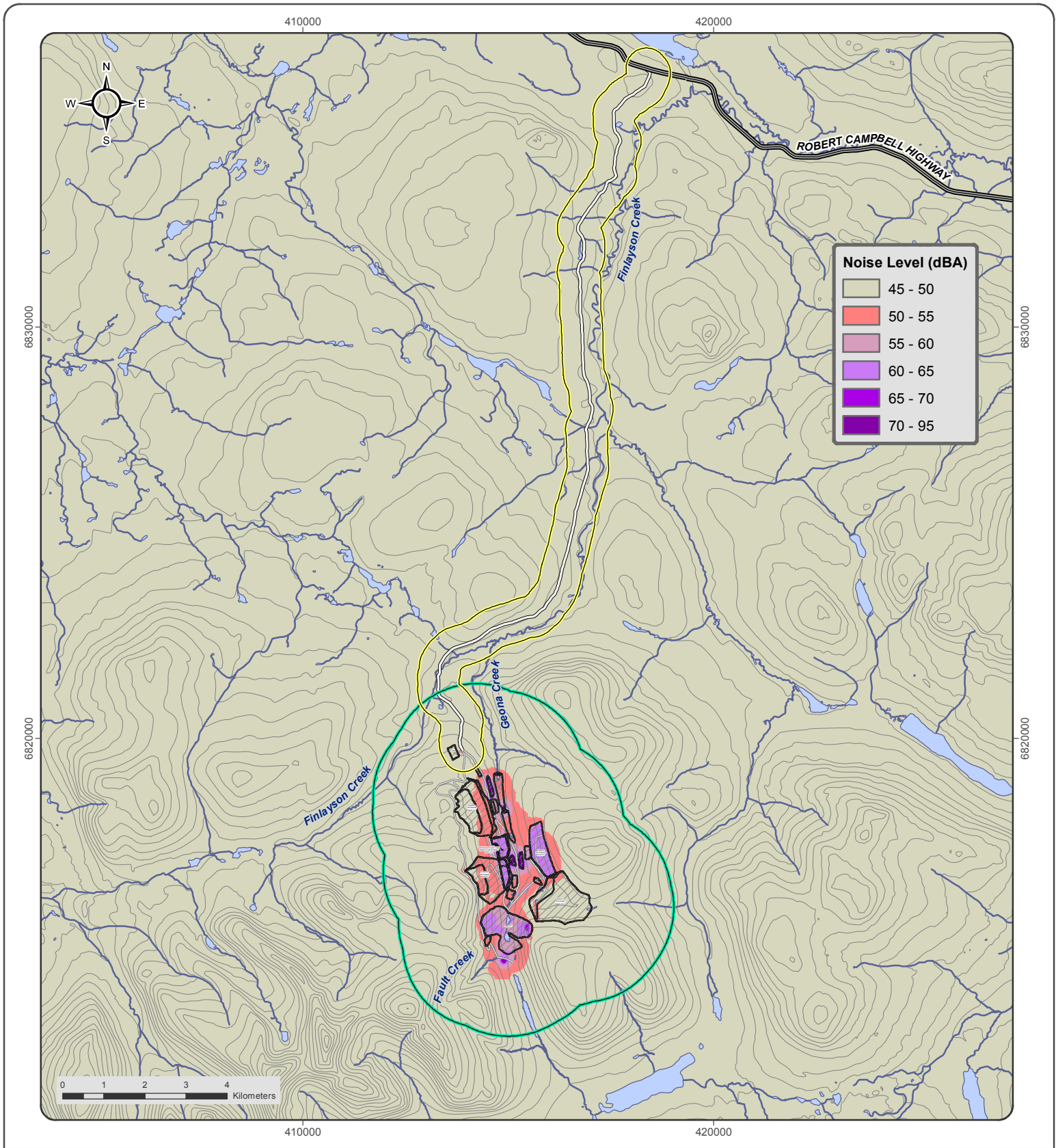


Location of Proposed Infrastructure (Year 10)

Tote Road/Proposed Access Road 500m Buffer Area

Location of Proposed Infrastructure 2km Buffer Area

Tote Road/Proposed Access Road

Project Site Roads

Contours (40 m)

Watercourse

Waterbody

**Standard Noise Levels:** Daytime - 50 dBA

Noise Levels Predictions shown on this map were produced with SoundPLAN Essential 3.0

Datum: NAD 83; Map Projection: UTM Zone 9N



AEG

BMC MINERALS

# KUDZ ZE KAYAH PROJECT

## FIGURE 2-3
## CLOSURE PHASE PREDICTED DAYTIME NOISE LEVELS (WITH DESIGN MITIGATIONS)

NOVEMBER 2018

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#### *2.2.2.4 Surface Water Quality*

BMC has demonstrated how RRDC traditional land use information has been incorporated into the effects assessment for water quality in response to R4-8 "*Thoroughly demonstrate how Traditional Knowledge and traditional land use have been incorporated into the consideration of effects to water in the proposal or the identification of mitigations*". The response to this IR includes an assessment of how traditional land uses of the waterbodies in the study area may be impacted by the Project. Potential effects specific to fish from changes in water quality are summarized (in part) in the following section of this Response Report.

#### *2.2.2.5 Fish*

**Traditional Use Waterbodies Used for Fishing**

During meetings with the RRDC Elders Oversight Committee and site tours with the Elders, Finlayson Creek and North Lakes were identified as having been used for the traditional land use activity of fishing. To date Arctic grayling have been identified as the main fish species caught. Geona Creek was identified as being important habitat for wild game and game birds that RRDC rely on (but not specifically for fish, which is not surprising given the low densities of fish observed in Geona Creek). Potential impacts to Geona Creek habitat are therefore discussed in the wildlife section below.

In addition, the Traditional Knowledge Study conducted in 1995 (Rutherford, 1995); and, the desk based Kaska Ethnography study (Appendix F-3 of the Project Proposal) identified the importance of other waterbodies in the region, including: Wolverine Lake, Francis Lake, Francis River, Hoole Canion along the Pelly River, Big Campbell Creek, Money Creek, Finlayson Lake, Finlayson River, Grass Lakes, and Fire Lake. Fish caught in these waterbodies include: Arctic grayling, trout, jackfish, whitefish, and suckers. These reginal waterbodies do not have the potential to be affected by the Project.

**Key Design Mitigation Measures to Protect Fish and Enhance Fish Habitat**

Given the importance of Finlayson Creek and North Lakes (as traditional use waterbodies for fishing) the Project Design team ensured that the Project was designed to avoid or minimize effects to these waterbodies and in the case of Finlayson Creek the Project was designed to cause a positive effect.

Finlayson Creek was identified by RRDC Elders as having historically been used for fishing of Arctic grayling; however, when YG installed the culverts at the Robert Campbell Highway they created a fish barrier. Since the barrier has been in place, Finlayson Creek has not been used for fishing as density of fish in the system is too low. BMC plans to reverse this effect as part of the proposed Fish Offsetting Plan (FOP). BMC is proposing to fund YG to remove the fish barrier. This mitigation will allow the Arctic grayling to move back into Finlayson Creek such that the traditional use of the Creek will be restored. Finlayson Creek itself, is a total stream length of 36.56 km which could be utilized for fishing. Additional information on the proposed FOP is presented in Appendix E-4 of the Project Proposal and in BMC's responses to R143(b) and R3-12 (BMC, 2017b).

North Lakes (approximately 5 km south of the proposed Project) has been identified as an important traditional use waterbody for fishing. Given the importance of these lakes, the open pit was designed to ensure that its most southern boundary did not cross the watershed divide and that the outlet of the pit at closure was at an elevation low enough to ensure surface water continues to flow north. Based on this design the groundwater will also flow north into the pit and north out of the pit. With these design mitigation/avoidance measures, all potential long term effects to the surface water quality and groundwater quality in the watershed south of the Project (including North Lakes) have been eliminated.

Section 4.15.4.2 of the Project Proposal presents the alternatives assessment for Waste Storage Facility Locations. In this assessment alternative locations for the Class C Waste Storage Facility were assessed. One of the options was to locate this facility south of the open pit (in the area of South Lakes). This was the least preferred option as it would result in Project infrastructure outside of the Geona Creek watershed and one of BMC's design philosophies was to keep all Project infrastructure to within the one watershed and to minimize the Project footprint to the extent practicable. This philosophy subsequently minimises the effects on traditional land use (due to less area being impacted). Had this option been selected there would have been permanent loss of the South Lakes for traditional land use activities (and potentially indirect effects to North Lakes).

**Modelled Water Quality**

Appendix D-7 and Chapter 8 of the Project Proposal presented modelled potential changes in water quality in Finlayson Creek and South Creek (which ultimately flows into North Lakes). At the request of YESAB (IR3-1) (YESAB, 2018a), BMC updated the model results in 2018 (BMC, 2018b). Overall the updated model predicts better water quality than the original model results presented in the Project Proposal. Notwithstanding, potential effects on water quality could result in potential effects to the traditionally harvested fish from Finlayson Creek and North Lakes (if the water in South Creek was impacted and the impacts went as far south as North Lakes). A summary of the updated model results is presented as follows:

Construction Phase:

- During this phase, contaminant of potential interest (COPI) concentrations in upper and lower Finlayson Creek (KZ-15 and KZ-26, respectively) were estimated to be comparable to, or slightly lower than baseline levels due to the diversion of upstream waters (Fault Creek) and dilution from the pit dewatering.
- No COPI exceedances were predicted in Finlayson Creek during the Construction phase for all of the precipitation scenarios.
- Model estimated COPI concentrations in South Creek (KZ-13) increased following the completion of the Fault Creek diversion to the South Creek catchment, with the increases most marked for selenium, cadmium and zinc; however, no preliminary water quality objective (pWQO) exceedances were estimated.

Operations Phase:

- No exceedances were estimated in any of the precipitation scenarios in Finlayson Creek (KZ-15 and KZ-26).
- In South Creek (KZ-13), increased concentrations of cadmium, selenium and zinc persisted from the Construction phase through to Operations, but no pWQO exceedances were estimated.

Active and Transition Closure Phases:

- COPI concentrations were estimated to increase in Upper Finlayson Creek (KZ-15) over the Active Closure phase as contact water from the site is collected, treated and discharged. However, no pWQO exceedances of any COPI were estimated in either the Upper or Lower Finlayson Creek monitoring locations in the Active or Transition Closure phases.
- COPI concentrations in South Creek (KZ-13) were estimated to return to baseline levels as the Fault Creek diversion is removed, allowing South Creek to revert to its pre-Project flow regime.

Post-Closure Phases:

- Discharge from the ABM Lake resulted in COPI concentration increases in Finlayson Creek; however, no water quality exceedances were estimated for any COPI at in Geona Creek or Upper and Lower Finlayson Creek.

**Aquatic Resources Effects Assessment**

Chapter 10 of the Project Proposal included an effects assessment of aquatic ecosystems and resources VC. One of the subcomponent VCs that was assessed was Arctic grayling. Arctic grayling was selected as a VC (in part) as it is the only fish species that has been identified in Geona Greek and has also been identified as an important traditionally harvested fish by RRDC. Aquatic habitat and benthic invertebrates, periphyton and aquatic plants were the other two subcomponent VCs assessed (given their importance to maintaining a healthy environmental for the fish to live). The following provides a brief summary of the assessment.

Arctic Grayling:

Changes to Arctic grayling population catch per unit effort or condition factor resulting from the Project activities were assessed to be in a beneficial or adverse direction, since Project activities would likely affect Arctic grayling population in an adverse direction while offsetting measures detailed in the Fish Offsetting Plan could enhance fish use and rearing conditions of the system. Sublethal effects to fish from changes in water quality were assessed to not result in residual effect as most parameters of interest did not exceed water quality objectives and chronic effects were alleviated by a number of toxicity modifying factors for all Project. Catch per unit effort and potential sub-lethal effects were assessed as not significant.

Aquatic Habitat:

The potential effects on aquatic habitat were evaluated through considering potential effects as a result of changes in habitat availability, distribution connectivity, total suspended solids, surface water quantity and quality, water temperature, stream sediments chemistry and particle size distributions. With implementation of mitigation measures, changes in water temperature were assessed not to result in residual effect with the rest of these effects on aquatic habitats assessed as not significant.

Benthic invertebrates, periphyton and aquatic plants:

The potential effects on benthic invertebrates, periphyton and aquatic plants were evaluated through considering potential effects as a result of changes in benthic invertebrate community, abundance and diversity of periphyton communities, and chlorophyll a, as well as potential sublethal effects to benthic invertebrates, aquatic plants or algae. With implementation of mitigation measures, potential sublethal effects were assessed not to result in residual effects, with the rest of these effects on benthic invertebrates, periphyton and aquatic plants were assessed as not significant.

**Preliminary Quantitative Risk Assessment**

A preliminary quantitative human health risk assessment (PQRA) was conducted for the Project (Appendix R2-N of Response Report #2 (BMC, 2017b). This risk assessment (in part) assessed the potential risks from the predicted changes in water quality to result in increases in the COPI concentrations in fish and the potential for subsequent adverse health effects to the traditional land users who may harvest and eat these fish. Overall, no unacceptable human health risks were predicted from the consumption of Arctic grayling.

As described above, the water quality model has been updated since the PQRA was conducted. Overall, the predicted water quality results show better water quality than the initial model (BMC, 2018b). The following presents an update to the PQRA considering the updated water model results. The summary is qualitative, rather than quantitative due to the lack of reliable models for predicting fish concentrations based on changes in water quality. The results are focussed on Finlayson Creek (as it has been identified as a waterbody used for fishing by RRDC and South Creek as it flows into South Lakes which eventually flows into North Lakes (which has also been identified as a waterbody used for fishing by RRDC).

Construction:

During construction, no COPIs were estimated to exceed their respective water quality objectives in Finlayson Creek, or South Creek. Some COPIs were estimated to be higher than baseline in the South Creek. Although COPI concentrations were predicted to be higher than baseline in South Creek, due to the diversion of Fault Creek, no pWQO exceedances were predicted from the modelling.

Finlayson Creek (upgradient of the culverts where Finlayson Creek crosses the Robert Campbell Highway) has an extremely low abundance of Arctic grayling (this is likely due to the fish barrier at

the culverts) and subsequently the waterbodies upgradient of the barrier are currently not a source of fish for consumption.

Based on the water quality modelling results for Finlayson Creek and South Creek, accumulation of metals in the fish tissue are not predicted. In addition, the abundance of fish in Finlayson Creek is so low that the RRDC land users don't currently fish from the creek (upgradient of the culverts). No unacceptable risks are predicted to the RRDC land users during construction from the consumption of fish.

Operations:

During operations, no COPIs were estimated to exceed their respective water quality objectives in Finlayson Creek, or South Creek.

If the FOP is completed during the construction period and Arctic grayling return to Finlayson Creek, there is the potential that RRDC citizens could fish from Finlayson Creek, with access via the traditional use trail (identified in Rutherford, 1995). However, based on the water quality modelling results for Finlayson Creek and South Creek, accumulation of metals in the fish tissue are not predicted. No unacceptable risks are predicted to the RRDC land users during operations from the consumption of fish.

Active and Transition Closure Phases:

During active and transition closure COPI concentrations in South Creek were estimated to return to baseline levels as the Fault Creek diversion is removed, allowing South Creek to revert to its pre-Project flow regime. No pWQO exceedances of any COPI were estimated in Finlayson Creek. By this Project phase Arctic grayling should have returned to Finlayson Creek, due to the FOP, thus RRDC citizens could fish from Finlayson Creek, with access via the traditional use trail (identified in Rutherford, 1995). However, based on the water quality modelling results for Finlayson Creek and South Lakes accumulation of metals in the fish tissue are not predicted. No unacceptable risks are predicted to the RRDC land users during active and transition closure from the consumption of fish.

Post Closure Phase:

During the post closure phase, no COPIs were estimated to exceed their respective water quality objectives in Finlayson Creek, or South Creek. No unacceptable risks are predicted to the RRDC land users during post closure from the consumption of fish.

**Monitoring**

Given that the modelled COPI's are not predicted to increase to a level above the pWQO's, it is unlikely that fish will accumulate metals to a level that results in the fish not being safe for human consumption and therefore, no unacceptable risks are predicted. However, due to the lack of reliable models for predicting fish tissue concentrations from exposure to changes in water concentrations, it is not possible to quantify human health risks. No water quality guideline in Canada or elsewhere

has been identified that reliably predicts the complex movement of these metals from water into fish/animal tissue and so there is no value for comparison. In particular, the federal guidelines and objectives do not address this pathway. In addition, there is no generally accepted manner identified to predict fish tissue concentrations for these COPIs.

Notwithstanding the above, there is a high degree of certainty that no unacceptable risks would occur from fish consumption and that people will be adequately protected for a variety qualitative reasons discussed in part above and in more detail below. Firstly, a key principle of risk assessment guidance is that in order for risk to occur, there must first be exposure. During construction the fish densities in Finlayson Creek will still likely be too low for RRDC to fish from this creek. In addition, during construction, operations and active closure, access to the creeks (for harvesting fish) would be limited (via traditional use trails only). Thus, there will be limited exposure.

A second factor that suggests a very low likelihood of unacceptable risks is that there are no predicted water exceedances therefore, significant metals accumulation into fish is not predicted.

However, the most important consideration that suggests low likelihood of unacceptable risks is the rigorous fish tissue monitoring plan that will be in place. Due to the lack of reliable models for predicting fish tissue concentrations/accumulations, the most accurate method of assessment of risks is monitoring of fish tissue concentrations. A very substantial database of baseline fish (sculpin) concentrations has been collected that will be used to compare against the monitoring that will take place during the mine operation and post-closure periods (which will be required under Metal Mining Effluent Regulations (MMER) and the Type A Water Licence). This baseline data set includes fish tissue sampling every other year since 2000. In addition, a monitoring program that includes Arctic grayling from downgradient of the culverts and in South Lakes was initiated in 2018 (the results were not available at the time of report preparation). If fish concentrations do not appreciably change from baseline concentrations, it will be clear that no incremental human health risks from fish consumption will be associated with the Project. If fish tissue concentrations start to trend higher, there will be ample time to complete a human health risk assessment to evaluate any concern during the period that fish consumption from the creeks is not occurring. Consequently, there will essentially be no opportunity for persons to consume fish with elevated concentrations without a human health risk assessment and, if required, additional mitigation measures having first been completed and implemented.

Overall, there is no information that suggest that the minor changes in water quality will result in unacceptable human health risks from fish consumption. Although there are no suitable models to accurately predict fish tissue concentrations, other factors are suggestive of low likelihood of risks. Most importantly, a rigorous monitoring plan will be in place that will detect any increases in fish tissues concentrations well in advance of any opportunity for persons to collect and consume fish from the creeks.

### Screening Level Concentrations

At the request of YESAB, BMC has developed preliminary fish tissue screening concentrations for protection of human health (BMC, 2018a). However, the local baseline concentrations in Arctic grayling are currently not known and it would be unreasonable and perhaps harmful to the health of the RRDC citizens to develop tissue screening concentrations that are less than background. In addition, there is also concern regarding the lack of detailed Health Canada guidance on development of tissue screening concentrations for country foods (including fish). In some cases, Health Canada's contaminated site group use different toxicity reference values and different target risk values than Health Canada's Food Branch and, in these cases, it is unclear which values take precedent. Whereas Health Canada's contaminated site group provides more detailed written guidance, it seems that the Health Canada Food Branch guidance is more case-by-case and provided only after country food data have been collected. It would seem that the Food Branch has decided it is important to not unnecessarily scare people away from healthy country foods and, consequently, no tissue concentrations/standards for comparison of results are provided by Health Canada for country foods (instead, the case-by-case approach seems preferred). For these reasons, the tissue screening concentrations provided in BMC (2018a) are considered to be preliminary and it is proposed that these will be revisited after the monitoring data is available, agency comments are provided and there is more certainty regarding use of the traditional use waterbodies (i.e. it might be that even with the FOP making Finlayson a fishable creek that RRDC chooses not to use it for fishing, due to the perception of vast contamination (based on their experience with other mines such a Faro). It is likely more prudent to develop screening values once additional information is available as this will increase the defensibility of the values.

### Monitoring

A monitoring program for the fish and aquatics VCs is presented in Section 10.6 of the Project Proposal with additional details provided in BMC's responses to YESAB's IRs related to this proposed program. In addition, RRDC's Elders Oversight Committee requested that BMC and RRDC develop a co-management program for fish and wildlife. In response to this request, BMC sent RRDC Chief and Council (in May 2017) a proposal for a BMC-Kaska Environmental, Cultural & Heritage Management Program for the Project. Through this co-management program it is anticipated that RRDC will collaboratively design, collect, report, manage and communicate the results of the fish monitoring program to RRDC citizens (including the RRDC Elders Oversight Committee). This program would be active through all Project phases and it is anticipated that it will provide a forum to incorporate culturally relevant mitigation measures to the fish and aquatic resources monitoring and adaptive management programs.

### Summary

Finlayson Creek and North Lakes have been specifically identified by RRDC as traditional use waterbodies used for fishing. Based on the assessment above, no unacceptable risks to the traditional use land users are predicted from the consumption of fish in these waterbodies during any of the Project phases. Monitoring and the collection of more detailed land use information (through the BMC-Kaska Environmental, Cultural & Heritage Management Program) the will ensure that these

predictions remain valid. Through this co-management program, the risk of the traditional land users of avoiding fishing from these waterbodies will be reduced.

#### *2.2.2.6 Soils*

By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for traditional land use activities (i.e., hunting, fishing, and harvesting berries and traditional medicines, travel etc.) until the post closure period. However, soils at the site will be managed through all Project Phases in order to ensure that it does not have the potential to prevent the traditional land users from using the area in the post closure period.

During construction, operations and closure, soil quality could be affected by minor fuel spills. These minor spills will be remediated as per the Spill Contingency Plan (Section 18.5 of the Project Proposal). Because the spills and all associated affected soils will be cleaned up, there is no potential for such spills to affect the land users in the post closure period. The quality of country foods (specifically vegetation and wildlife) are related (in part) to the quality of soil in the environment that they live. Because spills and all associated affected soils will be cleaned up, there is no potential for these foods to become impacted from exposure to a spill during construction, operations and active and transition closure.

During construction, operations and active closure, soil quality could be affected by dust containing metals. Potential sources of atmospheric metals are from residual ore dust from blasting, open haul trucks going to the crusher, the live ore stockpile, tailings dust from the Class A Storage Facility where the material has dried but is not yet covered, and earthmoving activities in an area with naturally higher mineralization. Low levels of particulates were modelled under a worst case scenario in the Air Quality Model (presented in Chapter 6 of the Project Proposal). Based on these results BMC determined that it was unlikely that concentrations in soils (from dust from the Project facilities) will increase. As such, there is low potential for changes in soil quality to affect the quality of country foods (i.e. vegetation or wildlife) during all Project phases.

In order to confirm this prediction, a monitoring program will initially collect soil samples at exposure and control sites. The sampling program will be conducted prior to construction, after development, and once every three years through to closure with data tracked over time to determine if there are any changes in metal concentrations resulting from the Project. An adaptive management plan will be developed during permitting, which will identify threshold values for additional mitigation or monitoring. If the soil concentrations trigger the threshold values (the lowest of which will be set as 'early warning' indicators, at levels below expected effects concentrations), additional mitigation measures would be implemented and a more intrusive monitoring program would be implemented (i.e., vegetation monitoring program).

At the request of YESAB (YESAB, 2018a), BMC provided additional information regarding the monitoring of air quality (as it relates to dust deposition) and further assessed the potential for the

accumulation of metals in soils (BMC, 2018a). The most relevant IRs and BMC's response are summarized as follows:

**R3-24**

Provide rationale and references to support the claim that levels of particulate would not result in appreciable increases to metal concentrations in soil.

BMC Response:

In addition to ambient air concentration modelling presented in Chapter 6 of the Project Proposal, TSP deposition rates were modeled. The results of this modelling for the operation phase (worst case) were presented and discussed Chapter 12 (Vegetation) of the Project Proposal and are reproduced below for easier reference.

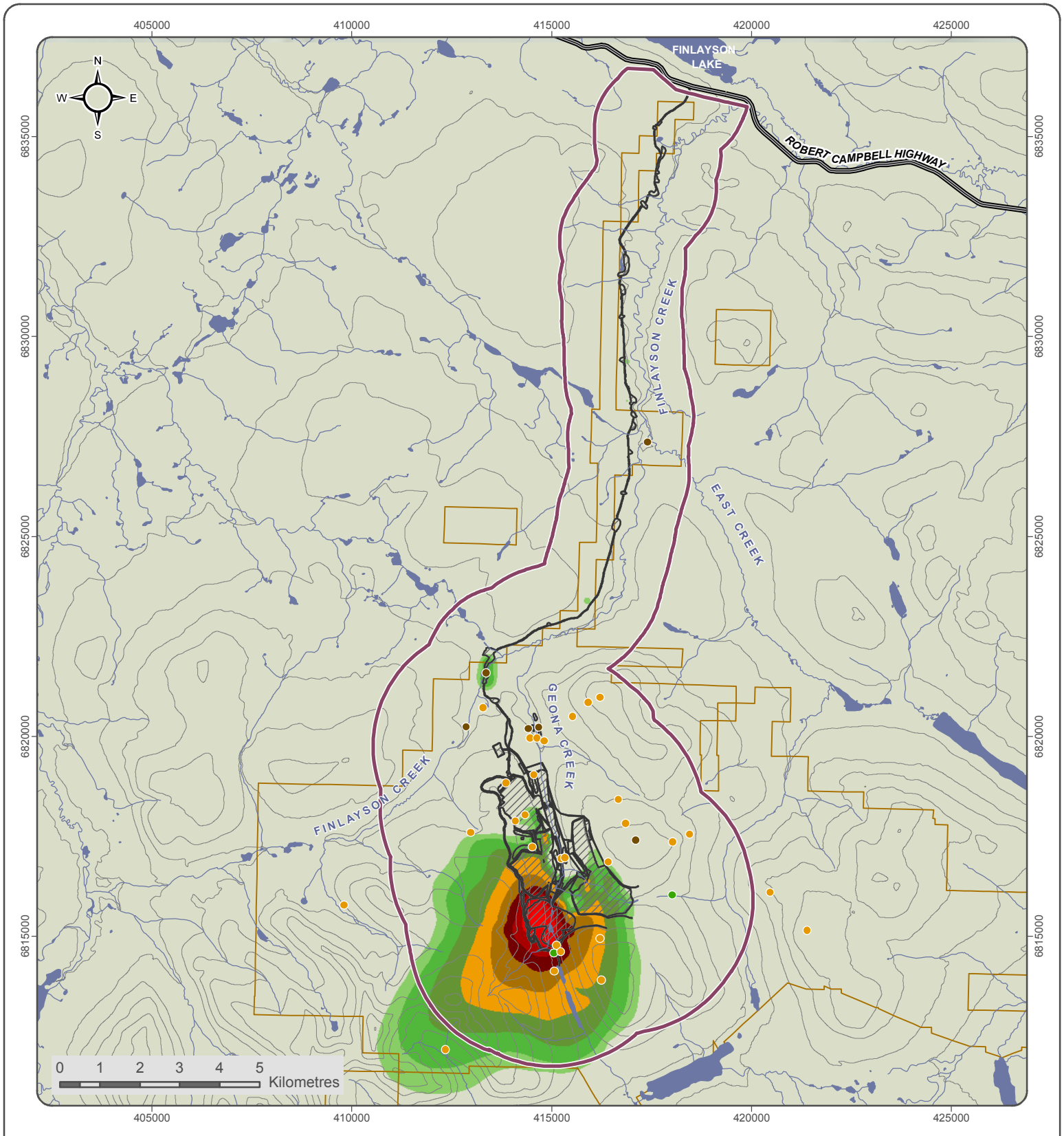
Project related activities occurring in the construction and operation phases may cause a potential short-term impact on metal concentrations in plants used for traditional purposes and wildlife browse. More specifically, the construction activity of pit development and operation activities of open pit operations, ore processing, and storage facilities operations can generate dust that disperses in the prevailing wind currents and settles on soil and vegetation and thereby can be absorbed or transported into the plant. Figure 12-7 of Chapter 12 of the Project Proposal shows the results of the dust dispersion model (for the operations phase when there is maximum dust generation) and is included here as Figure 2-4 for clarity. The model input parameters and results are outlined in Appendix E-1 of the Project Proposal. Based on the modelling, open pit blasting is the primary source of dust and dust dispersion patterns spread some to the east, but mostly to the southwest due to the prevailing northeast winds. It should be noted that the pit is expected to contain reasonable quantities of water and that pure 'dry' blasting is not expected. This model therefore predicts a worst-case scenario that includes the conservative assumption that all equipment will be operating at once (which will not occur during the life of the Project) and that blasts are at the surface for the life of the Project (which will only occur during a portion of the construction period). Atmospheric transport of dust is also expected from the Class A and Class B Storage Facilities, the ROM Pad, and Low Grade Ore Pad and unpaved roads, these sources were included in the model.

Vegetation metal concentrations are typically affected by airborne dust accumulation on plant tissue and the surrounding soils. Metals are a necessary micronutrient for plants, but at high concentrations can impair plant growth (Csavina et al., 2011). Lichens and mosses in particular are more sensitive to airborne metals and road dust (Walker and Everett, 1987; Farmer, 1993). Road dust also has the potential to reduce plants that prefer acidic environments (Walker and Everett, 1987).

Effects of metals in vegetation on wildlife varies widely depending on the plant species being consumed, foraging range, quantity of plant material consumed, climate, and the wildlife species (Roggeman et al., 2013).

The Project is a proposed polymetallic operation that can potentially result in dispersion of mineralized dust; therefore, there is the potential for the Project to be a source of various heavy metals that could adversely affect surrounding vegetation and indirectly human, and wildlife health. However, the risk of metals reaching detrimental concentrations is considered to be low because the operation is not located near an urban centre (i.e., receptors are distant). The majority of metals and metalloids in airborne emissions from the Project will be from open pit dust for which a worst- case scenario has been modelled. In addition, a more realistic case was modelled in response to R3-25, which indicates deposition will be low and limited to the Project footprint. The majority of the other dust is likely to be sourced from road use and dust from this source is unlikely to contain the deleterious elements in question due to the composition of its construction materials. In addition, the wildlife (i.e., receptors) browsing on vegetation surrounding the Project have large ranges and are unlikely to consume nearby vegetation in quantities that would cause detrimental effects to the wildlife or any humans consuming these animals (Roggeman et al., 2013). This is particularly true when evaluating the model results for the realistic case which shows deposition being localized to the Project footprint.

Based on the above, the Project Proposal concluded that there would be no appreciable increases to metal concentrations in soil and thus no significant adverse effects. The company also committed to monitoring soil concentrations at the site for the life of the Project and to developing adaptive management thresholds during permitting. If during the Project lifetime, concentrations in soils reach the adaptive management thresholds (that will be defined during permitting) the PQRA will be updated and additional management measures to reduce dust will be implemented as per the adaptive management plan (i.e. road watering and/or installing misters at certain key locations). In addition, based on comments received from YESAB and RRDC, during the Adequacy stage, BMC has installed 5 air quality monitoring stations at the site. These stations monitor TSP, $PM_{10}$, $PM_{2.5}$ and metals. The results of the 2018/2019 monitoring program will be used to confirm the assumed baseline concentrations of TSP, $PM_{10}$ and $PM_{2.5}$ that were presented in the Project Proposal. The stations will also be used in the monitoring program during construction, operations.




**TSP Deposition Annual Average (µg /m²/Day)**

- < 400
- 400 - 500
- 500 - 700
- 700 - 1,000
- 1,000 - 1,800
- 1,800 - 3,500
- 3,500 - 6,500
- 6,500 - 13,500
- 13,500 - 27,500
- 27,500- 55,600

- Baseline Vegetation Sample
- Baseline Soil Sample
- Baseline Vegetation and Soil Sample
- Location of Proposed Infrastructure
- Local Study Area
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Waterbody
- Watercourse
- Contour (100 m interval)

Predicted annual depositions shown on this map were produced with CALPUFF Version 5.8.5
National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 9N

AEG



BMC MINERALS

**KUDZ ZE KAYAH PROJECT**
**RESPONSE #4 TO YESAB EXECUTIVE COMMITTEE INFORMATION REQUEST**

# FIGURE 2-4
# TSP DURING OPERATIONS WORST CASE

DECEMBER 2018

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**R3-25**

Provide a sensitivity analysis to demonstrate how any changes to the assumptions would impact the resulting conclusions and which of these changes will have the biggest impact on total suspended particles (TSP) levels in air and soil.

BMC Response:

In addition to the results presented in response to R3-24 above for operations, average annual TSP deposition rates were also modeled and mapped for the worst case scenario for construction and closure and are presented in Figure 2-5 and Figure 2-6 below. The figures show contours of predicted annual average deposition rates. The only difference in the model between the Project phases is location, area and/or intensity of dust sources, the meteorological data input and other modeling parameters were kept the same for the three runs. The results show that the main factor affecting ambient air concentrations and deposition rates is whether or not there is blasting occurring in the open pit. The amount, frequency and type of traffic on unpaved roads also varies considerably between Project phases and deposition rates results along roads vary accordingly. Details on dust sources modeled for each Project phase are available in the Air Dispersion Model Report (Appendix E-1 of the Project Proposal).

Since blasting activities appeared to have an important impact on the resulting ambient concentrations and depositions rates, and parameters used in the model were chosen for a worst-case blasting scenario, the CALPUFF air dispersion model was rerun based on a more realistic blasting scenario. In the original model (results shown in Figure 2-4 to Figure 2-6, the TSP emission factor for fugitive dust emissions from blasting, was calculated according to the following equation (EPA, 1995):

$$E = 0.000014(A)^{1.5}$$

*where:*
*E = TSP emission factor in lb/blast*
*A = horizontal area (ft2), with blasting depth ≤ 70 ft (21.3 m)*

For the operations phase, the area assumed for the emission factor calculation was 2,500 $m^2$ per blast; however, the resulting factor was applied to the entire open pit area.

Because the above calculation doesn't account for soil moisture or for blasting depths greater than 70 ft (or ~ 21 meters), the equation below, previously recommended by the EPA (Sinclair Knight Merz, 2005), was used to re-calculate the emission factor.

$$E = 344(A^{0.8})(M^{-1.9})(D^{-1.8})$$

*where:*

*E = TSP emission factor in kg/blast*

*A = area of the blast (m2)*

*M = moisture content (%)*

*D = blast depth*

The moisture content was assumed to be 5.4% by weight based on the ore moisture content from the mill water balance. The blasting depth for the operations phase was assumed to be 100 m to produce a more realistic representation of depths expected during the operations phase. The area of the blast was still assumed to be 2,500 $m^2$, however the resulting factor was applied to that same area rather than the entire pit. It was assumed that there would be four blasts per week.

Resulting deposition rates for the realistic case for the operations phase is shown in Figure 2-7. Although not representative of long term accumulation, maximum 24-hr ranked results are compared in Table 2-11 for the worst case (original model run) and realistic case (model rerun) blasting parameters. It shows that by changing the blasting emission factor to account for moisture content and for a greater blasting depth and changing how the factor is applied to the area (2,500 $m^2$ at a time), resulting deposition rates are considerably reduced (by a factor of 2.6 to 3.7 for the first four ranks).

Similarly, the realistic case was modelled for the construction phase (assuming a blasting depth of 20 m, three blasts per week, a blasting area of 1,500 $m^2$ and the same moisture content as above) and the results are presented in Figure 2-8, showing considerably reduced deposition rates compared to the worst-case scenario.

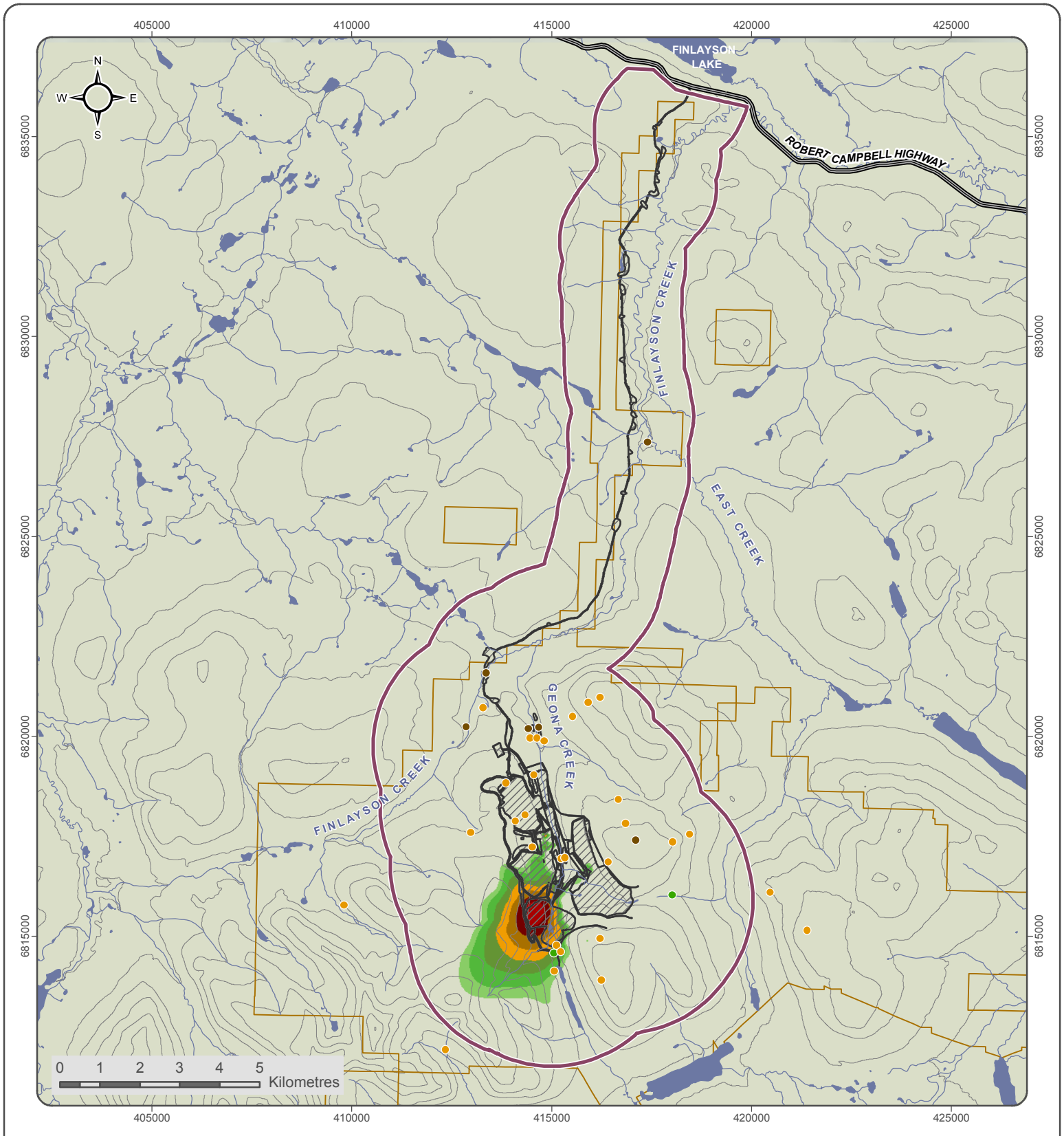
Another factor that plays a key role in dust dispersion and deposition rates is meteorological conditions. Although not representative of long term accumulation, maximum 24-hr ranked results can be used to evaluate model sensitivity to meteorological parameters input. They are based on worst case meteorological conditions and results indicate that deposition rates at the maximum point of impingement (POI) decrease rapidly with more favourable meteorological conditions, of which the most important factors are wind speed and direction. Figure 2-5 presents ranked 24-hr deposition rate results for the operation phase (original worst case model run) and associated meteorological parameters; note that rank 10 represents about 52% of rank 1.

**Table 2-11: Ranked 24-hr Deposition Rates at Maximum POI, Worst Case and Realistic Case**

| Rank | Operations Phase, Worst Case Blasting Scenario | | | | | Operations Phase, Realistic Blasting Scenario | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Peak Deposition Rate (µg/m²/s) | Year, Julian Day | Easting (m) | Northing (m) | Receptor | Peak Deposition Rate (µg/m²/s) | Year, Julian Day | Easting (m) | Northing (m) | Receptor |
| 1 | 2.31 | 2015, 330 | 414,607 | 6,815,621 | 467 | 0.90 | 2015, 269 | 414,807 | 6,817,521 | 284 |
| 2 | 1.95 | 2015, 316 | 414,607 | 6,815,371 | 450 | 0.53 | 2016, 201 | 414,807 | 6,817,521 | 284 |
| 3 | 1.73 | 2016, 026 | 414,607 | 6,815,621 | 467 | 0.49 | 2015, 244 | 414,807 | 6,817,521 | 284 |
| 4 | 1.66 | 2015, 325 | 414,607 | 6,815,621 | 467 | 0.47 | 2016, 110 | 414,807 | 6,817,521 | 284 |

**Table 2-12: Ranked 24-hr Deposition Rates at Maximum POI, Operations Phase (Worst-Case Blasting Scenario)**

| Rank | Peak Deposition Rate (µg/m²/s) | Year, Julian Day | Easting (m) | Northing (m) | Receptor | Average Daily Air Temperature (°C) | Average Daily Wind Speed (m/s) | Maximum Wind Speed (m/s) | Direction of Maximum Wind Speed (°) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.31 | 2015, 330 | 414,607 | 6,815,621 | 467 | -0.8 | 14.12 | 21.75 | 31.9 |
| 2 | 1.95 | 2015, 316 | 414,607 | 6,815,371 | 450 | -8.4 | 11.72 | 16.39 | 343.6 |
| 3 | 1.73 | 2016, 026 | 414,607 | 6,815,621 | 467 | -3.5 | 13.77 | 19.03 | 38.4 |
| 4 | 1.66 | 2015, 325 | 414,607 | 6,815,621 | 467 | -2.9 | 14.57 | 18.47 | 55.5 |
| 5 | 1.63 | 2015, 324 | 414,607 | 6,815,621 | 467 | -5.8 | 12.25 | 16.93 | 32.3 |
| 6 | 1.54 | 2015, 272 | 414,607 | 6,815,621 | 467 | 6.7 | 12.15 | 18.37 | 14.5 |
| 7 | 1.45 | 2015, 272 | 414,607 | 6,815,371 | 450 | 6.7 | 12.15 | 18.37 | 14.5 |
| 8 | 1.39 | 2015, 269 | 414,607 | 6,815,371 | 450 | -4.1 | 10.25 | 14.99 | 100.2 |
| 9 | 1.22 | 2015, 351 | 414,607 | 6,815,371 | 450 | -12.9 | 8.79 | 11.72 | 315.9 |
| 10 | 1.21 | 2015, 324 | 414,607 | 6,815,371 | 450 | -5.8 | 12.25 | 16.93 | 32.3 |




**TSP Deposition Annual Average (µg /m²/Day)**

- >400
- 400 - 500
- 500 - 700
- 700 - 1,000
- 1,000 - 1,800
- 1,800 - 3,500
- 3,500 - 6,500
- 6,500 - 13,500
- 13,500 - 27,500

- Baseline Vegetation Sample
- Baseline Soil Sample
- Baseline Vegetation and Soil Sample
- Location of Proposed Infrastructure
- Local Study Area
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Waterbody
- Watercourse
- Contour (100 m interval)

Predicted annual depositions shown on this map were produced with CALPUFF Version 5.8.5



Datum: NAD 83; Projection: UTM Zone 9N



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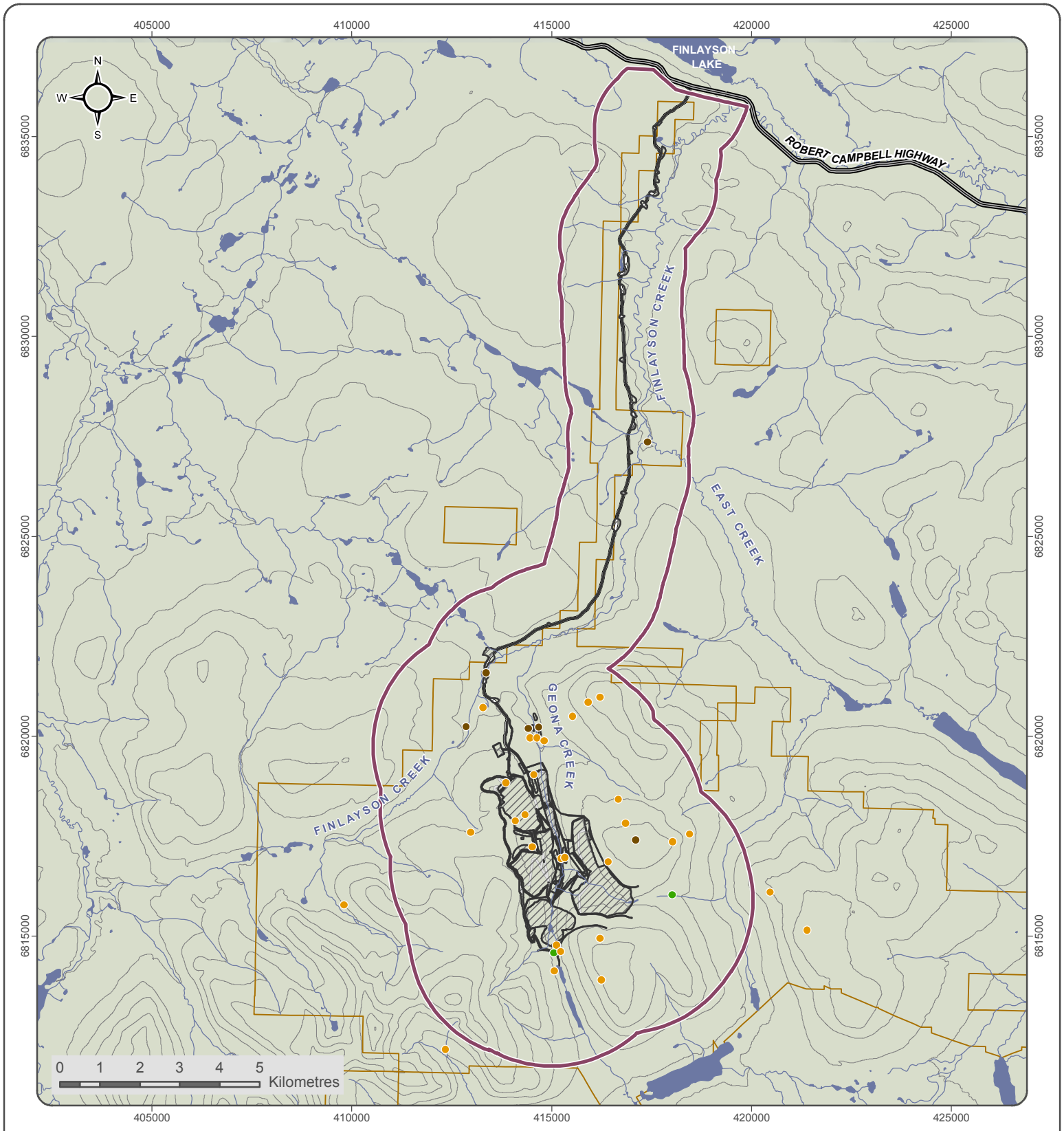
**KUDZ ZE KAYAH PROJECT**
**RESPONSE #4 TO YESAB EXECUTIVE COMMITTEE INFORMATION REQUEST**

# FIGURE 2-5

## TSP DURING CONSTRUCTION WORST CASE

DECEMBER 2018




**TSP Deposition Annual Average (µg /m²/Day)**

- <50

- Baseline Vegetation Sample
- Baseline Soil Sample
- Baseline Vegetation and Soil Sample
- Local Study Area
- Location of Proposed Infrastructure
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Waterbody
- Watercourse
- Contour (100 m interval)

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## FIGURE 2-6

## TSP DURING CLOSURE

DECEMBER 2018

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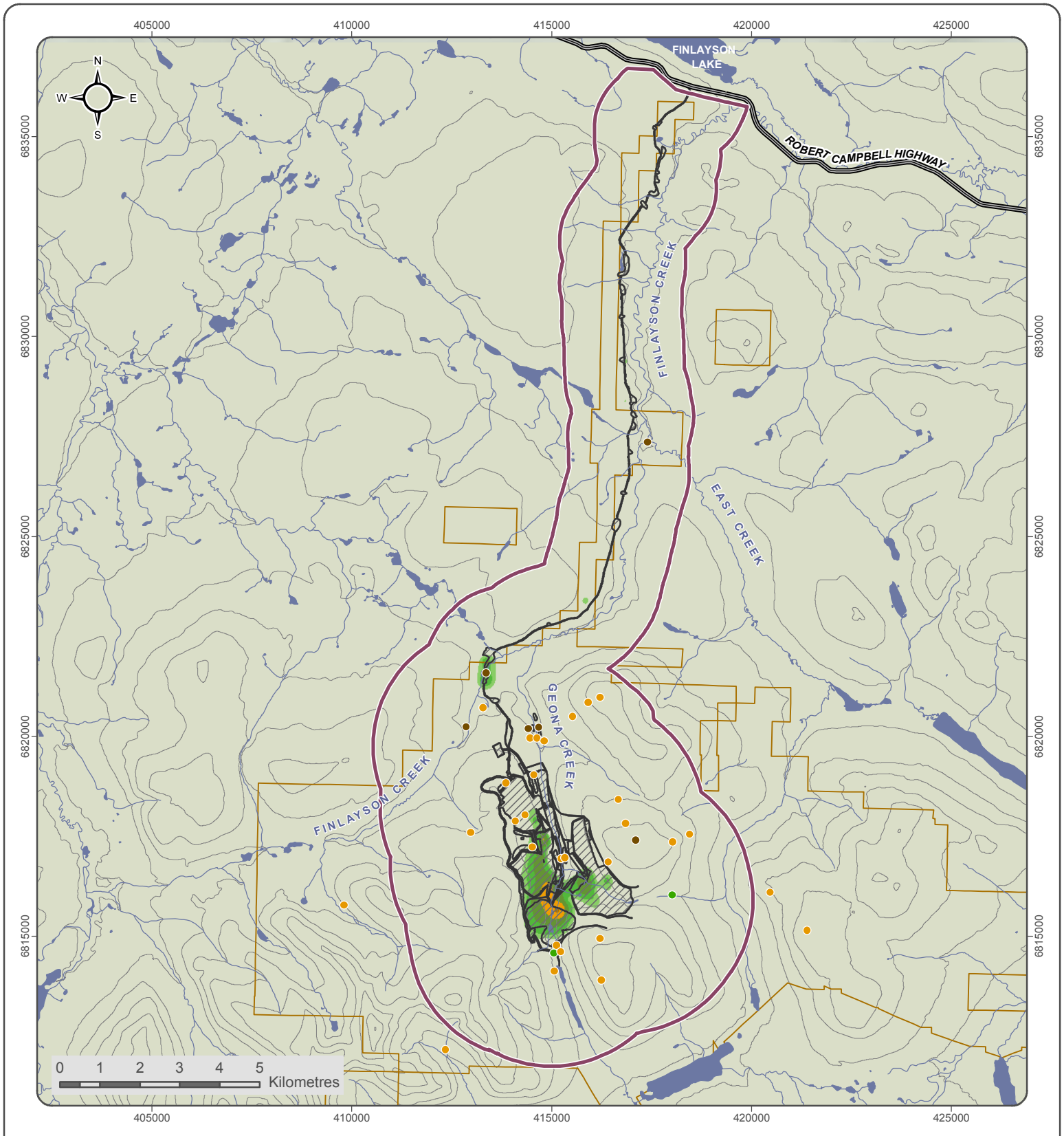
*(Last edited by: amatlashevska; 07/12/2018/08:53 AM)*




**Deposition Annual Average (µg /m²/Day)**

- > 400
- 400 - 500
- 500 - 700
- 700 - 1,000
- 1,000 - 1,800
- 1,800 - 3,500

- Baseline Vegetation Sample
- Baseline Soil Sample
- Baseline Vegetation and Soil Sample
- Location of Proposed Infrastructure
- Local Study Area
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Waterbody
- Watercourse
- Contour (100 m interval)

Predicted annual depositions shown on this map were produced with CALPUFF Version 5.8.5
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**KUDZ ZE KAYAH PROJECT**
**RESPONSE #4 TO YESAB EXECUTIVE COMMITTEE INFORMATION REQUEST**

# FIGURE 2-7

## TSP DURING OPERATION REALISTIC CASE

DECEMBER 2018

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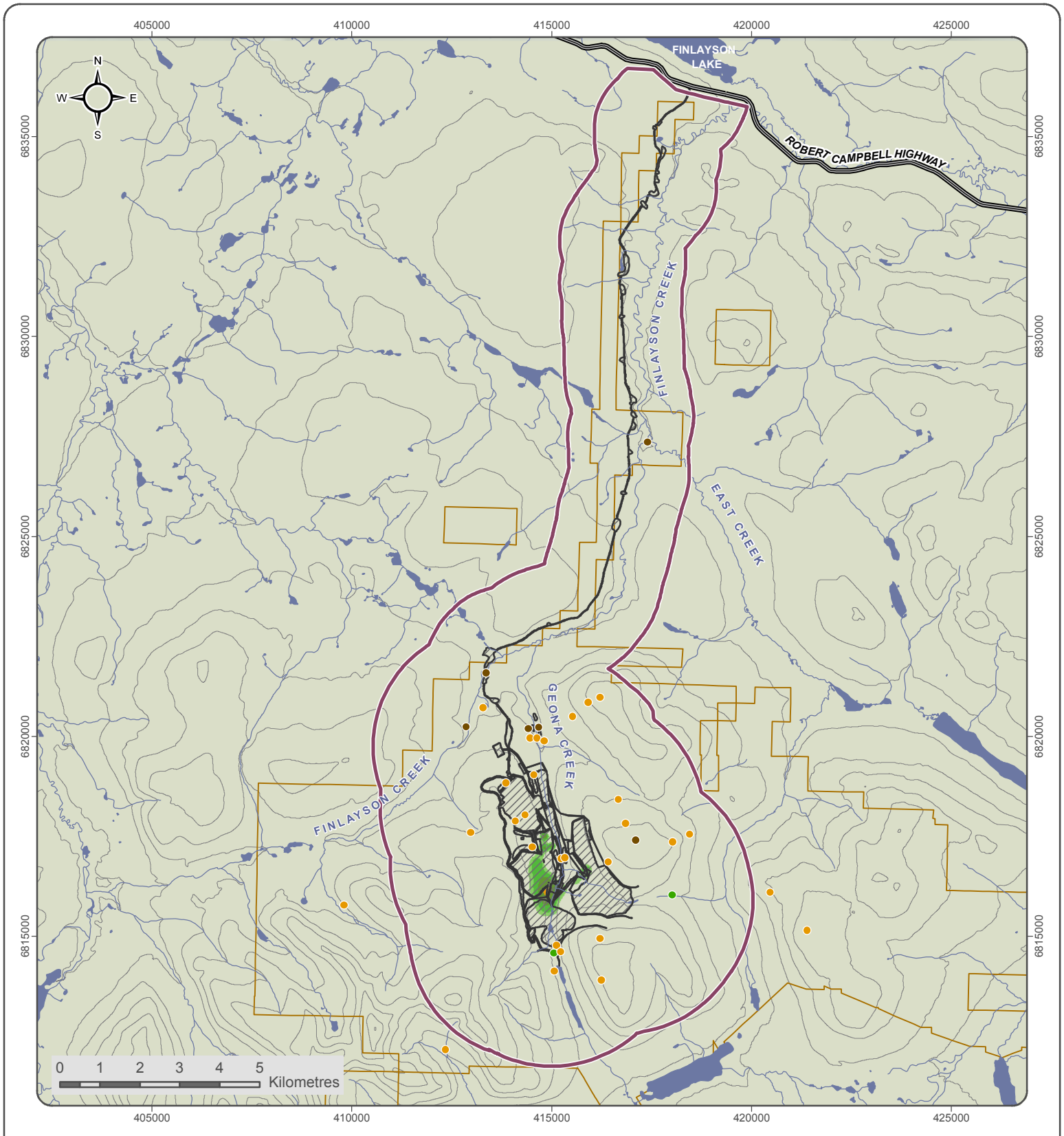


**Deposition Annual Average (µg /m$^2$/Day)**

- <400
- 400 - 500
- 500 - 700
- 700 - 1,000
- 1,000 - 1,800

- Baseline Vegetation Sample
- Baseline Soil Sample
- Baseline Vegetation and Soil Sample

- Location of Proposed Infrastructure
- Local Study Area
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Waterbody
- Watercourse
- Contour (100 m interval)

Predicted annual depositions shown on this map were produced with CALPUFF Version 5.8.5
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Datum: NAD 83; Projection: UTM Zone 9N

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BMC MINERALS

# KUDZ ZE KAYAH PROJECT
## RESPONSE #4 TO YESAB EXECUTIVE COMMITTEE INFORMATION REQUEST

## FIGURE 2-8

## TSP DURING CONSTRUCTION REALISTIC CASE

DECEMBER 2018

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(Last edited by: amallashevska; 07/12/2018/09:15 AM)

**R3-26**

Discuss how the increases of total suspended particles (TSP) as a result of the project will not cause increases of metal in soil over the life of the project.

BMC Response:

TSP resulting from windblown dust from unpaved roads is expected to have similar metal content as natural soils in the area. Soil samples were collected at 32 locations in the Local Study Area. Metal concentrations in soil samples were compared to Canadian Council of Ministers of the Environment (CCME) soil guidelines for metal concentrations at industrial sites (Table 2-13 12-5 of the Project Proposal and are presented in Table 2-13 below for clarity). Of all the metals in which guidelines have been established (i.e., 19), four exceeded the guidelines including arsenic, copper, selenium, and zinc. The arsenic guideline was exceeded at 16 out of 32 sites. Copper, zinc, and selenium exceeded the guidelines at three, two, and one site, respectively. Similar metal concentration ranges as presented in Table 2-13 are expected from windblown dust from unpaved roads during the Project phases.

**Table 2-13: Soil Metal Concentrations Compared to CCME Guidelines**

| Element | Units | CCME Industrial Guideline | Sites Exceeding CCME Guideline | Min | Max | Mean | Standard Deviation | 95th Percentile |
|---|---|---|---|---|---|---|---|---|
| Aluminum | mg/kg | - | - | 7,570 | 27,300 | 13,605 | 4,392 | 25,430 |
| Antimony | mg/kg | 40 | None | <0.10 | 1.78 | 0.38 | 0.30 | 1.21 |
| Arsenic | mg/kg | 12 | PA01, PA02, PA04, PA06, PA09, PA10, PA15, PA20, PA45, PA51, PA52, PA55, PA57, PA58, PA59, PA72 | 2.39 | 96 | 17 | 18 | 71 |
| Barium | mg/kg | 2,000 | None | 54 | 838 | 170 | 141 | 591 |
| Beryllium | mg/kg | 8 | None | <0.40 | 0.61 | 0.26 | 0.26 | 0.59 |
| Bismuth | mg/kg | - | - | 0.13 | 1.03 | 0.27 | 0.16 | 0.71 |
| Cadmium | mg/kg | 22 | None | 0.09 | 7.84 | 0.91 | 1.42 | 4.89 |
| Calcium | mg/kg | - | - | 1,370 | 19,900 | 5,269 | 3,542 | 16,215 |
| Chromium | mg/kg | 87 | None | 15 | 80 | 37 | 16 | 79 |
| Cobalt | mg/kg | 300 | None | 4.41 | 38 | 14 | 7.20 | 32 |
| Copper | mg/kg | 91 | PA02, PA16, PA17 | 3.52 | 192 | 40 | 37 | 145 |
| Iron | mg/kg | - | - | 14,500 | 58,100 | 30,993 | 11,455 | 56,340 |
| Lead | mg/kg | 600 | None | 10 | 72 | 28 | 17 | 70 |
| Lithium | mg/kg | - | - | 5.90 | 23 | 14 | 4.09 | 23 |
| Magnesium | mg/kg | - | - | 2,510 | 21,200 | 7,721 | 3,834 | 17,020 |
| Manganese | mg/kg | - | - | 112 | 1,320 | 572 | 288 | 1,282 |
| Mercury | mg/kg | 50 | None | <0.05 | 0.14 | <0.05 | -- | -- |

| Element | Units | CCME Industrial Guideline | Sites Exceeding CCME Guideline | Min | Max | Mean | Standard Deviation | 95th Percentile |
|---|---|---|---|---|---|---|---|---|
| Molybdenum | mg/kg | 40 | None | 0.63 | 9.11 | 1.89 | 1.54 | 6.11 |
| Nickel | mg/kg | 89 | None | 9.96 | 71 | 32 | 15 | 68 |
| Phosphorus | mg/kg | - | - | 439 | 3,930 | 1,061 | 638 | 2,775 |
| Potassium | mg/kg | - | - | 439 | 4,540 | 1,340 | 961 | 4,133 |
| Selenium | mg/kg | 2.9 | PA02 | <0.5 | 6.52 | <0.5 | -- | -- |
| Silver | mg/kg | 40 | None | <0.05 | 1.45 | 0.28 | 0.38 | 1.44 |
| Sodium | mg/kg | - | - | <100 | 159 | <100 | -- | -- |
| Strontium | mg/kg | - | - | 9.24 | 72 | 24 | 16 | 67 |
| Thallium | mg/kg | 1 | None | 0.06 | 0.43 | 0.15 | 0.08 | 0.35 |
| Tin | mg/kg | 300 | None | 0.15 | 1.14 | 0.47 | 0.23 | 0.97 |
| Titanium | mg/kg | - | - | 122 | 1,350 | 606 | 344 | 1,323 |
| Uranium | mg/kg | 300 | None | 0.66 | 9.50 | 1.77 | 1.65 | 6.12 |
| Vanadium | mg/kg | 130 | None | 19 | 122 | 51 | 26 | 122 |
| Zinc | mg/kg | 360 | PA16, PA20 | 28 | 784 | 161 | 141 | 593 |
| Zirconium | mg/kg | - | - | <0.5 | 4.98 | 1.37 | 1.19 | 4.50 |

* 95th percentile is equivalent to maximum concentration

Other sources of TSP and atmospheric metals are predicted from residual ore dust from blasting, open haul trucks going to the crusher, the live ore stockpile, tailings dust from the Class A Storage Facility where the material has dried but is not yet covered, and earthmoving activities in an area with naturally higher mineralization. The main dust deposition areas are located within the Project footprint. Predicting the exact potential concentrations in the TSP associated with these sources is not possible; however, given the low levels of TSP deposition predicted for the Project phases, BMC has concluded there would be no appreciable increases to metal concentrations in soil and thus no significant adverse effects.

Mitigation measures that will be implemented to reduce fugitive dust will also be effective in reducing dust deposition and metal increase in soils (see Air Quality Management Plan in Section 18.11 of the Project Proposal). A vegetation and soil monitoring plan will be implemented to track the effects of dust deposition relating to the mine area and Access Road. The monitoring plan is scheduled to be conducted every three years starting in the construction phase and will track change in soil metal concentrations from baseline conditions. The company has committed to developing adaptive management thresholds during permitting. If soil metals in soil exceed guidelines or are consistently higher than baseline concentrations, then additional mitigations measures will be taken to reduce emissions (as per the adaptive management plan – to be developed during permitting). In addition, the PRQRA would be updated.

Also, based on comments received from YESAB and RRDC, during the Adequacy stage, BMC has installed 5 air quality monitoring stations at the site. These stations monitor TSP, $PM_{10}$, $PM_{2.5}$ and metals. The results of the 2018/2019 monitoring program will be used to confirm the assumed baseline concentrations of TSP, $PM_{10}$ and $PM_{2.5}$ that were presented in the Project Proposal. The stations will also be used in the monitoring program during construction, operations.

**Co-management**

As described above in the Section 2.2.2.6 (Fish), at the request of the RRDC Elders Committee, BMC has proposed a BMC-Kaska Environmental, Cultural & Heritage Management Program for KZK. Through this co-management program it is anticipated that RRDC will collaboratively design, collect, report, manage and communicate the results of the air and soil quality monitoring programs to RRDC citizens (including the RRDC Elders Oversight Committee). This program would be active through all Project phases and would collaboratively ensure that the soil concentrations during all Project phases are not at levels that could potentially effect the quality of country foods. It would also collaboratively ensure that during that concentrations in the soils at closure are at levels which the traditional land users can safety use the land in the Geona Creek valley for traditional land use purposes. Through this co-management program, the risk of the traditional land users of avoiding the Project area will be reduced.

**Summary**

Soils and air quality at the site will be monitored and managed through all Project Phases in order to ensure that they do not have the potential to prevent the traditional land users from using the Project area in the post closure period. The monitoring and management program will also ensure that the soils and air quality do not have the potential to affect country foods (vegetation and wildlife) during all Project phases.

#### *2.2.2.7 Vegetation*

The importance of vegetation to RRDC has been identified during the following: BMC's meetings with the RRDC; Elders Oversite Committee meetings; consultation with RRDC; RRDC Elders tours; and the reclamation research programs. However, the specific species and harvest sites are not presented in this Response Report due to confidentiality agreements with RRDC. Notwithstanding, this confidential information has been considered in the assessment of effects, development of mitigation measures and development of the reclamation and closure plan. The focus of the following summary is on potential effects to the quality of vegetation and the collaborative approach to ensure the species used in reclamation are culturally appropriate. These are the main concerns that have been raised by RRDC with respect to traditional use vegetation.

By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for traditional land use activities (i.e. harvesting berries and traditional medicines) until the post closure period. However, vegetation at

the site will be managed through all Project phases in order to ensure that it does not have the potential to prevent the traditional land users from using the area for harvesting vegetation in the post closure period.

Potential sources of COPI uptake into (or deposition onto) plants are from either air, soil or water. A discussion of the potential for deposition from dust was presented in the previous section.

Since the soil is not predicted to be impacted, there would be no subsequent change to the vegetation concentrations during any of the Project Phases. In order to confirm this prediction a monitoring program will initially collect soil samples at exposure and control sites. The sampling program will be conducted prior to construction, after development and once every three years through to closure with data tracked over time to determine if there are any changes in metal concentrations resulting from the Project. An adaptive management plan will be developed during permitting, which will identify trigger values for additional mitigation or monitoring. If the soil concentrations are approaching the trigger values, then additional mitigation measures would be implemented and a more intrusive monitoring program would be implemented (i.e. vegetation monitoring program).

In the closure period, the only potential sources of COPIs in vegetation from water sources will be the constructed wetlands. The water management program will control and treat any contact water prior to release to the environment during operations and closure. A soil and vegetation metal monitoring program will commence with installation of constructed wetlands in order to monitor the efficacy of the constructed wetland at treating water as well as to ensure that metals are not accumulating to any significant degree in the wetlands. For wetlands, soils will also be tested for nutrients, metals, and microbes. The wetlands are designed to create metal compounds in the soil and root systems that are not bioavailable. The monitoring program will be used to ensure that metals are not accumulating significantly in the vegetative matter as planned and expected. If there is significant increase in vegetation metal concentrations beyond background, then the wetland system will be modified to minimize wildlife access.

Terrestrial vegetation on Project facilities during the closure period will not be affected due to the thickness of the covers between the vegetation and waste rock/tailings. Additional aspects of the closure plan which will ensure terrestrial vegetation is not impacted are presented in Appendix H of the Project Proposal (Reclamation and Closure Plan).

Based on the above, once the Project area is available again (post closure period) for the collection of traditional use vegetation, the quality of the vegetation is predicted to be safe for the land users.

### Screening Level Concentrations

At the request of YESAB, BMC has developed preliminary berry tissue screening concentrations for protection of human health (BMC, 2018a). However, as describe above in Section 2.2.2.6 (Fish) there is concern regarding the lack of detailed Health Canada guidance on development of tissue screening concentrations for country foods (including fish). Thus, the tissue screening concentrations provided

in BMC (2018a) are considered to be preliminary and it is proposed that these will be revisited once agency comments are provided and there is more certainty regarding the traditional use of vegetation from the Geona Creek valley (i.e. consumptions rates and frequencies). It is likely more prudent to develop screening values once additional information is available as this will increase the defensibility of the values.

**Co-management**

During the RRDC Elders tours at site and through the cultural awareness training programs, a number of culturally important plants (both berries and medicinal plants) have been identified in the Project area (they are not listed here due to confidentially agreements with RRDC). In 2017 BMC initiated a reclamation research program to further identify culturally important species at site that could be used in reclamation. In 2018, a field research program was initiated which involved participation by RRDC Elders familiar with culturally important plants. The reclamation research program (which will become a component of the Co-management program) will be ongoing through all Project phases. The program will ensure that the vegetation used in reclamation is culturally appropriate and/or is approved by RRDC. Through this co-management program, the risk of the traditional land users of avoiding the Project area (post reclamation) will be reduced.

**Summary**

Through the Project design; mitigation measures; monitoring programs; adaptive management; and working collaboratively with RRDC in the development of the final reclamation and closure plan, the RRDC traditional land users should be able to resume harvesting vegetation from the Project area in the post closure period.

#### *2.2.2.8 Wildlife*

RRDC have identified moose, caribou, furbearers, and game birds as important animals harvested for traditional use purposes (primarily for subsistence). By the nature of the proposed development, the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for this traditional land use activity until the post closure period. As described above, this impact will in part be mitigated through the provisions of the existing and modernized SEPA. The RRDC traditional land users will be able to hunt/trap in the areas around the Project that are not subject to the SEPA or other agreements made by BMC with the land users. Effects to wildlife that extend beyond the Project footprint could result in effects to the RRDC land users. The specific effects that could extend beyond the Project footprint include:

- wildlife displacement; and
- changes in the quality of the animals from exposure to potentially impacted environmental media (i.e. soil, water and vegetation) as they pass through the active Project area.

These effects are summarized in the following sections.

### Wildlife Displacement

Project construction and operation will result in direct and indirect habitat disturbance which may extend beyond the Project footprint, depending on the specific habitat and species. This disturbance could result in displacement of the animals (i.e. moose, caribou, furbearers, and game birds) to the areas that remain available for the traditional land use activity of hunting and trapping. Habitat in the regional area is not a limiting factor for these species. Therefore, no adverse effects are predicted to the traditional land users hunting the animals in the region around the Project during construction and operations. BMC's proposed reclamation plan to: "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities*" is presented in Appendix H of the Project Proposal. The implementation of this plan will ensure that the displaced animals return to the Project area such that the traditional activity of hunting/trapping can be resumed.

### Wildlife Quality

Wildlife take up chemicals from the environmental media (i.e., soil, vegetation and water). Thus, their concentrations (i.e., quality of the food) are directly related to the concentrations in the environmental media. Subsequently, any Project activity that could affect these media, could also affect the quality of the traditional use animals (i.e. moose, caribou, furbearers and game birds). To determine the potential effects on wildlife, predicted changes to the environmental media were reviewed from other relevant sections of the Project Proposal.

Soil

A summary of the potential impacts to soils was presented in Section 2.2.2.6. This assessment determined that it was unlikely that metals concentrations in soils will increase due to Project activities. As such, there is low potential for changes in soil quality to affect the quality of the traditional use wildlife during all Project phases.

Vegetation

A summary of the potential impacts to vegetation was presented in Section 2.2.2.7. This assessment determined that it was unlikely that metals concentrations in vegetation will increase due to Project activities. As such, there is low potential for changes in vegetation quality to affect the quality of the traditional use wildlife during all Project phases.

Creek Water

As described above in Section 2.2.2.5 the water quality model was updated in 2018 (BMC, 2018b). The model results for Finlayson Creek, South Creek and Geona Creek have been compared to the CCME guidelines and/or BC MOE objectives for the protection of livestock drinking water as there are no water quality objectives for the protection of wildlife. No exceedances of the livestock guidelines were predicted in these waterbodies during any of the Project Phases, with the exception

of arsenic in a small section of Geona Creek, prior to the confluence of Finlayson Creek in post closure. Given this small area of this exceedance compared to the home ranges of wildlife, no adverse effects are predicted. As such, there is low potential for changes in water quality of Finlayson Creek, Geona Creek or South Creek to affect the quality of the traditional use wildlife during all Project phases.

Mine Site Water

Potential exposure pathways to wildlife include ingesting water from the Operations Water Management Ponds, treatment ponds, or ABM Lake at closure. The likelihood for metals to transfer from water will be limited due to wildlife access barriers and water control and treatment programs. Wildlife is unlikely to access the water collection ponds or water management ponds as they will be fenced. In addition, the water quality of the ponds is predicted to meet the livestock drinking water guidelines with the exception of the Class A and Class B Storage Facilities collection ponds, which may have some elevated metals. But with limited access this is not a concern. The ABM Lake will be batch treated (if necessary) after closure to maintain water quality within acceptable guidelines for wildlife protection.

Based on the above, the quality of terrestrial wildlife is not predicted to be affected due to on-site water storage and management facilities.

Additional mitigation and monitoring measures to prevent birds from entering site waterbodies are Presented in the Draft Wildlife Protection Plan (submitted to YESAB as Appendix R2-J of the Response #2 to YESAB Executive Committee Adequacy Review).

Summary

To determine the potential effects to the quality of traditional use wildlife, predicted changes to environmental media were reviewed from other relevant sections of the Project Proposal. Based on this review, changes in soil, water and vegetation are not likely to result in a change in the quality of harvested wildlife.

### Screening Level Concentrations

At the request of YESAB, BMC developed preliminary tissue screening concentrations for protection of human health for moose and caribou (BMC, 2018a). However, as describe above in Section 2.2.2.5 (Fish) there is concern regarding the lack of detailed Health Canada guidance on development of tissue screening concentrations for country foods (including caribou and moose). Thus, the tissue screening concentrations provided in BMC (2018a) are considered to be preliminary and it is proposed that these will be revisited once agency comments are provided and there is more certainty regarding the traditional use of vegetation from the Geona Creek valley (i.e. consumptions rates and frequencies). It is likely more prudent to develop screening values once additional information is available as this will increase the defensibility of the values.

### Design mitigation

Section 4.15.4.1 of the Project Proposal presents the alternatives assessment for the Tailings Disposal Methods and Locations. In this assessment slurry tailings in Geona Creek was considered one of the methods to manage the tailings for the Project. This was the method that Cominco permitted in the late 1990s. The water and wetlands of Geona Creek have been identified as important habitat for wild game and game birds that RRDC rely on. This method of tailings management would not have permitted the Geona creek valley to be returned to a low flowing wetland system at closure and was therefore deemed to be least preferred alternative. In addition, as it would be the least likely alternative to achieve the closure objective "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities*" (Appendix H of the Project Proposal). The importance of reclaiming the Geona Creek system to its current state was further described to BMC during a meeting with the RRDC Elders Committee in April of 2017 (post-submission of the Project Proposal). In this meeting the Elders indicated that they would not support a project that proposed slurry tailings due to water quality concerns. BMC subsequently re-assured the Elders that BMC had conducted an assessment of tailings disposal methods and that the filtered tailings method had been designed for the Project rather than slurry tailings in Geona Creek. It was also re-iterated that the closure plan (as proposed) will ensure that traditional land use activities can resume post closure.

### Co-management and Monitoring

As described above, BMC has proposed a BMC-Kaska Environmental, Cultural & Heritage Management Program for KZK. Through this co-management program it is anticipated that RRDC will collaboratively design, collect, report, manage and communicate the results of the wildlife monitoring programs to RRDC citizens (including the RRDC Elders Oversight Committee). This program would be active through all Project phases and would collaboratively ensure any impacts to the traditional use animals are minimised. BMC will also work collaboratively with RRDC to ensure that the detailed closure plan meets the objective of: "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities*". Through this co-management program, the risk of the traditional land users of avoiding the Project area will be reduced.

### Summary

Based on the above, effects to RRDC's traditional hunting/tapping activities outside of the Project footprint during construction, operations, active and transition closure are not predicted. In post closure the RRDC traditional land users should be able to resume harvesting animals from the Project area.

#### *2.2.2.9 Access*

The region has long been used by RRDC for traditional purposes (i.e. to hunt, trap, fish, gather plants, and seek shelter). By the nature of the proposed development, access to the majority of the proposed Access Road and Project area within the Geona Creek valley will not be available for traditional land use activities until the post closure phase. This disruption of land use accounts for approximately 0.05% of the Kaska Traditional Territory in the Yukon. The existing SEPA with BMC and Kaska provides measures to compensate and/or offset (in part) the impacts of the Project area not being available for traditional land use purposes. BMC has agreed to modernize the existing SEPA and as part of this modernization, BMC has put a proposal in writing (to both RRDC and LFN) that would see significant benefits of over $100 million being delivered to Kaska from the Project over its 10 year operations phase in addition to direct jobs and training. Due to compensation and offsetting measures that are in the existing SEPA and/or will be in the modernized SEPA, significant adverse effects due to lack of access for traditional use purposes are not predicted.

#### *2.2.2.10 Heritage*

The Geona Creek Valley and the alignment of the proposed Access Road have been traditionally used by RRDC and any identified heritage sites need to be carefully managed on a site by site basis. Under the *Yukon Historic Resources Act* and Yukon Archaeological Sites Regulations, effects to the heritage resources will be avoided, and if they cannot be avoided, they will be minimized where possible, or mitigated through systematic data recovery efforts.

BMC understands that traditional land use with respect to heritage site is use through protecting and visiting sacred sites (sacred site is defined in the TK Protocol) and/or grave sites. To date no such sites have been identified in the Project area. Thus, such land use has not been identified. However, as mentioned previously, RRDC's collection of TK over the Project area is ongoing. As per the TK Protocol, when new TK is shared, both parties will collaboratively identify any new potential effects as well as any additional mitigation measures that may be required based on the new information. This information will be used in any future design modifications, management plans, and/or operating changes that are deemed appropriate.

In addition, the existing Project chance find procedure and the proposed Heritage Resource Management Plan (Appendix F-2 of the Project Proposal) requires that RRDC be notified of a chance find and that the assessment of potential significance of the materials will be assessed by a qualified archaeologist in collaboration with the YG Archaeology Department and RRDC Representative(s) and mitigative options will be identified. BMC will work with RRDC to ensure that any further action needed is taken. The BMC-Kaska Environmental, Cultural & Heritage Management Program will further ensure that impacts to heritage resources and subsequent impacts to the traditional land users are mitigated to the extent practicable.

#### *2.2.2.11 Contamination of Land from Spills*

RRDC has indicated that contamination at other projects in their traditional territory have resulted in the traditional land users never using the land in the vicinity of the project again. BMC's Project

design mitigations, management plans; reclamation and closure plan; and the proposed Environmental, Cultural & Heritage Management Program have all been developed to ensure that the area in post closure is "*compatible with a healthy environment and with traditional land use activities".* Therefore, there will be no contamination of the land that will prevent the land users from returning to the KZK project area in post closure.

#### *2.2.2.12 General Land use Post Closure*

See section 2.2.2.1.11.

#### *2.2.2.13 Cumulative Impacts*

The assessment of cumulative impacts is presented in response to IR4-5 below.

## 2.3 YESAB ISSUE

Concerns have been raised with respect to the various mines that have closed throughout the Kaska territory over the years and the short and long term impacts associated with such closures.

### 2.3.1 R4-5

Provide information on the past and current environmental and socio-economic effects of previous mine closures (planned or unplanned closures) on the Liard First Nation, Ross River Dena Council, and the residents of Ross River and Watson Lake to the extent that effects are unique to the community.

Section 5.7 of the Project Proposal describes how the Cumulative Effects Assessments (CEA) were undertaken for both the environmental and socio-economic VCs. This assessment not only included previous mine closures, it included all past, present and reasonably foreseeable projects and activities (including: exploration projects; guide outfitting; access; trapping; etc.). In this way all potential cumulative effects were evaluated (including those of past mines) following standard EA methods. The cumulative effects assessments for the environmental and socio-economic valued components are presented in Chapters 6 through 15 (Sections 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5 and 15.11). At the request of YESAB, this information from the Project Proposal has been extracted and is included as Appendix A to this Response Report. The only change to the CEA from the Project Proposal in this Response Report is that potential effects to Liard First Nation, Ross River Dena Council and Residents of Ross River and Watson Lake to the extent that effects are unique to these community have been identified (where possible).

### 2.3.2 R4-6

Based on this information develop appropriate mitigation measures to eliminate or reduce any potentially significant adverse effects and/or cumulative effects related to reclamation and closure (planned or unplanned) for the Kudz Ze Kayah Project.

The cumulative effects assessments for the environmental and socio-economic valued components are presented in Chapters 6 through 15 of the Project Proposal (Sections 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5 and 15.11). These Sections include additional mitigation measures to reduce the potential for cumulative effects (as required). At the request of YESAB, this information from the Project Proposal has been compiled and is included as Appendix A to this Response Report. This Appendix also includes Section 17.4 from the Project Proposal (Unplanned closure) as well as BMC's responses to previous information requests related to BMC's proposed mitigation measures for unplanned closure.

BMC's proposed reclamation plan to "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with*

*traditional land use activities*" is presented in Appendix H of the Project Proposal. This plan is not repeated in this Report. However, the implementation of this plan will eliminate or reduce any potentially significant adverse effects and/or cumulative effects related to reclamation and closure (planned or unplanned) for the Kudz Ze Kayah Project.

## 2.4 YESAB ISSUE

LFN indicated a concern regarding ore-truck traffic affecting their ability to access safely traditional areas along the Campbell Highway due to road condition and the type of traffic (trucks).

There is no indication in the proposal regarding mitigations specific to effects of the Project on LFN's and other users' traditional use of the area (where these sites are located, how many sites there is).

### 2.4.1 R4-7

Describe how the Project, namely highway traffic, will affect both traditional land use activities and other uses of the area, particularly on the safety of Liard First Nation and other users of the area and their ability to access traditional sites along the Robert Campbell Highway.

BMC's response to R4-7 has been divided into two components:

1. Public Health Safety Related to Increased Highway Traffic
2. Access to Traditional Sites along the Robert Campbell Highway

#### 1. Public Health and Safety Related to Increased Highway Traffic

Public Health and Safety Related to Increased Highway Traffic was assessed in the Project Proposal (Chapter 15) and was further assessed in response to YESAB's IRs during the adequacy review stage of the assessment process. The relevant information from the Project Proposal and BMC's responses to YESAB's IRs are repeated below, as per YESAB's request to "*Identify that information and extract it from the Project Proposal*".

##### Assessment in Project Proposal

Chapter 15 of the Project Proposal presents an Assessment of the Valued Component (VC) Human Health and Well Being. A Sub-component assessed for this VC is Public Health and Safety (Increased Traffic, Hazardous Material Transport, Waste Disposal) (Section 15.6.5). Section 15.5.2 (Transportation Infrastructure – Roads and Airports) also considers increased traffic on the Robert Campbell Highway. The information presented in Chapter 15 is repeated here.

The expected increase in traffic and hazardous material transport during operations is shown in Table 2-14. Most of this traffic, including the concentrate haul, is expected to be over the southern

portion of the Robert Campbell Highway between the Project and Watson Lake. The truck traffic during the operations phase is more regular and predictable than the construction phase. The construction phase will likely have truck traffic of around seven trucks per day but will vary significantly depending on where certain materials are sourced from. For example, if gravel for concrete was sourced on site then there would not be any need to truck it in from other sources.

**Table 2-14: Expected Truck Traffic: Operations Phase**

| Year 2 to Year 9 average | Annual Requirement | Load/ Truck (average) | Trucks/ year | Trucks/ Month | Trucks/ day |
|---|---|---|---|---|---|
| Reagents | 15,400 tonnes | 20 | 770 | 64 | 2.1 |
| Operations Fuel | 10,201,000 litres | 43,900 | 232 | 19 | 0.6 |
| Generator TDS | 991,200 GJ | 1,500 | 661 | 55 | 1.8 |
| Explosives | 6,400 tonnes | 20 | 320 | 27 | 0.9 |
| Underground Paste Cement | 13,300 tonnes | 40 | 333 | 28 | 0.9 |
| Miscellaneous | 5,000 tonnes | 20 | 250 | 21 | 0.7 |
| **Subtotal:** | | | **2,566** | **214** | **7.1** |
| **Concentrates** | | | | | |
| Cu/Zn -Tridem Trucking | 250,000 tonnes | 44 | 5,682 | 473.5 | 15.8 |
| Pb-Containerized Trucking | 36,500 tonnes | 33 | 1,106 | 92.2 | 3.1 |
| **TOTAL** | | | **9,354** | **780** | **26** |

The expected daily average truck traffic during the operations phase will be 26 trucks making round-trips to the site per day (or 52 one way trips per day). These trucks are expected to travel on the southern Robert Campbell Highway between the Project and Watson Lake. The traffic counter at KM 110 (Tutchitua of the Robert Campbell Highway) showed that the daily year-round vehicle counts between 1997 through 2011 varied from 17 to 44.

Subsequently, the Project will roughly double the average daily traffic on the southern portion of the Robert Campbell Highway. Although doubling the traffic count may appear significant, the still very low absolute numbers means the Project will likely not have a large effect on the highway itself as the use is well within design parameters.

As with any similar project there is the risk of an accidental spill or release of hazardous materials. This potential effect has been assessed in Section 17.3.2 of the accidents and malfunctions chapter of the Project Proposal and is therefore not carried forward in the socio-economic assessment.

The impacts of the increased truck transportation due to concentrate haulage will be mitigated in part through the Traffic and Access Management Plan (Section 18.12 of the Project Proposal). This plan includes BMC's commitment to contracting a qualified trucking firm that will:

- Use only experienced, professional drivers;
- Equip all trucks with two-way radio communications; and
- Implement design, safety and operating procedures proven by similar trucking systems utilized in Yukon and Canada.

Risks from hazardous materials and from spills will be mitigated through the application of the Hazardous Materials Management Plan (Section 18.3 of the Project Proposal) and Spill Contingency Plan (Section 18.5 of the Project Proposal).

In Addition, YG Highways has been upgrading portions of the Robert Campbell Highway and with the KZK Project proceeding, will create an incentive to continue the upgrades and perhaps re-allocated other funding to where use is increasing. These upgrades have widened the Highway and associated Rights of Way, which have made the Highway safer.

BMC will also require all contractors to follow all of the applicable territorial laws regarding use of the Highway (i.e., speed limits etc.).

With the mitigation measures in place, no residual effects to public health and safety (including LFN citizens) are predicted.

### Responses to Information Requests

During the both the Adequacy and Seeking views stages of YESAB's Environmental and Socio-economic Assessment process, YESAB requested BMC to provide additional information related to (in part) public health and safety due to increased highway traffic (YESAB, 2017a and 2018a). BMC's responses are presented in BMC, 2017b and 2018a. The information requests and BMC's responses are repeated here.

YESAB Issue (YESAB, 2017a)

Traffic safety around the Project footprint is described in detail but there is very little description of the proponent's plans to mitigate traffic risks in Watson Lake or along the truck route to port facilities.

R268

"Provide additional information on the identification of risks, effects of increased traffic along the entire route, and mitigations. Include communities, other road users, and wildlife in addition to the following:

a. strategies for avoidance of school children at the beginning and end of the school day,

b. logistics to reduce risks of driver fatigue in long haul truckers, and

c. risks to other users based on the transportation of fuel, supplies, and ore concentrate."

BMC Response (BMC, 2017b)

a) Once off the property and onto the Robert Campbell Highway and other highways, traffic out of and into the Kudz Ze Kayah Mine will operate using existing high traffic roadways and traffic corridors, which include identified industrial trucking routes through municipalities. All contract concentrate haul trucks, which will be appropriately lit including strobe lights, as well as high intensity driving lights for the long stretches of unlit highway during winter operations.

With the exception of Watson Lake, the municipalities through which Kudz Ze Kayah concentrate haul trucks will travel do not intersect school zones. Heavy truck haul routes have been designed to eliminate the intersection of industrial traffic and school zones. During community consultations and in meetings with the Mayor and Town Council of Watson Lake regarding the Kudz Ze Kayah Mine, this issue was identified. Under the current road arrangement, the truck route through Watson Lake runs in front of the school. In this section of the haul route, trucks will obey the school zone speed limit of 15 kilometres per hour.

Any school bus zones that occur along the truck route will be identified as part of driver orientation and training program prior to the first trip of any new drivers. New driver orientation sessions will also include briefings on known high incidence areas of wildlife crossings along the route, which will be updated with new sightings as they occur as part of the Wildlife Management Plan.

b) All long-haul trucking operations will be operated in accordance with Yukon Occupational Health and Safety Regulations in Yukon and in British Columbia the *BC Motor Vehicle Act* and other pertinent workers health and safety statutes and regulations regarding maximum allowable driver working durations.

c) Both the Yukon and BC also have modern statutes and regulations governing the transportation of hazardous goods on public roadways, designed to protect public safety.

In fact, past experience in Yukon has shown that the addition of regular traffic by professional drivers equipped with basic first aid supplies and reliable communication capabilities on remote highways has proven to be a welcome safety feature for the public. In many instances in the past during mining operations in remote areas such as Yukon, concentrate haul and supply trucks have played pivotal

roles in providing critically needed and otherwise unavailable timely roadside assistance. BMC assumes that this reality will not go unobserved in the socio-economic assessment of this aspect of the Kudz Ze Kayah Project.

YESAB Issue (YESAB, 2017a)

While the proposal provides an effects characterization on Transportation Infrastructure – Roads and Airports (Section 15.8.2), it only considers traffic volumes; it does not provide information on or discuss the current condition of the Robert Campbell Highway. No details are provided about the configuration and types of project related vehicles that will be using the highway, and there is limited discussion as to how or whether or not the current conditions and state of the highway, and how it can vary seasonally, could affect or alter the project schedule and use of the highway. Additionally, there is limited discussion about potential mitigations or adjustments that the proponent could implement or propose to accommodate highway conditions and other highway users. The discussion provided is focused on limits to legal axle loads that could be imposed during spring thaw and break up. And while the project proposal does have a Traffic and Access Management Plan component (Section 18.12), it appears only to apply to the proposed tote road and site/haul roads in the Project area and not to the proposed use of the Robert Campbell Highway.

R291

"Provide information on the following in relation to the Robert Campbell Highway:

a) current conditions with respect to expected road standards;

b) configuration and types of project related vehicles that will be using the highway;

c) discussion on how or whether the current conditions and state of the highway, and expected seasonal variances and effects of the environments, may affect or alter the project schedule and proposed use of the highway;

d) traffic management plan for proposed use of the Robert Campbell Highway including consideration for the varying physical state and condition of the road and with respect to other users; and

e) mitigations and alternatives that could be implemented."

BMC Response (BMC, 2017b)

It is acknowledged that there have been upgrades to the Robert Campbell Highway and more are planned by the Department of Highways and Public Works (HPW). The recent upgrades have concentrated on the section between Watson Lake and the Tuchitua Highway Maintenance Camp over the last few years.

While the current road conditions on the highway between KZK and the Wolverine Mine (approximately 50 km) are not ideal, they are acceptable for all expected Project traffic and are not expected to affect or delay the Projects timeline or proposed use of the highway. However, any highway improvements that are made to this section of the road will benefit all users of the road including those directly involved with the Project. The existing highway from Wolverine mine to the port of Stewart has been upgraded by HPW to allow concentrate haulage.

Project related traffic on the Robert Campbell Highway has been described at a high level in Section 4.12.4 (Transportation Volumes) of the Project Proposal. There will be a variety of configuration of trucks and light vehicles dependent on the material being transported to, or from, the site. These will vary from light vehicles carrying passengers to oversize wide load haulers for the larger pieces of equipment during the construction phase. During the operations phase, the majority of the traffic will entail concentrate haulers consisting of a combination of conventional bulk concentrate carriers (tridem tractor with Super B train Convey Ore style concentrate trailers) and specialized super B flat deck trailers outfitted to transport containerized bulk carriers. Supplies will be transported using conventional trucking fleets provided by appropriately licenced contractors and suppliers.

The current condition of the road and seasonal variances have been taken into account with the construction schedule, the projected concentrate trucking schedule, and the supply schedule with redundancy and excess warehouse space to mitigate for seasonal, and unanticipated road closures and less than ideal driving conditions.

The Traffic and Access Management Plan only applies to the Access Road from Robert Campbell Highway to the Kudz Ze Kayah site. It would be presumptuous for BMC to create a traffic management plan for a public highway such as the Robert Campbell Highway as any such plan may involve restrictions on other users. It is anticipated that a traffic management plan would be created for the Robert Campbell Highway by the HPW, with input from BMC regarding Project related traffic use. The condition of the Robert Campbell Highway would inform any restrictions required and the plan would be updated as roads were improved or conditions deteriorated. Restrictions, such as the speed limits enforced for the concentrate trucks from Wolverine, may be required on Project specific equipment and possibly on all traffic, an example of this would be extended “No Passing” zones. The decisions for these are the responsibility of the HPW although it is hoped that they would liaise with BMC when making adjustments to traffic use requirements.

YESAB Issue (YESAB, 2018a)

The Robert Campbell Highway is narrow in many areas, with poor sightlines, limited passing opportunities, pull outs, turning lane and presents travel concerns in all seasons. An increase in truck traffic throughout the construction, operation and active closure of the mine has resulted in a series of safety concerns being raised.

R3-38

Describe the various safety concerns with the proposed use of the Robert Campbell Highway and BMC's role in addressing those concerns.

BMC Response (BMC, 2018a)

BMC is aware of limitations of the Robert Campbell Highway and this has been reiterated by the communities that use it. While there has been substantial work undertaken in previous years by YG, which is ongoing, the Robert Campbell Highway remains an all season gravel highway with certain limitations.

The Robert Campbell Highway (Highway 4) has a total length of 583.6 km consisting of 355.2 km dual lane gravel, 60 km single lane seal coated highway, and 168.4 km double lane seal coated highway. From Watson Lake, the first 100 km is seal coated; the balance is gravel until the Faro intersection. It is generally considered a well maintained road but can experience rough/wet operating conditions during rainy periods from May until freeze up in early October. Historically, weight restrictions are in place from early April until late May and occasionally during prolonged wet, rainy periods in summer/fall.

The primary area of concern of the highway is south from the KZK Access Road to the Wolverine turnoff, a distance of approximately 50 km. A secondary (and lesser) area of concern exists from the Wolverine turnoff to Tuchitua, a length of approximately 120 km. The section of highway from Tuchitua to Watson Lake has been widened and chip sealed which has assisted in the abatement of a majority of the deficiencies that exist in the 60 km to 232 km section. Other works have also been carried out over the last 5 years from Tuchitua to the Wolverine turnoff.

Prior to construction and operations, BMC commits to discuss with the local communities BMC's preliminary plans and request any suggestions on ways to assist with managing the increased traffic to maximise safety and minimise disruptions that they may have.

Safety concerns that have been identified prior to use of the road for haulage of concentrates and supplies are centred on two main issues:

1. *Road Conditions- current conditions and likely changes with increased traffic*
2. *Traffic- An increase in traffic volumes will increase the potential for vehicle interactions*

The amount of truck traffic estimated during operations is 52 one way trips per day or approximately 2 one way trips per hour if the trucks are operated for 24 hours per day. The majority of these one-way trips will be concentrate trucks (38 one way trips per day) which will be operated 24 hours a day. All concentrate traffic and the majority of supply trucks will use the Watson Lake to kilometre 232 stretch of the Robert Campbell Highway.

The expected number of trucks and assuming an average speed of 55 km/hr suggests that at any one time there will be 4 Project related trucks travelling in each direction on the highway.

BMC will have some control over the actions of certain portions of the traffic using the highway such as the haulage trucks, supply trucks, and light vehicles driven by employees, and contractors, of BMC. However, BMC has no control over other users of the roads and must rely on these users to abide by Yukon's road rules and to drive in a manner that takes into consideration road conditions. With this limited control it may be possible to mitigate some of the potential safety concerns:

1. Communications: All Project related heavy traffic on the Robert Campbell Highway will be equipped with radio communication. The radios will be used to advise of relative positions on the highway and advise others about oncoming traffic and road conditions. These radios can also be used to call for assistance if there have been mechanical or road problems. This communication network could also be of advantage to non-company users of the road in cases where assistance is needed and no communication is available due to the lack of cell coverage on the highway.
2. There are limited locations where vehicles can pass traffic going in the same direction safely, as the road has numerous blind curves and is generally too narrow for safe overtaking. Prior to construction and operations, the locations of safe passing zones will be identified and drivers associated with the Project will be advised of these locations. A list will be provided and appropriate actions to take at the passing areas will be outlined. These actions may include reducing speed, or even stopping, to allow traffic to pass at these locations.
3. Dust can be reduced by limiting the speeds of vehicles travelling the road however this also could lead to unsafe passing by traffic travelling in the same direction. Vehicles will be advised to allow other users to pass as early as it is safe to do. Yukon Highways can help limit this problem by judicious use of chemical sealants. Chemical sealants may also decrease the overall cost of road maintenance if applied correctly.
4. Traffic travelling on the Robert Campbell Highway will have to pass approximately 4 Project related heavy vehicles travelling in the opposite direction when driving on the stretch of the highway under discussion. Radio communications will warn the trucks of oncoming traffic however there will be no warning for private vehicles and other road users. Prior to construction and operations, it is suggested that BMC travels a number of times to the local communities and asks for their suggestions on ways to assist with managing the increased traffic to maximise safety.
5. One possible way to limit encounters on the highway is for the trucks to travel in convoys, rather than individually. This, however can also lead to increased safety issues both for opposing traffic and passing traffic. This is an area where community input will be requested and where there may need to be trials to evaluate the effectiveness of each strategy.
6. Increased traffic will degrade road conditions more rapidly than at present. The worsening can be minimised by reducing the speed that traffic uses the road and using proper driving techniques such as; minimising the use of brakes and selecting appropriate gears on sections with steep grades. The company and contract drivers using the road will have appropriate skillsets and training on handling large vehicles on gravel roads.

7. Yukon Highways, and contractors working for them, are continually upgrading and maintaining the highway and BMC realizes that communications with the various work crews is essential. BMC commits to maintaining communications with Yukon Highways at all stages of the Project and working with them to minimise disruption to their projects. This will mean informing Highways of trucking schedules and may mean scheduling trucking to certain times of the day to minimise effects on the various activities.
8. Winter driving: In winter the driveable width of the highway may be decreased due to high snow amounts and the associated snow plowing activities by the Highways department. This will increase the risk to all travel on the highway. There will be less non Project related traffic on the highway; however, the decreased road widths will mean that extra restrictions may have to be implemented. This could include speed restrictions applied to company traffic as well as more frequent mapping of potential passing zones.
9. The Robert Campbell Highway is prone to washouts during high rainfall events and ice "glaciers" during the spring melt. The glaciers will occur during the highway weight restriction period and during this period there will be less site specific traffic and thus less potential risk for vehicles passing at specific icy locations. Potential washouts can be identified by company traffic prior to actual road closure. If this information is forwarded to Yukon Highways, then there is the possibility that the potential problem may be resolved prior to the washout causing a highway closure. High rainfall events will be monitored and if there is a chance of road closures then company traffic will be restricted from highway use. In the event of a highway closure, due to washouts or other causes, BMC will provide any assistance required and will advise all company users of the closure and prevent all Project related traffic from entering the affected stretch.

It is apparent that success in minimising effects of the increased traffic on the Robert Campbell Highway will rely on continued communication between all the relevant parties including, but not limited to, BMC, Yukon Highways, the people of Ross River and Watson Lake, and all service providers that use the road currently or into the future. With this communication in place and the appropriate procedures and action plans in place negative effects of the increased traffic can be minimised.

With the mitigation and management measures in place, no residual effects to public health and safety (including LFN citizens) are predicted.

2. Access to Traditional Sites along the Robert Campbell Highway

Based on the mitigation measures presented above, no residual effects to public health and safety (including LFN citizens) are predicted. Therefore, health and safety concerns should not impede LFN citizens from accessing traditional sites along the Robert Campbell Highway. However, BMC acknowledges that some LFN citizens may chose not to access traditional sites along the highway due to what they view as health and safety concerns (i.e. it is understood that some people stopped using the Highway for traditional purposes when the Wolverine mine was operating).

The predicted volume of traffic will remain very low and should not prevent LFN from accessing traditional sites (i.e. there would be no physical barriers from Project related vehicles to the Traditional Sites).

## 2.5 YESAB ISSUE

BMC did not demonstrate convincingly how they incorporated TK for this important value based on LFN, RRDC and other comments received.

The document used to describe the importance of water to the Kaska referenced in the Project proposal (Kaska Dena Management Practices) has been developed for the Kaska First Nations in BC and does not make reference to waterbodies present in the regional or local areas around the Project. The document mentions that other Kaska Nations and communities may eventually include other areas within the larger Kaska territory but did not include statements specific to RRDC or LFN.

### 2.5.1 R4-8

Thoroughly demonstrate how traditional knowledge and traditional land use have been incorporated into the consideration of effects to water in the proposal or the identification of mitigations.

**Preface**

As described in Section 1.1.1 (of this Response Report), RRDC's collection of TK over the Project area is ongoing and BMC is constrained from disclosing specific TK matters by confidentiality obligations in existing agreements with Kaska. However, in general when new TK is shared, both parties will collaboratively identify any changes to known potential effects as well as any additional mitigation measures that may be required based on the new information. Any mitigation measures agreed to by BMC/Kaska will be incorporated into BMC's detailed management and monitoring plans that will be submitted for regulatory review during permitting and/or will be adopted by BMC (subject to existing permit conditions) over the life of the project.

BMC's response to this IR is based on: the available information provided to BMC during consultation with LFN and RRDC and their citizens; the Traditional Knowledge Study Conducted in 1995 (Rutherford, 1995); and, the desk based Kaska Ethnography study (Appendix F-3 of the Project Proposal). It is noted that the 1995 Traditional knowledge study included interviews with Elders knowledgeable of the area based in Ross River but did not include any LFN citizens. It is also noted that the Kaska Ethnography study was based on all Kaska in Yukon and did not differentiate between RRDC and LFN. Part of the rationale for not differentiating between the two groups is articulated in Chapter 4 of the Ethnographic Study as follows:

*"Also important in the determining of effects of the proposed Project on Kaska land use is the concept and approach among Kaska people that their Traditional Territory is viewed as a whole with distinct yet interdependent parts. This is explained further in the KDC court submission to support their Comprehensive Land Claim:*

> *"It is difficult to view the lands used by the Kaska Dena as being in some way divisible.*
>
> *Rather, the image that comes across most clearly is that the Yukon area harvested by the*

*Kaska Dena form as a whole an integral and integrated part of the resource base upon which their sociocultural integrity relies (KDC, 1982:58 in Exhibit 3)."*

It is noted that the recent submissions from LFN to YESAB have indicated that the KDC does not represent them; however, the documentation from court submission indicates that at one point KDC did represent them. Since BMC did not hear otherwise, during the consultation efforts with LFN, during the preparation of the Project Proposal, BMC was confident that this information from the courts was reliable and therefore did not differentiate between LFN/RRDC effects or mitigations (other than in the consultation chapter).

BMC acknowledges that several of the "Kaska" mitigation measures presented in the Project Proposal come from the document entitled "*Kaska Dena Management Practices*" (KDI, 2010). These mitigations were considered appropriate for use in the Project Proposal as the report was developed in collaboration with RRDC's Traditional Knowledge Team who are acknowledged in the Acknowledgments section of the report. Further the report includes a map of the entire traditional territory, communities and states: "*The Kaska Land Use Framework is a community based land use plan, management practices, and policies. It is a framework the Kaska will use to protect Kaska lands from third party dispositions*". However, when RRDC conducted the Adequacy review of the Project Proposal in June of 2017 (Dena Cho, 2017). RRDC indicated that the management practises in the "*Kaska Dena Management Practices*" report did not necessarily reflect RRDC's Management Practices. BMC responded to RRDC in August of 2017 (BMC, 2017d) by re-assuring RRDC that as per the Traditional Knowledge Protocol "RRDC's assessment of potential effects and recommended mitigation measures will be developed by the Traditional Knowledge Team and presented to BMC for consideration and implementation". Subsequently BMC is committed to working with RRDC to include their mitigation measures in the planning and ongoing operation of the Project once they are received. Likewise, BMC is committed to working with LFN in incorporating any specific LFN Kaska Elder TK that they might provide into the Project planning and operation once they are received.

#### *2.5.1.1 Selection of Surface Water as a VC based on RRDC/LFN Kaska Interests*

During BMC's consultation with RRDC/LFN Kaska it was made clear to BMC that water was an important VC. The specific concerns related to water from the consultation were presented in Chapter 2 of the Project Proposal (Table 2-3 (Views Presented by RRDC and BMC's Full and Fair Consideration) and Table 2-5 (Views Presented by LFN and BMC's Full and Fair Consideration)). For ease of review the question/comment/concerns from Tables 2-3 and 2-5 that relate to water are presented in this Response Report as Table 2-15 (RRDC's comments) and Table 2-16 (LFN's comments). The tables also present BMC's responses that were provided during the community and/or Elders meetings. The tables also cross references the section of the Project Proposal where the concern was further addressed/assessed.

## Table 2-15: Water Related Views Presented by RRDC and BMC's Full and Fair Consideration

| RRDD Question/Comment/Concern | BMC's Full and Fair Consideration | | | | Meeting Where Question/Comment/Concern was Raised | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Response to Question/Comment/Concern During Meeting | Consideration and/or Follow-up (if response was not provided at meeting or follow-up required) | Topic of Question/Comment /Concern | Project Proposal Chapter/Section/Appendix where Question/Comment/Concern is Further Addressed | RRDC Introductory Community Meeting April 8, 2015 Attendees: 20 RRDC members | Ross River Community Meeting #1 January 12, 2016 Attendance: 30 | RRDC Elders Meeting in Ross River #1. June 1, 2016 Attendance: 20 elders and several youths | KZK RRDC Elders Tour June 22, 2016 Attendance: 8 | RRDC Elders Meeting in Ross River #2 July 13, 2016 Attendance: 35-40 elders (plus some younger attendees) | RRDC Elders Tour August 1, 2016 Attendance: 7 | RRDC Chief and Council Tour Sept. 8, 2016 Attendance: 2 | Elders Meeting #3. Sept 27, 2016 Attendees 25 elders (approximately 7 other participants) | Ross River Community Meeting #2 December 6, 2016 Attendees: 15 | RRDC Chief & Council Meeting December 7, 2016 Attendees: 3 |
| YTG Highways has a culvert on the Robert Campbell Highway at Finlayson Creek that is blocking fish passage and is even killing small fish. | BMC cannot be responsible for YTG's culvert. BMC does have a monitoring station at the location. | Following the meeting BMC assessed the reported fish barrier art the culverts and determined that eliminating the barrier would open up Finlayson Creek fish habitat for Arctic grayling. BMC discussed this option with YG biologists and concluded that this may be a viable option. At the second community meeting BMC responded: BMC will propose to remove the barrier as part of the Fish Habitat Compensation Plan. | Aquatic Eco-systems and Resources | Fish Habitat Compensation Plan - Appendix D-4 | | √ | | | | | | | | |
| Concerned about the tailings and impacts on fish and wildlife (we all saw what happened at Mt Polly). | Mt.Polly was a collapsed tailings dam; KZK will not have a tailings dam. KZK will use modern, environmentally responsible dry-stack method, where the tailings are pressed dry, and placed on the hillside above the creek in a progressively reclaimed facility that conforms to the existing hillside slope. We are using this much safer and more expensive method because we think it's the right thing to do. | N/A | Aquatic Eco-systems and Resources/Wildlife | Project Description - Chapter 4<br>Aquatic Ecosystems and Resources - Chapter 10<br>Wildlife and Wildlife Habitat - Chapter 13 | | | | | √ | | | | | |
| Would like ecological and traditional values mitigated. | Any potential impacts to ecological and traditional values will be mitigated. | N/A | Environmental Management and Mitigation | Effects Assessment Chapters - Chapters 6 to 17<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | √ | | | | | |
| Faro is a mess and we are left to deal with it, will KZK be the same? | Faro is a mess from another era, when mining was largely unregulated and without the advantages of modern techniques and technologies that are effective today in preventing long term environmental impacts. BMC has designed the mine for closure which includes progressive reclamation. Also, BMC will be required by the Territorial and Federal agencies to adhere to strict environmental permits to ensure that a mess is not generated as well as provide security bonds up front and that funds are available to reclaim the site by government, if needed. | N/A | Environmental Protection | N/A | | | | | √ | | | | | |
| The land is important to us, we want our children and grandchildren to be able to use the land. | We understand and respect that completely. | N/A | Environmental Protection | Project Description - Chapter 4<br>Effects Assessment Chapters - Chapters 6 through 17<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | √ | | | | | |
| How far is Fyre Lake? | Fire lake is approximately 30 km to the south of KZK. | N/A | General | Effects Assessment Methods - Chapter 5 (has a map showing the location of Fyre Lake) | | | | | | √ | | | | |

| RRDD Question/Comment/Concern | BMC's Full and Fair Consideration | | | | Meeting Where Question/Comment/Concern was Raised | | | | | | | | | |
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| There are a lot of artesian seeps on site. Is ground water going to be a problem? Water levels will rise as mining happens, how are you going to deal with it? | Yes, the site is artesian. In 2015 BMC capped a number of drill holes left by Cominco. How the ground water will be dealt with is something that will be part of the mining and water management plans. | At the second community meeting BMC described the water management plan for the Project in detail. | Groundwater/Surface water | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Surface Water Quality Baseline Report - Appendix D-1<br>Receiving Environment Water Balance Report - Appendix D-6<br>Surface Water Quality Model Report - Appendix D-7 | | √ | | | | | | | | |
| Is the dry stack going to have a culvert? | No, it won't have a culvert. Water will be drained via a rock-filled "french drain". | N/A | Mine Design | Project Description - Chapter 4 | | | | | | | | | √ | |
| Rather than constructing a liner for dry stack can you line it with moss? | Moss is not feasible as it would not provide a sufficiently low permeably barrier to protect groundwater. | N/A | Mine Design | N/A | | | | | | | | | √ | |
| Are there creeks by the tailings facility? | There are no creeks near the dry stack (and there is no tailings pond). | N/A | Mine Design | N/A | | | | | √ | | | | | |
| Where is the tailings pond on the map? | There is no tailings pond - it's a dry stack facility. | N/A | Mine Design | Project Description - Chapter 4 | | | | | √ | | | | | |
| Will KZK have the same problem as Wolverine with having a full tailings pond? | No - BMC is not planning to have tailings stored underwater, we are proposing to have dry stack tailings. | N/A | Mine Design | Project Description - Chapter 4 | | | | | | √ | | | | |
| What is the depth of the pit? | Approximately 250 m. | N/A | Mine Design | Project Description - Chapter 4 | | | | | | | | √ | | |
| Environmental protection was brought up as a key concern. | BMC is committed to designing the Project to minimize environmental impacts and will be conducting a thorough impact assessment in collaboration with RRDC (as per the cooperative engagement process that will be developed as part of the SEPA amendments). | Environmental protection will continue to be addressed as part of ongoing consultation as the Project progresses. | Mine Design/Environmental Management | Project Description - Chapter 4<br>Conceptual Environmental Management Plans - Chapter 18 | | | √ | | | | | | | |
| What are you going to do with the waste rock and water - will it be like Faro? | BMC explained modern permitting and design would not permit environmental impacts like Faro to occur and then later in the presentation described the waste rock storage and management strategies (i.e., dry stack methods and design to keep clean water clean). | N/A | Project Description | Project Description - Chapter 4 | | | | | | | | √ | | |
| Will the ABM lake at closure need treatment? | The final water quality predictions are being worked on, but the thoughts are that with design strategies such as adding limestone to the pit that the potential for treatment is unlikely. However, there will be a treatment plant on site through operations and closure and would be used post closure (it is not known at this time if it will be required). | Modelling has been completed since the meeting and the results are presented in the Project Proposal. | Project Description | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Reclamation and Closure Plan - Chapter - Appendix H-1 | | | | | | | | √ | | |
| The Elders would like to be part of designing the mine as infrastructure may need to be changed to meet the Elders needs. | RRDC (including Elders, have been involved since purchase of the Project) and will continue to be involved in accordance with the cooperative engagement plan under the renewed SEPA. | Will continue to be addressed as part of ongoing consultation as the Project progresses. | Project Description | N/A | | | | | √ | | | | | |
| Where is the concentrate going to be trucked? | The concentrate will be hauled south through Watson Lake to the Port in Stewart BC. | N/A | Project Description | Project Description - Chapter 4 | | | | | | √ | | | | |
| How far from the road is the mine? | Approximately 25 km. | N/A | Project Description | Chapter 3 - Project Location | | | | | √ | | | | | |
| Where are the Lakes? | The lakes were shown on the map. | N/A | Project Description | Surface Water Quality and Quantity - Chapter 8 | | | | | √ | | | | | |

| RRDD Question/Comment/Concern | BMC's Full and Fair Consideration | | | | Meeting Where Question/Comment/Concern was Raised | | | | | | | | | |
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| | Response to Question/Comment/Concern During Meeting | Consideration and/or Follow-up (if response was not provided at meeting or follow-up required) | Topic of Question/Comment /Concern | Project Proposal Chapter/Section/Appendix where Question/Comment/Concern is Further Addressed | RRDC Introductory Community Meeting April 8, 2015 Attendees: 20 RRDC members | Ross River Community Meeting #1 January 12, 2016 Attendance: 30 | RRDC Elders Meeting in Ross River #1. June 1, 2016 Attendance: 20 elders and several youths | KZK RRDC Elders Tour June 22, 2016 Attendance: 8 | RRDC Elders Meeting in Ross River #2 July 13, 2016 Attendance: 35-40 elders (plus some younger attendees) | RRDC Elders Tour August 1, 2016 Attendance: 7 | RRDC Chief and Council Tour Sept. 8, 2016 Attendance: 2 | Elders Meeting #3. Sept 27, 2016 Attendees 25 elders (approximately 7 other participants) | Ross River Community Meeting #2 December 6, 2016 Attendees: 15 | RRDC Chief & Council Meeting December 7, 2016 Attendees: 3 |
| The ponds past the end of the Tote Road are called South Lakes. | Yes, they are called South Lakes. | N/A | Project Description | Surface Water Quality and Quantity - Chapter 8 | | | | | √ | | | | | |
| How far is it to South Lakes? | Approximately 500 m. | N/A | Project Description | Surface Water Quality and Quantity - Chapter 8 | | | | | | √ | | | | |
| Will the tailings impact the creek? | The tailings will be placed in a lined facility and dry stacked on the side of the valley, with a small slope. The tailings will be progressively reclaimed with an engineered low permeable barrier to minimize water infiltration. Additional designs include water management ponds, water treatment, water collection ponds and treated wetlands. Therefore, no impacts to the water quality in the creek are predicted. | N/A | Project Description/Water Quality | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | | | | √ | | |
| Water is really important and would like to see it protected. | The Project has been designed to re-use water where ever practical and to keep clean water clean. | N/A | Surface Water | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | | | | √ | | |
| Wolverine Lake is black; will your Project do the same to the lakes there? | No - this is not a possibility for our Project. | N/A | Surface Water | N/A | | | | | √ | | | | | |
| Is there an evidence of natural current contamination from minerals at surface or near surface? Is there background selenium in the water? Will selenium in the water increase as mining occurs? | KZK appears to be typical of the types of sites with surface and near-surface mineralization. There are very low levels of selenium in the water now. The levels occurring in the water now will be part of the baseline and as mining proceeds the allowable level of selenium and other metals will be set in the relevant licenses. | N/A | Surface Water | Surface Water Quality and Quantity - Chapter 8<br>Surface Water Quality Baseline Report - Appendix D-1<br>Receiving Environment Water Balance Report - Appendix D-6 | | √ | | | | | | | | |
| Concerns about impacts to water quality was brought up. | BMC is designing the Project to reduce and minimize the potential for water quality impacts. The water quality modelling is currently underway. Once the design and modelling is complete, we will present the results to the community to show all of the steps we will take to reduce the potential for water quality impacts. | N/A | Surface water | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18 | | | √ | | | | | | | |
| Will the impacts to water impact Campbell River? We use Campbell River as a drinking water source. | There will be no impacts to water quality in Campbell River. | N/A | Surface water | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | √ | | | | | |
| Concern is the continental divide with the water going in both directions. | In consideration of this concern, BMC will ensure that any temporary impacts during mining operations will be reversed upon mine closure. | N/A | Surface water | Project Description - Chapter 4<br>Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18<br>Reclamation and Closure Plan - Chapter - Appendix H-1 | | | | | | | | | | √ |
| Is the Project by Mink Creek? This creek is important to us. | No, the Project is not close to Mink Creek. | N/A | Surface Water | N/A | | | | | √ | | | | | |

| RRDD Question/Comment/Concern | BMC's Full and Fair Consideration | | | | Meeting Where Question/Comment/Concern was Raised | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Response to Question/Comment/Concern During Meeting | Consideration and/or Follow-up (if response was not provided at meeting or follow-up required) | Topic of Question/Comment /Concern | Project Proposal Chapter/Section/Appendix where Question/Comment/Concern is Further Addressed | RRDC Introductory Community Meeting April 8, 2015 Attendees: 20 RRDC members | Ross River Community Meeting #1 January 12, 2016 Attendance: 30 | RRDC Elders Meeting in Ross River #1. June 1, 2016 Attendance: 20 elders and several youths | KZK RRDC Elders Tour June 22, 2016 Attendance: 8 | RRDC Elders Meeting in Ross River #2 July 13, 2016 Attendance: 35-40 elders (plus some younger attendees) | RRDC Elders Tour August 1, 2016 Attendance: 7 | RRDC Chief and Council Tour Sept. 8, 2016 Attendance: 2 | Elders Meeting #3. Sept 27, 2016 Attendees 25 elders (approximately 7 other participants) | Ross River Community Meeting #2 December 6, 2016 Attendees: 15 | RRDC Chief & Council Meeting December 7, 2016 Attendees: 3 |
| Is selenium an issue? | KZK has about one tenth the level of selenium as Wolverine. Selenium may end up in the concentrate or in the tails. If in the concentrate selenium may have a smelter credit or penalty. Will have to wait on more testing and markets during operations to know for sure. | N/A | Surface Water | Surface Water Quality and Quantity - Chapter 8<br>Surface Water Quality Model Report - Appendix D-7 | | √ | | | | | | | | |
| Will the mine impact water quality? | BMC is designing the Project to reduce and minimize the potential for water quality impacts. The water quality modelling is currently underway. Once the design and modelling is complete, we will present the results to the community to show all of the steps we will take to reduce the potential for water quality impacts. | At the second community meeting BMC described the water management plan for the Project in detail. Including the strategies to minimize impacts to water quality. | Surface Water | Surface Water Quality and Quantity - Chapter 8<br>Conceptual Environmental Management Plans - Chapter 18 | | | | | | √ | | | | |
| Will the Pit Lake water after the mine is closed be contaminated? | We are currently modelling the ABM lake water at the closure scenario. If metals are predicted to be elevated, we will treat the water until it meets the water quality guidelines. We are also planning to construct a wetland treatment system to treat the spill water long term. But the final design will be presented in the Project Proposal once more studies are completed. | N/A | Surface Water | Surface Water Quality and Quantity - Chapter 8 | | | | | | √ | | | | |

### Table 2-16: Water Related Views Presented by LFN and BMC's Full and Fair Consideration

| | Response to Question/Comment/Concern During Meeting | Consideration and/or Follow-up (if response was not provided at meeting or follow-up required) | Topic of Question/Comment/Concern | Project Proposal Chapter/Section/Appendix where Question/Comment/Concern is Addressed | Watson Lake Community Meeting #1. January 14, 2016 Attendance: 60 | Watson Lake Community Meeting #2. Nov. 17, 2016 Attendees: 30 |
|---|---|---|---|---|---|---|
| From the flotation mill - where would all the wastewater go? | The design is based on recycling water from the process ponds back to the mill - so it's being recycled. | N/A | Mine Design | Project Description - Chapter 4 | | √ |
| You've covered a lot of detail about your baseline data. But what are you going to do to the environment? Will you dam the creek? | BMC is now in the process of looking at the various alternatives for how to mine the deposit. Next time BMC comes to the community it will have a mine plan that will answer these kinds of questions and ask for further input from residents of Faro and LFN citizens. | Follow-up response at the second community meeting: BMC has completed the alternatives assessment and there will be no submerged tailings placed in the valley with a dam in perpetuity, which was the original plan by Cominco. BMC will have a dry stack tailing facility on the west side of the valley as shown in the figure in the presentation. However, due to the positive water balance of the site, two small temporary dams will be placed in the valley to manage water during construction and operations, but they will be removed at closure. | Mine Design | Project Description - Chapter 4 | √ | |
| How safe is the containment of the tailings piles - worried about dust in the air and water quality? | Dust will be minimized via dust suppression techniques during construction and operations and will be reduced further through progressive reclamation activities of the Class A Storage Facility. | N/A | Mine Design / Air Quality | Project Description - Chapter 4Air Quality - Chapter 6 Air Quality Model Report - Appendix E-1 | | √ |
| How safe is the water that reaches the spawning ground? | Completely safe. | N/A | Surface Water | Surface Water Quality Baseline Report - Appendix D-1 | | √ |

The main chapters where TK and/or traditional land use were incorporated into the consideration of effects on water or used in the identification of mitigations are:

- Chapter 4 - Project Description
- Chapter 8 - Water Quality and Quantity Effects Assessments
- Chapter 9 – Groundwater Quality and Flow
- Chapter 16 – Effects of the Environment on the Project
- Chapter 17 – Malfunctions, Accidents and Unplanned Closure
- Chapter 18 – Conceptual Management Plans

In addition to the chapters above, subsequent assessments related (in part) to water (which also considered TK and/or traditional land use) were made in response to YESAB's previous IRs and include:

- Preliminary Quantitative Risk Assessment (R267, and R2-119); and
- Dam Failure of the Upper and Lower Water Management Ponds (R274, R2-124, R2-125 R3-14); and
- Class A Storage Facility - Failure Modes Effects Assessment (R2-3).

The following describes how TK and/or traditional land use were incorporated into the consideration of effects on water or used in the identification of mitigations in each of these chapters and previous IR responses.

#### *2.5.1.2 Chapter 4 - Project Description*

LFN and RRDC have advised BMC that water has historically been and continues to be an important Valued Component that needs to be protected to ensure it's use for future Kaska generations. During the consultation efforts, meetings with the RRDC Elders Oversight Committee, and Elders tours of the site, a number of waterbodies were identified as having been used for traditional purposes, primarily for fishing and drinking water. These waterbodies were also identified as being a component of the environment that wild game and game birds rely on for survival. The waterbodies closest to the proposed Project that have been specifically identified as being used for traditional purposes are Finlayson Creek, Fault Creek, North Lakes and Geona Creek. Subsequently, the Project Design team ensured that the Project was designed to avoid or minimize effects to these waterbodies and in the case of Finlayson Creek the Project was designed to cause a positive effect.

Finlayson Creek was identified by RRDC Elders as having been historically used for fishing of Arctic grayling; however, when YG installed the culverts at the Robert Campbell Highway they created a fish barrier. Since the barrier has been in place, Finlayson Creek has not been used for fishing by RRDC as density of fish in the system is too low. With RRDC support, BMC plans to reverse this effect as part of the proposed Fish Offsetting Plan (FOP). BMC is proposing to fund YG to remove the fish barrier. This mitigation will allow the Arctic grayling to move back into Finlayson Creek, a total stream length

of 36.56 km, such that the traditional use of the creek, including fishing, will be restored. Additional information on the proposed FOP is presented in Appendix E-4 of the Project Proposal and in BMC's responses to R143(b) and R3-12 (BMC, 2017b and 2018a).

Fault Creek has been identified by RRDC Elders as a drinking water source. Given the importance of this creek, BMC has designed the Project to ensure that the water quality of the creek is not impacted by the proposed mine infrastructure (i.e. no mine infrastructure is proposed in the vicinity of Fault Creek). The creek will continue to be monitored through the Project phases to ensure that this avoidance mitigation measure is successful (i.e. that there are no detectable changes in the water quality from baseline).

North Lakes (approximately 5 km south of the proposed Project) has been identified as an important traditional use area for fishing by RRDC. Given the importance of these lakes, the open pit was designed to ensure that its most southern boundary did not cross the watershed divide and that the outlet of the pit at closure was at a low enough elevation to ensure surface water continues to flow north. Based on this design the groundwater will also flow north into the pit and north out of the pit. With these design mitigation/avoidance measures, all potential long term effects to the surface water quality and groundwater quality in the watershed south of the Project (including North Lakes) have been eliminated.

Section 4.15.4.1 of the Project Proposal presents the alternatives assessment for the Tailings Disposal Methods and Locations. In this assessment slurry tailings in Geona Creek was considered one of the methods to manage the tailings for the Project. This was the method that Cominco gained permitting permission in the late 1990's. The water and wetlands of Geona Creek have been identified as important habitat for wild game and game birds that RRDC rely on. This method of tailings management would not have permitted the Geona creek valley to be returned to a low flowing wetland system at closure and was therefore deemed to be least preferred alternative. In addition, as it would be the least likely alternative to achieve the closure objective "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities*" (Appendix H of the Project Proposal). The importance of reclaiming the Geona Creek system to its current state was further described to BMC during a meeting with the RRDC Elders Committee in April of 2017 (post-submission of the Project Proposal). In this meeting the Elders indicated that they would not support a project that proposed slurry tailings due to water quality concerns. BMC subsequently re-assured the Elders that we conducted an assessment of tailings disposal methods and that the filtered tailings method has been designed for the Project rather than slurry tailings in Geona Creek. It was also re-iterated that the closure plan (as proposed) will ensure that traditional land use activities can resume in post closure.

Section 4.15.4.2 of the Project Proposal presents the alternatives assessment for Waste Storage Facility Locations. In this assessment alternative locations for the Class C Waste Storage Facility were assessed. One of the options was to locate this facility south of the open pit (in the area of south lakes).

This was the least preferred option as it would result in Project infrastructure outside of the Geona Creek watershed and one of BMC's design philosophies was to keep all Project infrastructure to within the one watershed and to minimize the project footprint to the extent practicable. This philosophy subsequently minimises the effects on traditional land use. Had this option been selected there would have been permanent loss of the South Lakes for traditional land use activities (i.e. fishing). It is noted that RRDC's Chief has on several occasions has indicated that the proposed Project is very close to the watershed divide and that maintaining water quality is important to RRDC citizens. He has asked that BMC ensure that water quality is not impacted south of the Project. This has further supported the proposed design of no infrastructure to the south of the open pit.

It is noted that the traditional Knowledge Study Conducted in 1995 (Rutherford, 1995) and the desk based Kaska Ethnography study (Appendix F-3 of the Project Proposal) identified the importance of other waterbodies in the region, including: Wolverine Lake, Francis Lake, Francis River, Hoole Canion along the Pelly River, Big Campbell Creek, Money Creek, Finlayson Lake, Finlayson River, Grass Lakes, Fire Lake These reginal waterbodies do not have the potential to be affected by the Project.

#### *2.5.1.3 Chapter 8 - Water Quality and Quantity Effects Assessments*

The previous section of this Response Report describes the design mitigation and/or avoidance measures that have been incorporated into the Proposed Project to minimize the potential effects on the traditional land use waterbodies. The following section describes how the potential effects to these traditional land use waterbodies were considered/assessed in Chapter 8 (Water Quality and Quantity Effects Assessments) of the Project Proposal. The summary of the assessment has been updated based on the updated model results (BMC, 2018b). Potential effects to these traditional land use waterbodies as it relates to fishing was already presented in this Response Report in Section 2.2.2.5.

Surface water quality and quantity was identified and selected as a VC for two reasons. Firstly, surface water is essential to maintain aquatic and biophysical environments, and secondly, surface water quality is of high value to Yukon residents, including the Kaska First Nation (Kaska) as represented by RRDC and LFN.

Discussions with local RRDC citizens indicated that surface water at Fault Creek is used as a drinking source and that headwater streams, including Geona Creek, hold an important value within their Traditional Territory (Chapter 2 of the Project Proposal).

Given the value of drinking water identified by RRDC through consultation and confirmed through desk-based research results (Appendix F-3 of the Project Proposal), comparisons of model estimated water quality with drinking water maximum acceptable concentration guidelines (Health Canada, 2014) were made, the comparisons were restricted to those monitoring points that are accessible to the general public during a given Project phase and are considered potentially potable:

- South Creek (KZ-13) and lower Finlayson Creek (KZ-26) at all phases of the Project; and

- Upper Finlayson Creek (KZ-15) at post-closure. since the Access Road is gated such that only site workers will have access to these locations during construction through transition closure. Potential access could be gained through the traditional trail; however, given the amount of times the trail crosses the Access Road, this is unlikely.

  Geona Greek was excluded from assessment as it is a low flowing creek that does not visually look potable.

It should be noted that Fault Creek where drinking water has been collected by RRDC is upstream of any proposed Project disturbances.

These locations are relevant and important to RRDC/LFN Kaska for a variety of social, sustenance, cultural, and ecological reasons, in particular:

- Finlayson Creek flows into the Finlayson River and Frances Lake, which are important fishing locations for RRDC and LFN citizens; and
- South Creek flows into North Lakes, which is a destination for RRDC/LFN Kaska fishing and hunting of caribou, moose, and sheep.

No constituents assessed were estimated to exceed Canadian drinking water guidelines in the publicly accessible lower Finlayson Creek (KZ-26) during the construction period.

Similarly, no constituents were estimated to exceed drinking water guidelines in South Creek during the construction period. The water quality in Fault Creek itself will not be affected by the Project and will continue to meet drinking water guidelines for the constituents assessed at all phases of the Project. It should be noted that the assessment does not consider bacteriological parameters such as coliforms, which are often naturally present in most surface waters and require treatment to be suitable for drinking.

No constituents modelled were estimated to exceed drinking water guidelines at the publicly accessible sites in South Creek (KZ-13) and lower Finlayson Creek (KZ-26) during the operations period.

No constituents were estimated to exhibit drinking water guideline exceedances at any of these locations at closure.

#### *2.5.1.4 Chapter 9 – Groundwater Quality and Flow*

The following section describes how the potential effects to the traditional land use waterbodies were considered/assessed in Chapter 9 (Groundwater Quality and Flow) of the Project Proposal.

Potential effects to groundwater quality have been raised by RRDC Elders as a concern as groundwater flows to surface water which could have effects on the surface water quality and aquatic life. Traditional land use waterbodies that have specifically been listed as a concern (with respect to impacted groundwater flowing into them) are Big Campbell Creek and the Liard River. Groundwater

in the Geona Creek valley does not have the potential to directly flow into these waterbodies (i.e., no Project interactions). However, the effects assessment did assess the potential for groundwater flow to surface water of Geona Creek, which ultimately flows to the Liard River (approximately 292 km down stream from the headwaters of Geona Creek).

Based on the screening of anticipated interactions between proposed Project activities and groundwater quality, the activities and potential effects can be grouped as follows:

1. Mine dewatering and use of explosives in open pit and underground workings;
2. Flooding of mine workings at closure and ABM lake formation;
3. Seepage from Class A and B Storage Facilities and associated Collection Ponds;
4. Seepage from Water Management Ponds;
5. Seepage from Waste Management Facility; and
6. Sewage and grey water effluent from camp.

Spills of fuel or other deleterious substances may have potential effects on groundwater quality and were addressed in Chapter 17 (Accidents and Malfunctions) of the Project Proposal.

1. Mine Dewatering and Use of Explosives

The proposed ABM open pit and underground workings are located at the valley floor in a natural groundwater discharge area with a shallow groundwater table, local artesian conditions in the deeper bedrock aquifer, and vertical upward hydraulic gradients. Both the open pit and underground workings will therefore require dewatering to allow mining of the ABM Deposit. The mine dewatering will result in a hydraulic depressurization of the surrounding rock mass and a lowering of the groundwater table (referred to as the cone of depression). The drawdown of the groundwater table will alter the flow regime within the area of influence with groundwater flowing radially toward the mine workings.

Prior to the initial mine development, overburden drainage will be conducted by excavating a series of trenches and sumps to the top of the fractured/weathered bedrock. The natural groundwater intercepted will be pumped into the Pit Rim Pond for sediment settlement and subsequently discharged to the receiving environment, providing that it meets the discharge requirements. If the water quality in the Pit Rim Pond does not meet the discharge requirements it will either be treated prior to discharge or pumped to the Operations Water Management Ponds for eventual discharge to Geona Creek, once the water quality meets the discharge requirements. The overburden dewatering is not expected to have any adverse effects on groundwater quality or the surface water quality of Geona Creek. There is no interaction between this activity and the surface water quality of South Lakes.

Dewatered water from the bedrock in the open pit area will be collected and pumped to the Pit Rim Pond for sediment settlement. Once TSS levels have reduced to approved levels, the water may then be conveyed to the Process Plant for use, to the Water Treatment Plant or to the Upper Water Management Pond prior to the release to the receiving environment. The activity of overburden

dewatering is not expected to have any adverse effects on groundwater quality and no significant adverse effects are predicted for the surface water quality of Geona Creek. There is no interaction between this activity and the surface water quality of South Lakes.

However, the quality of groundwater that is extracted during dewatering of the mine workings can potentially be affected by the following:

- Contact with explosive residues; and
- Contact with exposed rock.

This water will be conveyed to the Process Plant for use, to the Water Treatment Plant or to the Upper Water Management Pond prior to the release to the receiving environment depending on its quality. Since the water will meet the discharge requirements there will be no significant adverse effects on the surface water quality of Geona Creek. There is no interaction between this activity and the surface water quality of South Lakes.

2. Flooding of Mine Workings and ABM Lake Formation

At mine closure, the entrance to the underground workings will be plugged to prevent flow from occurring between the pit and the abandoned underground workings. The pre-mining diversion of Fault Creek will then be removed, allowing the creek to resume its natural flow path, north toward Geona Creek and to flow directly into the pit, accelerating the rate of filling of the pit void. Filling the open pit will create a pit lake referred to as ABM lake. Upon filling to capacity (elevation of 1,380 metres above sea level) ABM lake will spill directly into Geona Creek. Potential effects of the ABM lake on surface water quality are discussed in detail in Chapter 8 of the Project Proposal (Surface water) and updated water quality modelling has been presented in response to R3-1 (BMC, 2017a and BMC, 2018b, respectively). Both documents show no significant adverse effects to Geona Creek. There is no interaction between this activity and groundwater quality south of the ABM lake or the surface water quality of South Lakes, as the water will only spill towards the North.

The pathway of groundwater in the vicinity of the pit at closure was evaluated using a numerical flow model (the updated model is presented in response to R3-1 in Response Report #3B) (BMC, 2018b). The groundwater modelling shows that groundwater particles may travel up to approximately 1 km north before the upward groundwater gradients present throughout the valley resulting groundwater discharging into Geona Greek. No groundwater is predicted to flow south out of the pit. Potential effects of this groundwater flow to surface water is assessed in Chapter 8 of the Project Proposal (Surface water) and updated water quality modelling has been presented in response to R3-1 (BMC, 2017a and BMC, 2018b, respectively). Both documents show no significant adverse effects to Geona Creek. There is no interaction between this activity and groundwater quality south of the ABM lake or the surface water quality of South Lakes, as the groundwater will flow north.

3. Seepage from Class A and Class B Storage Facilities

Tailings and waste rock produced from the ABM Deposit will be segregated depending on their geochemical characteristics and potential to produce acid drainage and/or neutral metal leaching potential. Potential seepage from both Class A and Class B Storage Facilities has the potential for adverse effects on groundwater quality underneath and downgradient of these facilities. However, based on the designs of the liners and covers for these facilities and the fact that they will have lined drainage collection ponds, it is expected that any effects on groundwater quality due to seepage from these facilities is very unlikely. Despite this low likelihood, potential leakage of the Class A and Class B Storage Facilities or the associated drainage canals and collection ponds, the flow paths of potentially affected groundwater were evaluated using a numerical flow model (the updated model is presented in response to R3-1 in Response Report #3B) (BMC, 2018b). For clarity, given the very low likelihood for potential leakage, this model is hypothetical in nature only. The model shows flow of groundwater toward the Geona Creek drainage then either flows northward through the shallow alluvium or discharges directly to Geona Creek. Potential effects of such leakage of groundwater to Geona Creek is assessed in Chapter 8 of the Project Proposal (Surface water) and updated water quality modelling has been presented in response to R3-1 (BMC, 2017a and BMC, 2018b, respectively). Both documents show no significant adverse effects to Geona Creek. There is no interaction between this groundwater and the surface water of South Lakes, as the groundwater would flow into Geona Creek and then north.

Note that during operations potentially affected groundwater by leakage from the Class A and Class B Storage Facilities will be collected in the Water Collection Ponds at each facility and treated as necessary before it is discharged to the Water Management Ponds and eventually released into the receiving environment. Because the water will be treated to meet the discharge requirements no significant adverse impacts are predicted to Geona Creek or Finlayson Creek.

4. Seepage from Water Management Ponds

A two-stage Water Management Pond will be constructed in the Geona Creek valley with the Upper Water Management Pond being used for management of contact water and the Lower Water Management Pond for final settling and polishing before the water is discharged to the receiving environment.

The Upper Water Management Pond will store water that was in contact with Class B material and water from the dewatering of the mine workings (once it has settled in the Pit Rim Pond). It is expected that the water quality in the Upper Water Management Pond will undergo further settling prior to discharge into the Lower Water Management Pond. If required, water from the Upper Water Management Pond can be treated by the site water treatment plant prior to being discharged into the Lower Water Management Pond. Contact water from the Class A material will be treated in the on site water treatment plant and then discharged to the Lower Water Management Pond. It is expected

that the water quality in the Lower Water Management Pond will meet discharge criteria and therefore does not pose any potential risk for seepage from the Lower Water Management Pond to have adverse effects on groundwater downgradient of the pond.

To further eliminate or minimize the risk for seepage both Upper and Lower Water Management Ponds will be lined with an impermeable synthetic liner (HDPE).

In the case of liner leakage, seepage from the Upper Water Management Pond will have potential adverse effects on the shallow groundwater quality underneath and downgradient of the facility. However, based on the location of the Water Management Ponds, which are in a natural discharge area with upward hydraulic gradients, it is expected that seepage from the Upper Water Management Pond will surface near the toe of the dam below the pond and discharge to the Lower Water Management Pond, but not uncontrollably escape into the downgradient environment.

Based on this assessment, there are no residual effects to Geona Creek. There is no interaction between this groundwater and the surface water of South Lakes, as the groundwater flows north under these facilities.

5. Seepage from Waste Management Facility

The Waste Management Facility will be located between the Class A Storage Facility and the Process Plant and will contain all waste, recyclables and contaminated materials, excluding waste oil which will be stored in a tank at the Mine Workshop. The Waste Management Facility will also include an incinerator, a small Land Treatment Facility (LTF), and a small landfill area for non-hazardous waste.

Combustible refuse that can safely be burned in the incinerator will be burned daily. The incinerator ash will be disposed of in the Class A Storage Facility or used in the Paste Plant. All special waste will be collected and shipped off site to licensed recycle or disposal facilities, except for waste oil which will be burned in a suitable waste oil burner.

The main concern with respect to seepage from the Waste Management Facility and associated effects on groundwater quality is related to the LTF for remediation of contaminated soil and snow from possible spills. The LTF will be constructed and licensed in accordance with applicable regulations. Under the Yukon CSR all LTFs in Yukon must obtain an LTF Permit before construction of the facility begins. The regulations include requirements for the siting of the facility and suitable low permeability liner to minimize the risk of seepage from the LTF and to effectively protect the environment. These requirements include, but are not limited to:

- A land treatment facility cannot be constructed on any land where:
    - The slope is greater than 6 %;
    - The seasonal high-water table is less than 3 m below the surface;

- The Facility would be within 100 m of a surface waterbody; or
- The land is identified as being within a 25-year floodplain.

- An artificial impermeable liner must be installed beneath the remediation cells of an LTF unless the hydraulic conductivity of the native soils is less than $10^{-5}$ cm/s, and this layer of low permeability soil is a minimum of 1 m thick and continuous throughout the proposed LTF location. More stringent requirements exist for LTFs permitted to receive special waste.

Since the LTF proposed for the Project will meet or all regulatory requirements outlined above, the risk of any adverse effects on groundwater quality is considered negligible. Based on this assessment there are no residual effects to Geona Creek. There is no interaction between this groundwater and the surface water of South Lakes, as the groundwater flows into Geona Creek under this facility and the surface water then flow north.

6. Sewage and Grey Water Effluent from Camp

Sewage and grey water produced by the camp and Process Plant will be disposed of by on site sewage disposal systems, consisting of septic tanks and a soil absorption system. The construction and operation of sewage disposal systems is regulated in Yukon under the *Waters Act, Waters Regulation* and *Sewage Disposal Systems Regulation* to ensure both protection of the environment and proper function of the sewage disposal system. The design specifications for sewage disposal systems include requirements for setback distances of the sewage disposal system from surface waterbodies and drinking water wells. The system also has to be constructed so that it is a minimum of 1.2 m from the seasonal high groundwater table.

Since the sewage disposal system proposed for the Project will meet all regulatory requirements outlined above, the risk of any adverse effects on groundwater quality is considered negligible. Based on this assessment, there are no residual effects to Geona Creek. There is no interaction between this potential effect and the traditional land use waterbodies of Genoa Creek and South Lakes.

Summary

In summary, Chapter 6 of the Project Proposal and the Response Reports (listed above) assessed the potential effects to groundwater from the various Project activities. None of the potential effects to groundwater are predicted to cause significant adverse effects to the local traditional land use waterbodies (i.e. Geona Creek or South Lakes). Subsequently there will be no significant adverse effects to the traditional land use waterbodies downstream of Geona Creek and South Lakes.

#### *2.5.1.5 Chapter 16 – Effects of the Environment on the Project*

Chapter 16 of the Project Proposal provides an assessment of the potential effects of the environment on the Project (e.g., landslides, floods, extreme weather, earthquakes, predicted effects of climate change on Project components and activities). The consideration of potential effects of the

environment on the Project includes identification of environmental factors deemed to have reasonably possible consequences for the Project, and the mitigation measures currently implemented or planned to reduce or eliminate potential effects. The following provides a summary of those environment factors that could effect the Project, the result of which could subsequently effect the traditional land use waterbodies. The methods for the assessment are presented in Section 16.1 of the Project Proposal.

The environmental events which were considered to have a potential to affect the Project components and activities during all Project phases and could subsequently effect the traditional land use waterbodies are:

1. Site-specific terrain hazards (i.e., permafrost degradation, landslides, slope stability);
2. Seismic activity;
3. Extreme weather events (i.e., severe rainstorms and flooding, extreme snow and ice accumulation, high winds, extreme temperature); and
4. Climate change.

1. Site-specific terrain hazards (i.e., permafrost degradation, landslides, slope stability)

The potential effect on the Project as a result of terrain instability may affect Storage Facilities, water management facilities, roads and the ABM open pit. If major terrain instability effected the integrity of the water management ponds this could have adverse impacts to the traditional land use waterbodies (i.e. Geona and Finlayson Creeks). The terrain analysis (Section 16.2.1 of the Project Proposal and Appendix R2-H of Response Report #2) highlighted local geohazards at the site, signs of previous landslides in the area and provided permafrost mapping for the site. Debris slides have occurred, locally, on moderate natural slopes either side of Genoa Creek. Permafrost throughout the project area is discontinuous. Therefore, while there exists potential for localised terrain instability occurring within the Project Footprint, any such events are likely to be small in scale and localized, as design of Project components takes into account local geotechnical conditions and potential terrain instability. Stability assessment and geotechnical characterization were undertaken for Storage Facilities and Process Plant and included consideration of potential effects on these for slope stability and permafrost degradation (Appendices C-2, C-4, and C-6 of the Project Proposal). Additional mitigation measures are presented in Section 16.2.2 of the Project Proposal and in BMC's Response Report #2 (response to R2-77, R2-78, R2-79, and in Appendix R2-H) (BMC, 2017c). The severity of any such event is considered low, as no stoppage in Project activities is expected, and any damage is expected to be minor, temporary in nature and repairable. Subsequently, there are no predicted effects to the traditional land use waterbodies from terrain hazards at the site.

2. Seismic activity

The Project is located in the Yukon-Tanana Terrane approximately 30 km east of the Tintina Fault, which trends to the northwest and extends from BC to Alaska. The Tintina Fault is one of the most prominent physiographic and geologic features in Yukon (Yukon Government, 2015). The Project is located in an area of low seismic activity (Hyndman et al., 2005). Seismicity can trigger a variety of natural hazards: ground vibrations, large landslides, avalanches, liquefaction of saturated sediments, and surface rupture. If such events did occur over the project area this could result in instability of the Project infrastructure which in turn could impact the traditional use waterbodies (i.e. Geona, and Finlayson Creeks). A preliminary seismic hazard assessment was completed using the 2015 National Building Code Seismic Hazard Calculation (NRCC, 2015) for the Project location (Section 16.3.1 of the Project Proposal). The 2,475 year return period quake is the only one with potential to affect the Project, thus is the only event that is considered in this assessment. Using the binomial distribution, the probability of a 1 in 2,475 year seismic event being exceeded once in the 28 year Project life is 1%. Therefore, the likelihood of a 1 in 2,475 year seismic event is rated as unlikely.

Seismic activity for the Project area is incorporated into the design of major infrastructure components such as the Storage Facilities, Operations Water Management Ponds, water treatment plant, power facilities, and Process Plant Facility. The Project has been designed to ensure that components and activities will perform at earthquake exposure up to the expectations and in compliance with current standards in Canada. Procedures and protocols to be followed in the unlikely event of an earthquake will be in accordance with general emergency response procedures, which will be developed as part of the Health, Safety and Emergency Response Plan (conceptual plan details provided in Section 18.15 of the Project Proposal).

All buildings on site will be designed according to the National Building Code of Canada (NRCC, 2015). The National Building Code of Canada incorporates technical requirements to ensure that buildings are protected against earthquakes based on local seismic conditions. The code generally applies to buildings and not geotechnical structures (e.g., dams). The two dams associated with the Operations Water Management Ponds will be constructed in accordance with the Canadian Dam Association's Dam Safety Guidelines. The Storage Facilities are designed using the 1 in 2,475 year earthquake event and have a factor of safety above 1 for seismic conditions.

Should an event exceeding design specifications occur, damage to Project infrastructure may occur. The severity of such an event is expected to be moderate as a minor stoppage in Project activities may be expected and substantial damage to infrastructure may occur.

The severity of seismic events with return period of less than 1 in 2,475 years is rated as negligible as no adverse effects to the Project or Project timing are anticipated due to these earthquakes.

The Project design specifications have considered the potential for seismicity to affect the Project and given that the likelihood of an event larger than design specifications is rated as unlikely the potential effects of the seismic activity on the Project is considered to be not significant. Therefore, it

is even more unlikely that there would effects to the traditional land use waterbodies from seismic events that effect Project infrastructure.

3. Extreme weather events (i.e., severe rainstorms and flooding, extreme snow and ice accumulation, high winds, extreme temperature)

Globally and locally, there has been an increase in the incidence of extreme weather conditions, a trend that most climate models predict will continue in association with ongoing climate change (additional details are provided in Section 16.6 of the Project Proposal). Extreme weather conditions and weather events which could potentially affect the Project include severe rain and flooding, extreme snow and ice accumulations, wind, and extreme temperatures. Effects to the Project infrastructure from such events could subsequently impact the Traditional land use waterbodies (i.e. Geona Creek, Finlayson Creek and Fault Creek).

Design of water management features allows for rainfall events of 1 in 10 year to 1 in 200 year depending on the infrastructure function and location. In addition, the Overburden Stockpile Collection Pond and Class A, B, and C Storage Facility Collection Ponds are sized to manage freshet inflow volumes. Diversions around the Project will help manage surface water runoff by diverting it to streams.

Stream channels at road crossings will be through culverts. Road closures would be minimal for extreme events only and would be temporary with traffic resuming when the water level lowers and structural checks of the road and crossings have been made. Further to the above mitigation measures, weather forecasts will be monitored to anticipate large rainfall events and make necessary preparations and changes to operations to minimize effects of extreme weather events on the Project, as necessary (e.g., reduce activities, minimize traffic).

Infrastructure on site will be constructed to withstand periods of heavy snowfall and snow can be shovelled off roofs after heavy snowfalls if needed to prevent roof damage from excessive loads. To maintain safe working conditions excessive snow will be removed where needed (blast areas, active areas of storage facilities, stockpiles).

Mitigation and response to extreme weather events will follow the Sediment and Erosion Plan, Surface Water Management Plan, and Health, Safety and Emergency Response Plan (conceptual management plans are provided in Chapter 18).

Severe Rainstorms and Flooding

The design return period for the Project's water management infrastructure is show in Table 2-17. The probability of the exceedance of the design return period event and correlating likelihood is also shown in Table 2-17.

**Table 2-17: Likelihood of Flooding from Infrastructure**

| Design Return Period | Infrastructure | Probability of Exceedance in 28 Years | Likelihood |
|---|---|---|---|
| 1 in 10 year | Class C Storage Facility and Overburden Stockpile Collection Ponds | 95% | Very Likely |
| 1 in 100 year | Open Pit Dewatering Surface Water Inflow | 25% | Likely |
| 1 in 200 year | Class A, and B Storage Facility Collection Ponds, Upper and Lower Management Ponds | 13% | Likely |

Although the likelihood of the 1 in 10 year event is very likely the only infrastructure such event is likely to affect is Class C Storage Facility and Overburden Stockpile Collection Ponds. As the water quality in these ponds is not expected to be of concern therefore consequence of these ponds releasing excess water after shorter settling time is not likely to affect other Project activities and their timing. No Project activity stoppage is expected; therefore, the severity of this event is considered to be negligible. In addition, no adverse impacts are expected in the traditional land use waterbodies that receive this water.

The likelihood of 1 in 100 year event is assessed as likely as probability over Project life is 25%. The 1 in 100 year event may cause minor stoppage in Project activity if the pit dewatering system is affected. Therefore, the severity of this event is considered to be moderate. However, this event would not impact the traditional land use waterbodies.

The likelihood of 1 in 200 year event is assessed as likely as the probability over the Project life is 13%. The 1 in 200 year event is likely to affect Project's water management infrastructure and cause localized flooding. Minor stoppage in Project activities is expected as a result of this event (i.e., less than a month) and some damage to infrastructure may occur as a result of the flooding. Therefore, the severity of this event is considered to be moderate. During such an extreme event, it is unlikely that RRDC or LFN would be using the traditional use waterbodies for fishing or drinking water purposes due to the turbidity in the waterbodies, this would not be a result of the Project.

Additional information is provided in BMC's response to R2-122 and R2-123 (BMC, 2017c).

Given that the severity of the potential effects is not expected to exceed moderate as a result of severe rainstorm and flooding events, these are not considered to have significant effects on the Project. In addition, no significant adverse impacts are predicted in the traditional land use waterbodies.

### Extreme Snow and Ice Accumulations

Given the local climate, it is considered likely that extreme snowfall events that could impede the movement of equipment and activities on the mine site occur during the life of the Project. Access to the mine site could become limited as well due to snowfall amounts and/or poor visibility due to blizzard conditions. The severity of such events is considered to be low as only minor effect on Project timing are expected, with Project activities returning to normal shortly following the event. These events are not expected to be severe enough to cause substantial damage to Project infrastructure, as Project design accounts for local climate. Therefore, the extreme snow events are not considered to have a significant effect on the Project. Subsequently, no adverse impacts are predicted in the traditional land use waterbodies.

Wind

High winds have been recorded on site during baseline data collection and therefore, it is considered likely that high wind events may occur during the life of the Project. However, it is not expected that major infrastructure damage occurs during these events. The severity of these events is considered negligible as only negligible damage to minor structures would occur. Therefore, the extreme wind events are not considered to have a significant effect on the Project. Subsequently, no adverse impacts are predicted in the traditional land use waterbodies.

Extreme Temperature

Extreme high temperatures are not expected on site. Extreme low temperatures may occur and considered to be likely during the life of the Project. These events could affect Project activities and their timing, with minor Project activity stoppage expected. The Project design specifications and scheduling have considered potential extreme temperature events. Therefore, no significant effects to the Project or Project timing are anticipated as a result of extreme weather events that are likely to occur during the life of the Project. Subsequently, no adverse impacts are predicted in the traditional land use waterbodies.

4. Climate Change

Example effects of climate change that have the potential to affect the Project include:

- Melting of permafrost potentially resulting instability in infrastructure;
- Increased forest fire risk due to increased temperatures, changes in precipitation, and increased thunderstorms;
- Increased extreme weather events (snow, rain, wind) potentially affecting Project infrastructure; and
- Changes to hydrological flow regimes in watercourses around the Project area affecting water conveyance and storage systems or surrounding infrastructure.

Predicted increases in mean annual temperature or mean annual precipitation are presented in Section 16.6.1 of the Project Proposal and are not expected to have major direct effects on the Project. Mitigations for indirect effects are discussed below.

Project design and contingency measures to address extreme weather events are described above. Potential changes in hydrologic response or patterns were also integrated in the Project design with return period analysis of flood and low flows. Depending on the Project feature, design accommodates a 1 in 10 to a 1 in 200 year 24-hour flood event. Additional information is provided in BMC's response to R2-122 and R2-123 (BMC, 2017c).

Potential permafrost degradation that could result from climate change and associated terrain hazards were also considered in the Project design and proposed mitigation measures. Additional mitigation measures are presented in Section 16.2.2 of the Project Proposal and in BMC's Response Report #2 (response to R2-77, R2-78, R2-79, and in Appendix R2-H).

The likelihood of climate change occurring is overall likely; however, changes will occur over the long term and the magnitude of changes likely to occur over the Project's life is small. The severity of potential effects is negligible given the short Project life and the fact that the Project specifications have considered the potential for climate change to affect the Project directly or indirectly. Therefore, no significant adverse effects to the Project or Project timing are anticipated due to climate change. Subsequently, no adverse impacts are predicted in the traditional land use waterbodies as a result of the Project.

#### *2.5.1.6 Chapter 17 – Accidents and Malfunctions*

The following section describes how the potential effects to the traditional land use waterbodies were considered/assessed in Chapter 17 (Accidents and Malfunctions) of the Project Proposal.

Table 17-3 of the Project Proposal identifies the VC's with potential interactions from Accidents and Malfunctions. For the purposes of this Response Report, this table has been modified (Table 2-18) to only show the accidents or malfunctions that interact with the Surface Water VC. For clarity the traditional land use waterbodies have also been added to the table along with the potential interaction.

**Table 2-18: Surface Water VC and Traditional Land Use Waterbody with Potential Interaction from Accidents and Malfunctions**

| Assessment Scenarios | | Valued Component | Traditional Land Use Waterbody | | | |
|---|---|---|---|---|---|---|
| *Malfunctions* | *Scenario* | *Surface Water* | *Geona Creek* | *Finlayson Creek* | *Fault Creek* | *South Creek, South Lakes, North Lakes* |
| Open pit mining | Slope failure | | | | | |

| Assessment Scenarios | | Valued Component | Traditional Land Use Waterbody | | | |
|---|---|---|---|---|---|---|
| | Dewatering system failure | | | | | |
| | Reclamation measures failure | x | x | x | | |
| Underground mining | Underground stope failure | | | | | |
| | Underground dewatering system failure | | | | | |
| Storage facilities (Class A, B, C and Overburden) | Failure of water collection systems (discussed in Water Management malfunctions below) | x | x | x | | |
| | Slope failure | x | x | x | | |
| | Erosion control failure | x | x | x | x | x |
| | Reclamation measures failure | x | x | x | | |
| Process Plant Facility | Mechanical equipment failure | | | | | |
| | Pipes and pumps failure | | | | | |
| Water Management | Embankment or spillway failure of Operations Water Management Ponds | x | x | x | | |
| | Clean water diversion (including Fault Creek) failure | x | x | x | x | x |
| | Sediment and erosion control measures failure | x | x | x | x | x |
| | Storage facility water collection systems failure | x | x | x | | |
| | Water treatment plant failure | x | x | x | | |
| Power Generation Facility | Power outage | x | x | x | | |
| Accidents | Spill or leak during transport | x | | x | | |
| | Spill or leak during site transport and storage | x | x | | | |
| | Project-related fire | | | | | |

| Assessment Scenarios | | Valued Component | Traditional Land Use Waterbody | | | |
|---|---|---|---|---|---|---|
| ***Unplanned Closure*** | | | | | | |
| Temporary closure | | x | x | x | | |
| Early permanent closure | | x | x | x | | |

The following summarizes the effects analysis and risk level determination for each of the potential interactions listed in Table 2-18. The methods for this assessment are presented in 17.1 of the Project Proposal. The mitigation measures that will be used by BMC throughout the life of the Project are described in the management plans (Chapter 18 of the Project Proposal). The relevant environmental management plans, emergency responses, and design considerations to minimize risk are identified within the accidents and malfunctions assessed below. If the initial assessment identifies a risk rating of high or unacceptable then additional mitigation measures are required and introduced to lower the risk rating to moderate or low.

## Malfunctions Assessment

### Open Pit Mining - Reclamation Measures Failure

Detail regarding reclamation measures is provided in Section 4.13 and Appendix H-1 of the Project Proposal. During closure phase, the ABM open pit will be allowed to flood as dewatering will cease and the Fault Creek diversion will be removed with flow re-directed to the ABM open pit. The open pit and surrounding areas will undergo reclamation to the extent of ensuring that the pit walls are stable and pose no danger to the general public or local wildlife. Berms will be created around highwall edges to prevent access by people or wildlife. Batch treatment of the ABM lake will consist of addition of lime during the initial filling of the pit to address flushing of secondary mineralization related metal concentrations.

Water quality monitoring of the ABM lake will be used to evaluate pit chemistry and ensure that the concentrations of constituents which are expected to respond to lime treatment (e.g., zinc, cadmium, copper, lead, arsenic) are minimized.

An engineered spillway will be constructed to control outflow from the ABM lake. The wetland treatment system within Geona Creek downstream of the pit will provide both a contingency treatment for those constituents that may not be efficiently ameliorated by ABM lake lime addition (e.g., selenium, uranium, antimony) and a secondary polishing step for other constituents of potential interest (e.g., zinc, lead, cadmium, copper, and arsenic).

Given that the water treatment may be adjusted through the ongoing monitoring for water quality, the failure of reclamation measures is considered to be unlikely. As any water released will be contained prior to discharge to receiving environment, the consequence is considered to be very low.

The risk assessment for open pit reclamation measures failure identified a likelihood of unlikely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect on the surface water VC (including the traditional land use waterbodies of Geona Creek and Finlayson Creek) is considered not significant.

No additional mitigation measures are warranted, given the low risk rating.

### Storage Facilities

Storage facilities and stockpiles include:

- Class A, B, and C Storage Facilities;
- Overburden Stockpile; and
- Topsoil Stockpiles.

The Class A Waste Storage Facility is designed to contain tailings and Class A waste rock. Class A material will be acid generating and metal leaching in the near term and therefore requires encapsulation to limit contact with oxygen and water. The Class B contains waste rock with potential acid generation and metal leaching over the longer term (after cessation of mining activities) and requires encapsulation to limit contact with oxygen and water. The Class C material will not be acid generating and could even be acid consuming, and have low metal leaching potential.

Overburden from the open pit will be excavated and used for construction materials, excess overburden will be stockpiled and stored on the eastern side of the valley. Topsoil will be stripped from the Overburden Stockpile, Class A, B, and C Waste Storage Facilities and the ABM open pit footprint areas during construction.

Potential malfunctions assessed for storage facilities and stockpiles are:

1. Slope failure;
2. Erosion control failure; and
3. Reclamation measures failure.

Water collection system malfunctions associated with these facilities and stockpiles are discussed under water management in Section 17.2.5 of the Project Proposal and is summarized in the "Water Management" section below.

#### 1. Slope Failure (Class A, B and C Facilities)

The main concern with release of mine rock or tailings from the contained area is the potential for metal leaching and acid rock drainage affected runoff from the Class A, Class B Facilities. Metal leaching and acid rock drainage from the C Facility is not predicted, but a slope failure of this facility could cause increased turbidity in the receiving environment. The increased loadings (metals or

particulates) could affect water quality and aquatic life in the traditional land use waterbodies of Geona Creek and Finlayson Creek. Environmental effects from ditch or pond failure are discussed in Section 0 of the Project Proposal and is summarized in the "Water Management" section below.

The design considerations to minimize the likelihood of slope failure for the Class A Facility is a Factor of Safety (FOS) of 1.5 static and 1 seismic condition with a slope of 4H:1V. Class A Storage Facility stability assessment is provided in Appendix C-4 of the Project Proposal. For the Class B and C Facilities, the design considerations included the FOS of above 1.5 for static conditions and above 1.1 for seismic conditions with a slope of 3H:1V. Class B and C Storage Facilities, and Overburden Stockpile stability assessment is provided in Appendix C-6 of the Project Proposal.

The Investigation and Design Manual Interim Guidelines (BC MWRPRC, 1991) provides recommendations for stability assessment of mine waste piles. These guidelines include a Dump Stability Rating (DSR) scheme. The DSR system provides a semi-quantitative method for assessing the relative potential of pile stability and recommends the appropriate level of pile investigation and design. Each facility was determined to have a moderate failure hazard level. A follow up stability analysis was completed using SLOPE/W (GEO-SLOPE, 2012), a limit equilibrium modelling program. A FOS of 1.5 was targeted for static conditions, and above 1 for seismic conditions was met by each facility under both static and seismic conditions (Appendices C-4 and C-6 of the Project Proposal).

Permafrost is not ubiquitous throughout the Project area and was primarily observed in the northern boundaries of the Class C Facility. Shallow flow slope failure and slope creep caused by permafrost are not anticipated beneath the Class A Storage Facility, Class B Storage Facility, Class C Storage Facility, and Overburden Stockpiles for the following reasons:

- Modelling of Permafrost in the Project area indicates permafrost is limited in coverage, occurring within the Overburden Stockpile, northern portions of the Class B and C Storage Facilities and the north west border of the A Facility (Appendix R2-1 of Response Report #2) (BMC, 2017c);
- The Class C Storage Facility is placed in a confined valley with a shallow basin grade, thus limiting the potential for movement; and
- The piles and stockpile foundations typically consist of sand and gravel soils with some silt. These soils are expected to consolidate at the same rate as thawing occurs, therefore exhibiting an effective shear strength similar to unfrozen soils during any thawing. Additionally, the stability model conservatively assumes fully saturated conditions for the foundation materials, which accounts for any buildup of fluid within the soil pores during thawing.

The Class A Facility will have a Class C material buttress and will be constructed for confinement at the downstream slope of the Class A Facility which improves the overall FOS of the facility. The buttress will be constructed with a 2.5H:1V upstream slope and 3H:1V downstream slope. Tailings and Class A material will be placed and compacted in controlled lifts within the facility.

General operations considerations are as follows:

- Rock fill and overburden materials will be transported from the pit using haul trucks. The material may be end dumped over the face or dumped short of the crest and pushed/spread by dozers over the crest of the storage facilities;
- Trial sections may be constructed in the field during the initial stages of development to monitor rock fill pile stability and foundation performance. The various rock fill materials may be sampled for characterization and for durability test work to confirm the design parameters; and
- Rock fill material shall be end dumped over the crest to allow for maximum segregation of the coarser material at the base of each bench. For overburden materials, end dumping short of the crest and dozing over may be required.

Geotechnical inspections will be undertaken by an engineer licensed to practice in Yukon on an annual basis during operations for all storage facilities and water management infrastructure (Section 11.6 of the Project Proposal). Physical inspections of all storage facilities and water management infrastructure will be conducted on a monthly basis during operations by site personnel.

Given the above considerations the slope failure for storage facilities is considered to have an unlikely likelihood rating.

If the slope failure is contained within the footprint of the storage facility, the consequences of this event are considered to be very low as no additional effects (to those already identified for the Project) are expected for any of the VCs (including the traditional land use waterbody of Geona Creek). If the slope failure causes the waste material to travel downslope of the facility footprint, additional effects may be expected. The effects would be limited to the Project area, as any slope failure for any of the storage facilities would not be expected to result in materials travelling down the valley beyond the Operations Water Management Ponds during operations. Short term effects may be expected on the water quality of the Water Management Ponds as the potential slope failure may affect the water collection system and ponds. However, the discharge to the receiving environment is not expected to be affected as discharge from the ponds would not occur until the water in the ponds met the discharge requirements. As the effects are expected to be limited in extent and short term, the consequence of the event is considered to be low.

The risk assessment for slope failure for storage facilities identified a likelihood of unlikely and a consequence of very low to low, resulting in a risk rating of low to moderate for the slope failure event that may extend beyond the footprint of the storage facility (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the traditional land use waterbodies of Geona Creek (down gradient of the discharge location) and Finlayson Creek would also not experience significant adverse effects from a slope failure.

No additional mitigation measures are warranted, given the moderate risk rating.

**1. Slope Failure (Overburden and Topsoil Stockpiles)**

Similar to the storage facilities, failure of the Overburden and Topsoil Stockpile slopes could be due to a pre-shearing event or major failure event. The Overburden Stockpile was modelled to have a 2.2H:1V slope. The stability analyses meet or exceed the target FOS of 1.5 for static and 1.1 for seismic conditions (Appendix C-6 of the Project Proposal).

Topsoil stockpiles will be placed in localized stockpiles and windrows around site. Material will be placed and contoured to a 4H:1V slope. The stockpile surfaces will be revegetated during operations to stabilize the slope surfaces and control erosion from runoff.

Geotechnical inspections will be undertaken by an engineer licensed to practice in the Yukon on an annual basis during operations for all storage facilities and water management infrastructure (Section 11.6 of the Project Proposal). Physical inspections of all storage facilities and water management infrastructure will be conducted on a monthly basis during operations by site personnel.

Given the above considerations the slope failure for overburden and topsoil stockpiles is considered to have an unlikely likelihood rating.

Overburden material is non-acid generating and therefore environmental effects due to chemical loading from a slope failure are of lesser concern. Physical blockage of ditching; however, would need to be repaired as it could increase the sediment load. Any failure of the Overburden Stockpile will be contained within the Project Footprint. If a failure were to occur the stockpile would be re-contoured in place after the failure area has been secured. Any damage to drainage ditches would be repaired. To reduce the potential for sediment loads to enter the environment, the water from the runoff collection ditches reports to the Overburden Stockpile Collection Pond to allow sediment to settle. In an event of a major slope failure for the Overburden Stockpile potential increased sediment loads may be expected in the short term. As the effects are expected to be limited in extent and short term, the consequence of the event is considered to be very low.

The risk assessment for slope failure for Overburden and Topsoil Stockpiles identified a likelihood of unlikely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the traditional land use waterbodies of Geona Creek (down gradient of the overburden and topsoil stockpiles) and Finlayson Creek would also not experience significant adverse effects from a slope failure.

No additional mitigation measures are warranted, given the low risk rating.

### 2. Erosion Control Failure

Diversion and collection ditches are utilized to prevent erosion of the storage facilities and Overburden Stockpile. Surface runoff will be routed to Water Collection Ponds via appropriate grading and collection ditches to reduce sediment load to the environment.

The Class A Storage facility will be constructed at an overall slope of 4H:1V and will be progressively reclaimed with synthetic cover, and approximately three of Class C material for frost protection. Topsoil will be spread and the facility will be revegetated to mimic the current site conditions. The cover, frost protection, and revegetation efforts will protect and reduce the potential for erosion of the cover. For water that does make it through the cover, the risk of chemical loading to the environment is controlled by the collection of the seepage by using sumps to collect the water and subsequently treating the water at the Water Treatment Plant before discharge.

The Class B Storage Facility, similar to Class A Storage Facility, will be progressively reclaimed will also have a synthetic cover, frost protection and topsoil for vegetation. The frost protection and topsoil will reduce erosion of the facility and potential for chemical loading to the environment. Runoff from the Class B Facility is collected in the Class B Water Collection Pond and routed to either the Water Treatment Plant or the Upper Operations Water Management Pond. A seepage collection system will collect any water that does make it through the cover.

The Class C Storage Facility will have a slope of 3H:1V to help reduce erosion risks. Failure of erosion measures on the slope will be recovered by Class C Water Collection Pond.

The Overburden Stockpile will be constructed at an overall slope of 2.2H:1V for long-term physical stability. Failure of erosion measures on the slope will be recovered by Overburden Stockpile Collection Pond. Erosion measures for the Topsoil Stockpiles include a 4H:1V slope and revegetation during operations.

The potential failure of erosion control systems is managed through the mitigation measures outlined in the Sediment and Erosion Control Plan (Section 18.6 of the Project Proposal). Any potential need for changes to the sediment and erosion control for the Project will be monitored through the Adaptive Management Plan developed during the permitting process. Based on the above design features, and mitigation and monitoring in place for the Project, the likelihood of erosion control failure is considered to be unlikely.

Potential effects to the environment as a result of the erosion control failure include increased sediment load in the surface water and potential effects in the downstream aquatic resources and habitats. However, considering a number of mitigations and monitoring in place, including collection ponds, it is not expected that the potential effects of erosion control failure extends downstream beyond the Project area. The consequence is therefore considered to be very low.

The risk assessment for erosion control failure identified a likelihood of unlikely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek, Finlayson Creek, Fault Creek and South Lakes) are also not predicted to be significant from a slope failure.

No additional mitigation measures are warranted, given the low risk rating.

### 3. Reclamation Measures Failure

The conceptual Reclamation and Closure Plan has been developed that outlines reclamation measures for each of the Storage Facilities (see Section 4.13 and Appendix H-1 of the Project Proposal). The likelihood that some components of reclamation measures may fail and need adjustment through the life of the Project is considered to be likely.

Progressive reclamation will be undertaken progressively for Class A, B and C Facilities throughout operations through installation of a cover. Reclamation progress will be monitored and based on the early outcomes of the reclamation, subsequent reclamation planning may be adjusted if any of the elements are failing to perform. Given that reclamation measures may be adjusted through the operations phase and will be monitored and adjusted through the active closure phased, the consequence of reclamation measures failure is considered to be very low.

The risk assessment for reclamation measures failure identified a likelihood of likely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek and Finlayson Creek) are also predicted to be not significant from a reclamation failure.

No additional mitigation measures are warranted, given the low risk rating.

## Site Water Management

As described in Section 4.10 of the Project Proposal, BMC has designed the water management systems and associated facilities for the Project with the following objectives:

- Keep clean water clean; and
- Re-use water on site, were ever practicable, to reduce the volume required for discharge.

Water management will include: water collection; conveyance; storage; treatment; and release. Runoff will be controlled to minimize erosion in areas disturbed by construction activities and to prevent the release of sediment laden water to the receiving environment. This includes the collection and diversion of surface water runoff, and sediment and water collection ponds and pumping systems.

Potential malfunctions assessed for site water management are:

1. Embankment or spillway failure of Operations Water Management Ponds;
2. Clean water diversion (including Fault Creek) failure;
3. Sediment and erosion control measures failure;
4. Storage facility water collection systems failure; and
5. Water treatment system failure.

### 1. Embankment or Spillway Failure of Operations Water Management Ponds

The Upper Operations Water Management Pond will temporarily store site runoff water from areas surrounding the Process Plant Facility, and the east side of Geona Creek including runoff from the Overburden Stockpile and Class C Facility that is unsuccessfully diverted around site. Settling of sediment and metals will occur in a sump(s) prior to being pumped into the Upper Operations Water Management Pond and the water will be decanted to the larger Lower Operations Water Management Pond where it will be stored for use as reclaim water for the Process Plant Facility or discharged to the environment. The Operations Water Management Ponds will be constructed with geosynthetic liners, which can improve bank stability. The Operations Water Management Ponds have a design threshold of 1 in 200-year 24-hour storm event and 1 m design freeboard. The embankments for the ponds will be built with 2.5H:1V upstream and downstream slopes, with upstream slope lined with geomembrane liner (Section 4.10 of the Project Proposal).

The discharge from the Lower Operations Water Management Pond will either be directly to Geona Creek or piped to Finlayson Creek. Water will be discharged year-round to Geona Creek at a minimum 3:1 ratio (receiving water: effluent) and piped to Finlayson Creek also at a minimum 2:1 ratio (receiving water: effluent).

Geotechnical inspections will be undertaken by an engineer licensed to practice in Yukon on an annual basis during operations for all water management infrastructure. Physical inspections of all water management infrastructure will be conducted on a monthly basis during operations by site personnel.

Considering the design parameters and planned inspections, the likelihood of embankment or spillway failure of Operations Water Management Ponds is considered to be very unlikely.

Embankment or spillway failure of the Upper Operations Water Management Pond would result in uncontrolled discharge to the Lower Operations Water Management Pond. The Lower Operations Water Management Pond has a design threshold of 1 in 200-year 24-hour storm event and 1 m design freeboard, which are likely to contain additional inflow from the Upper Operations Water Management Pond. In an event of embankment or spillway failure of the Lower Operations Water Management Pond, uncontrolled discharge to Geona Creek would occur. As Operations Water Management Ponds are primarily used for additional sediment control and discharge rate control, there are no chemical load concerns in the event of a discharge as a result of a failure (see Section 4.10 of the Project Proposal for more information on Project water management). The potential effect of discharge from Lower Operations Water Management Pond could result in a temporary increase in flow and potential erosion of aquatic habitat in Geona Creek and potential downstream effects to Finlayson Creek. These effects are likely to extend beyond the Project area; however, they are reversible during the life of the Project. Therefore, the consequence is considered to be medium (as per Table 2-20).

The risk assessment for embankment or spillway failure of the Operations Water Management Ponds identified a likelihood of very unlikely and a consequence of medium, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek and Finlayson Creek) are also predicted to be not significant from an embankment or spillway failure of the Operations Water Management Ponds.

No additional mitigation measures are warranted, given the low risk rating.

### 2. Clean Water Diversion (including Fault Creek) Failure

Diverting clean water around the Project is one of the main objectives of the water management strategy. Reducing the volume of contact water requiring management and treatment is critical to the success of the water management strategy for the Project. The Project includes three major diversions:

- The Fault Creek and associated southern diversions temporarily re-routes water that would otherwise flow into the ABM open pit and diverts it to South Creek during operations;
- The northwestern diversion routes water above the Class A Storage Facility, Process Plant and the Class B Storage Facility past the Operations Water Management Ponds into Geona Creek.; and

- The northeastern diversion routes water from above and the runoff from the Class C Storage Facility and Overburden Stockpile, which is directed into Geona Creek below the Lower Operations Water Management Pond.

The water balance has assumed the diversions have a nominal 50% efficiency rating other than the Fault Creek diversion which has assumed a nominal 100% efficiency rating (as it will be lined with an HDPE geomembrane). Air photo interpretation suggests that in recent geologic times, Fault Creek has flowed to the south via a paleochannel, located where the temporary diversion would be developed. All diversion ditches will be designed to manage a 1 in 200-year flood event. Further detail on diversion design parameters is provided in Section 4.10.1.1 of the Project Proposal.

Geotechnical inspections will be undertaken by an engineer licensed to practice in Yukon on an annual basis during operations for all water management infrastructure. Physical inspections of all water management infrastructure will be conducted on a monthly basis during operations by site personnel.

Considering the design parameters and planned inspections, the likelihood of clean water diversion failure below the efficiency ratings indicated above is considered to be very unlikely.

In the event of Fault Creek diversion failure, water will enter the pit where it will be collected via in-pit dewatering system and pumped to the Pit Rim pond. In the event of northwestern or northeastern diversion failure, water will be collected via Storage Facilities and stockpiles water collection systems and will be handled within those runoff streams. Collected water will be treated before release, if required. As indicated above, the water management system is designed to retain major storm events and would be able to accommodate short term water influx resulting from diversion failure until it is repaired. As no release of impacted water from the Project area is expected, the consequence of this failure is expected to be low.

The risk assessment for clean water diversion failure identified a likelihood of very unlikely and a consequence of low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek, Finlayson Creek, Fault Creek and South Lakes) are also not predicted to be significant from a clean water diversion failure.

No additional mitigation measures are warranted, given the low risk rating.

### 3. Sediment and Erosion Control Measures Failure

A conceptual Sediment and Erosion Control Plan is provided in Section 18.6 of the Project Proposal. The primary approaches to mitigate the introduction of sediment into downstream environments will include:

- Minimizing the generation of sediment at the source;
- Minimizing the volume of contact runoff capable of transporting the constituents of potential concern; and
- Collecting and treating the contact runoff as required, thus meeting downstream water quality requirements.

All water collection and conveyance systems (e.g., ditches, sumps, pumps, pipes, and flumes) will be designed by hydrotechnical engineers on the BMC design team. These systems will be designed to convey the necessary water flow and resist erosion under design inflow conditions.

Sediment ponds will also be designed by hydrotechnical engineers and these sediment ponds will be:

- Designed to trap sediment particles of 10 microns in size or larger with flow volumes equivalent to a 1 in 200-year, 24-hour rainstorm;
- Maintained by periodically removing accumulated sediment to ensure they have adequate capacity to function properly during a 1 in 200-year, 24-hour rainstorm; and
- Tested for suspended sediment concentrations in the effluent and managed further if required.

Water diversion berms or ditches will be constructed upslope of disturbed working areas, as appropriate, to reduce contact runoff water, as well as to reduce erosion and sediment transport.

Any potential need for changes to the sediment and erosion control for the Project will be monitored through the Adaptive Management Plan developed during the permitting process. The above design features, and mitigation and monitoring in place for the Project, will ensure that the failure of any sediment and erosion control mitigation is caught early; however, conservatively the likelihood of sediment and erosion control failure is considered to be likely.

In the event of potential failure of these measures, higher loads of sediment would be introduced to the system; however, with the water management infrastructure in place, it is not expected that additional sediment loads would be released to the environment. The consequence is considered to be very low.

The risk assessment for sediment and erosion control failure identified a likelihood of likely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies

of Geona Creek, Finlayson Creek, Fault Creek and South Lakes) are also not predicted to be significant from a sediment and erosion control failure.

No additional mitigation measures are warranted, given the low risk rating.

### 4. Storage Facility Seepage Collection Systems Failure

Both the Class A and B Storage Facilities will have a basin liner and closure cover consisting of a composite liner constructed of a high-density polyethylene (HDPE) geomembrane and a compacted glacial till layer. No liner is required for the Class C Storage Facility and Overburden Stockpile as the seepage water quality is predicted to meet the water quality objectives.

The Class A and B Storage Facility Ponds have been sized to manage a 1 in 200-year, 24-hour storm event (including a 1 m freeboard allowance) and the projected freshet inflow. Water collected from the Class A Storage Facility Collection Pond will be directed to the Water Treatment Plant which will be located at the Process Plant Facility. The treated water will be directed to the Lower Operations Water Management Pond. The Class B pond water will be pumped to the Water Treatment Plant, for treatment if required, or to the Upper Operations Water Management Pond for re-use or discharge to the receiving environment.

The Overburden Stockpile and Class C Storage Facility Collection Ponds will be constructed with a compacted glacial till (low permeability) liner. The ponds have been designed to provide a 30-day storage period from seepage and surface runoff for the 1 in 10-year, 24-hour storm event (including a 1 m freeboard allowance) and the projected freshet inflow. Flow from the ponds will be conveyed downstream of the Lower Operations Water Management Pond and discharged into Geona Creek, as it is predicted to meet the water quality objectives for Geona Creek and not require treatment.

Groundwater will be monitored in wells situated downstream of the Class A, Class B, and Class C Collection Pond and the Water Management Ponds (Sections 18.4.3.7 of the Project Proposal). On-going water quality monitoring will assess the effectiveness of the water collection systems. In the event that the water collection systems are found to not effectively recover seepage, it will be necessary to install additional seepage control provisions.

Due to the combination of ground water monitoring, liner construction, and design parameters for the Class A and B collection ponds, the seepage collection system failure is assessed as unlikely. Given the shorter return period design for the Class C Storage Facility and Overburden Stockpile collection ponds, as well as no liner under the stockpiles, the likelihood of failure for Class C Storage Facility and Overburden Stockpile is assessed to be likely.

Class A and Class B Storage Facility seepage is considered to require treatment; as a result, in the event of the collection system failure, effects to the groundwater and subsequently to surface water in Geona Creek may occur. Progressive reclamation and placement of the cover on the Storage Facilities will limit infiltration and potential seepage. Any failure would be repaired as soon as

possible following the detection of the failures (through the groundwater monitoring program). Thus, it is anticipated that only a small volume of water would have seeped past the collection system. Given the small amount of water that has potential to enter receiving environment, the concentrations in Geona Creek are not expected to be affected. In the event of the complete failure of the water collection system, and some of the Class A/B Storage Facility water entering receiving environment, the consequences are considered to be medium.

As Class C and Overburden seepage is predicted to meet water quality objectives, even if the water collection system fails, the consequences are expected be very low.

The risk assessment for water collection system failure for Class A Storage Facility identified a likelihood of unlikely and a consequence of medium, resulting in a risk rating of moderate (per Table 2-20). Therefore, this potential effect is considered not significant.

The risk assessment for seepage collection system failure for Class B and Class C Storage Facilities, and Overburden stockpile identified a likelihood of unlikely (Class B, Class C and Overburden), and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant.

Further, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek and Finlayson Creek are also not predicted to be significant from a seepage collection system failure.

No additional mitigation measures are warranted, given the low risk ratings.

### 5. Water Treatment Plant Failure

A Water Treatment Plant, located at the Process Plant Facility, will be in place primarily to treat the runoff from the Class A Storage Facility. It will be sized to also treat water from the Class B Collection Pond, Run of Mine (ROM) Pad, and the Process Plant Facility area, as required to maintain dischargeable water quality in the Lower Operations Water Management Pond. The treatment will consist of pH adjustment, clarification, and any other processes that may be required to bring the water to a suitable standard for discharge to the environment. Additional details on the proposed water treatment plant are presented in Appendix R2-D of Response Report #2 (BMC, 2017c). The treated effluent will either be discharged to the Lower Operations Water Management Pond or used in the Process Plant.

Conventional water treatment technologies will be used, and water treatment plan effluent will be monitored prior to discharge.

In the event of the Water Treatment Plant failure, the storage capacity of the Class A Storage Facility Collection Pond and other collections ponds (if needed) can provide sufficient time to repair any failure.

Failure of the water treatment system is considered to be unlikely.

It is not expected that failure of the Water Treatment Plant would result in a release of water to the receiving environment that does not meet the water quality objectives. As such, the consequence is assessed to be very low. The event that results in release of untreated water to the receiving environment would also need to include other site water management system failure to release the water without capture in one of Operations Water Management Ponds. Such event is considered to be very unlikely though would result in high consequence. As noted in the methods section (Section 17.1 of the Project Proposal), the assessment generally assumes that only one failure mode may exist at a time.

The risk assessment for failure of the Water Treatment Plant identified a likelihood of unlikely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including traditional land use waterbodies of Geona Creek and Finlayson Creek are also not predicted to be significant from a seepage collection system failure.

No additional mitigation measures are warranted, given the low risk ratings.

**Power Generation Facility Failure (Power Outage)**

Although the generators will be regularly inspected and maintained, unplanned power outage during the life of the Project is considered to be likely.

Power restoration procedures will be developed as part of Health, Safety and Emergency Response Plan (Section 18.15 of the Project Proposal). Back-up generators will be in place for critical equipment.

With the back-up and emergency generators in place, no effects on the water VC (including traditional land use waterbodies of Geona Creek and Finlayson Creek) are expected as a result of the power generation facility failure. The consequence is considered to be very low.

The risk assessment for power generation facility failure identified a likelihood of likely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant.

No additional mitigation measures are warranted, given the low risk ratings.

**Accidents Assessment**

The accidents identified for risk evaluation for the Project water VC (including the traditional land use waterbodies) are:

1. Spill or leak during transport (including from a transportation accident); and

2. Spill or leak during site transport and storage.

### 1. Spill or Leak During Transport

A number of fuel sources will be required for the Project including LNG, diesel, gasoline, and propane, with natural gas and diesel being the primary fuel sources. LNG will be required to be delivered every two days. Hazardous materials of concern to be used on site include processing reagents, explosives materials, and lubricants.

Fuel release during truck transport would typically be managed by the fuel provider. Depending on the proximity of the fuel release to the Project area, BMC's mine rescue personnel may be able to assist with containment and management of a potential spill.

As outlined in Hazardous Materials Management Plan (Section 18.3 of the Project Proposal), transportation of dangerous goods and materials to the Project will comply with the *Transportation of Dangerous Goods Act and Regulations* (Government of Canada, 1992) which requires transporters to have a certified contractor and a spill response plan for all goods to be transported.

The use of LNG to fuel the generators was selected (in part) as it is the safest fuel to transport with respect to protection of the environment because in the event of an accidental release, the LNG will evaporate with no residual effects to soil or surface water.

Depending on the potential location of a non-LNG fuel spill, soil will most likely be affected, with potential effects to vegetation and surface water quality (if spill occurs in proximity to a waterbody), as well as potential effects on infrastructure and services. During transport potential spills will be limited to the immediate area, and maximum volumes shown in Table 2-19. The consequence of a spill is expected to very low (in isolated areas not in proximity to surface water or affecting vegetation) to low (in populated area or in proximity to surface water or affecting vegetation).

The risk assessment for spill or leak during transport identified a likelihood of likely and a consequence of very low to low, resulting in a risk rating of low to moderate (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including the traditional land use waterbody of Finlayson Creek and other Traditional land use waterbodies that are likely present along the Robert Campbell Highway are also not predicted to be significant from a spill or leak during transport).

No additional mitigation measures are warranted, given the low risk ratings.

**Table 2-19: Estimated Operations Traffic and Load Volumes**

| Year 2-Year 9 average | Load/ Truck (average) | Trucks/ year |
|---|---|---|
| Reagents (t) | 20 | 770 |
| Operations Fuel (l) | 43,900 | 232 |
| Generator LNG (GJ) | 1,500 | 661 |
| Explosives (t) | 20 | 320 |
| Underground Paste Cement (t) | 40 | 333 |
| Miscellaneous (t) | 20 | 250 |
| ***Concentrates*** | | |
| Cu/Zn -Tridem Trucking (t) | 44 | 5,682 |
| Pb – Containerized Trucking (t) | 33 | 1,106 |

In addition to the assessment above, at the request of YESAB (YESAB, 2018a), BMC prepared a Conceptual Cyanide Management plan for the Project (BMC, 2018a). The plan (in part) describes how cyanide will be safely transported to site, including requirements for the transport contractor to develop a written Emergency Response Assistance Plan which will outline the steps to be taken in the even of an emergency (including a spill or leak).

### 2. Spill or leak during site transport and storage

Spill response procedures are described further in the Spill Contingency Plan (Section 18.5 of the Project Proposal).

To reduce risk, all fuel storage locations on site will utilise either double walled storage tanks or concrete berms capable of containing 110% of the fuel storage volume (Section 4.11.6 of the Project Proposal). Refuelling facilities on site will provide for refuelling over a concrete apron, with an integrated sump to collect any fuel spillage to prevent release to the environment. Refuelling of excavators and track dozers will take place in the pit or on waste dumps and will not be on a concrete apron. In the event of fuel spilled outside the concrete apron, the spill will be contained with spill absorbent materials stored on site, with any contaminated soil removed for remediation treatment. Aviation fuel will be stored adjacent to the helipad in a single fuel tank within a lined containment berm.

Processing reagents will be stored under cover, then mixed in reagent tanks and transferred to distribution tanks for process use. The reagent storage shed will be a steel framed structure with metal roofing; metal siding will be installed to keep reagents dry and protected from the sun. The floors will be slab-on-grade concrete with concrete containment walls to capture spills.

The separate concentrates of copper, lead, and zinc, will be thickened, filtered, and stockpiled on site. Copper and zinc concetrate will be bulk loaded into trucks and lead concentrate will be loaded into 30 t sealed containers for transport off site for further processing at third party smelters .

Chemical spills within contained facilities will be managed and cleaned up in accordance with the chemical manufacturer's Material Safety Data Sheet guidance. If necessary, the chemical manufacturer will be consulted prior to cleanup. Depending on the nature of the spill, operating personnel may complete the cleanup, with BMC's mine rescue personnel available to complete cleanup if required due to hazardous conditions.

LNG and propane storage tanks are the main pressurised vessels to be used on site. All tanks will be located within concrete bunding capable of containing 110% of the storage volume. Should an LNG spill occur, the liquid will absorb heat from the environment and dissipate over time as it returns to a gaseous state. Natural ventilation is expected to adequately disperse the resulting vapour cloud. Propane will also return to a gaseous state, however as it is denser than air, it may accumulate and require forced ventilation to adequately disperse.

Depending on the potential location of a non-LNG fuel spill, soil is most likely to be affected during spill or leak with potential effects on surface water and aquatic resources if spill reaches a waterbody, as well as potentially affecting vegetation in proximity of the spill. The implementation of the Spill Contingency Plan will limit environmental effects and such the consequence of the spill is considered to be very low.

The risk assessment for a spill or leak on site identified a likelihood of likely and a consequence of very low, resulting in a risk rating of low (per Table 2-20). Therefore, this potential effect is considered not significant. Subsequently, potential effects to the surface water VC (including the traditional land use waterbody of Geona Creek is also not predicted to be significant from a spill or leak during storage on site).

No additional mitigation measures are warranted, given the low risk ratings.

### Unplanned Closure

In Yukon, temporary closure at a mine site is defined as a closure that exceeds six months and is not expected to last longer than five years, and can include both planned and unplanned closure (Yukon Energy, Mines and Resources, 2006). This condition assumes that the owner is still in active control of this site (i.e., not abandoned). The management of the Project in the event of a temporary closure is discussed in the Conceptual Reclamation and Closure Plan (Section 4.13 and Appendix H-1 of the Project Proposal).

BMC's approach to temporary closure is based on maintaining the Project in a state of physical and chemical stability, while also ensuring the Project is secure, safe, and in compliance with all regulatory requirements and authorization obligations. While ensuring these conditions, the Project

infrastructure will be maintained in such a manner so as to facilitate the resumption of mining operations in a timely manner. Site security will be maintained in a manner comparable to the operational period with access to the site controlled by consistent presence in the gatehouse.

The potential environmental effects will be managed through the measures described in the Conceptual Reclamation and Closure Plan (Appendix H-1 of the Project Proposal). During temporary closure, the strategy from the Operational Water Management Plan will be maintained. The site will be monitored in compliance with the approved Environmental Monitoring, Surveillance, and Reporting Plan that will be approved during the Quartz Mining Licencing process. An updated plan with a reduced monitoring frequency may be developed and submitted for approval if a temporary closure period is expected to be longer than six months. With these mitigation and management plans in place, the environmental effects consequence as a result of unplanned closure is expected to be very low.

In summary, the likelihood of temporary closure is considered to be unlikely with a consequence of very low for environment effects, resulting in a risk rating of low. The potential environmental effects are considered not significant given the risk rating of low.

In the event that a commercial decision is made by BMC not to reopen the mine, the final Reclamation and Closure Plan will be executed to permanently close the site (with all the necessary regulatory approvals in place). The environmental effects consequence as a result of early permanent closure is expected to be very low. Similarly, as noted above for temporary closure, the potential risk rating of low is identified. Therefore, the potential environmental effects are considered not significant. Subsequently, potential effects to the surface water VC (including the traditional land use waterbodies of Geona Creek, Finlayson Creek, Fault Creek and South Lakes are also not predicted to be significant from temporary or early permanent closure).

### Summary

The summary of the scenarios assessed, their likelihood and consequence and resulting risk rating is provided in Table 2-20.

**Table 2-20: Accidents, Malfunctions and Unplanned Closure Assessment Summary for the Surface Water VC and Traditional Land Use Waterbodies**

| Assessment Scenarios | Likelihood | Consequence | Risk Rating |
|---|---|---|---|
| ***MALFUNCTIONS*** | | | |
| ***Open pit mining*** | | | |
| Reclamation measures failure | Unlikely | Very low | Low |
| ***Storage facilities (Class A, B, C), and Overburden and Topsoil Stockpiles*** | | | |
| Slope failure: Storage Facilities | Unlikely | Very low to low | Low/Moderate |
| Slope failure: Overburden and Topsoil | Unlikely | Very low | Low |

| Assessment Scenarios | Likelihood | Consequence | Risk Rating |
|---|---|---|---|
| Erosion control failure | Unlikely | Very low | Low |
| Reclamation measures failure | Likely | Very low | Low |
| ***Process Plant Facility*** | | | |
| Mechanical equipment failure | Unlikely | Very low | Low |
| Pipes and pumps failure | Likely | Very Low | Low |
| ***Water Management*** | | | |
| Embankment or spillway failure of Operations Water Management Ponds | Very unlikely | Medium | Low |
| Clean water diversion failure | Unlikely | Low | Low |
| Sediment and erosion control measures failure | Likely | Very Low | Low |
| Storage facility seepage collection systems failure: *Class A* | Unlikely | Medium | Moderate |
| Storage facility seepage collection systems failure: *Class B, C and Overburden* | Unlikely | Very Low | Low |
| Water treatment plant failure | Unlikely | Very low | Low |
| ***Power generation facility failure*** (Power outage) | Likely | Very low | Low |
| ***ACCIDENTS*** | | | |
| Spill or leak during transport | Likely | Very low to low | Low to moderate |
| Spill or leak during site transport and storage | Likely | Very low | Low |
| ***UNPLANNED CLOSURE*** | | | |
| Temporary closure/ Early permanent closure | Unlikely | Very low | Low |

Based on the likelihood and consequence ratings, none of the accidents, malfunctions, or unplanned closure scenarios were assessed to have high or unacceptable risk rating. Therefore, accidents, malfunctions, and unplanned closure are not considered to have a significant effect on the water quality VC (including the traditional land use waterbodies of Geona Creek, Finlayson Creek, Fault Creek and South Lakes).

#### *2.5.1.7 Conceptual Management Plans*

The conceptual management plans (included in the Project Proposal) that will ensure potential effects to the traditional land use waterbodies are avoided and/or minimized include:

- Waste Management Plan (Section 18.2);
- Hazardous Materials Management Plan (Section 18.3);
- Surface Water Management Plan (Section 18.4);
- Spill Contingency Plan (Section 18.5);
- Sediment and Erosion Plan (Section 18.6);
- Tailings Management Plan (Section 4.9);

- Waste Rock and Overburden Management Plan (Section 4.9); and
- Conceptual Reclamation and Closure Plan (Appendix H-1).

#### *2.5.1.8 Preliminary Quantitative Risk Assessment*

At the request of YESAB, BMC completed a multi-media exposure human health risk assessment (HHRA) of environmental conditions of at the proposed Project). The objective of the HHRA was to determine the potential risks to human health from exposure to Contaminants of Potential Concern (COPCs) under the various Project phases (Appendix R2-N of Response Report #2) (BMC, 2017c). The risk assessment included the evaluation of potential risks to the traditional land users who use the traditional use waterbodies. The following provides a summary of the assessment.

The water quality assessment (Chapter 8 of the Project Proposal) included the traditional use waterbodies in the local study area (Geona Creek, South Creek and upper Finlayson Creek) and the regional study area (Lower Finlayson Creek and North River). The only creek in the Project area that was specifically identified by RRDC as being used for drinking water purposes is Fault Creek. However, other creeks in the study areas may also be used for drinking water purposes when people are hunting or fishing in the area. It is unlikely that Geona Creek is used for drinking water purposes as it is a slow flowing stream that visibly does not look potable. The water quality in Fault Creek is not predicted to change as it is upgradient of the Project activities. Therefore, a further risk assessment of Fault Creek is not warranted as there are no Project related "COPCs that might pose a toxicological hazard".

During the construction, operations, and decommissioning, reclamation and active closure phases, there will be no public access to the creeks in the local study area (i.e., Fault Creek, Geona Creek, and upper Finlayson Creek). As per the requirements of the Tote Road license, the road will be gated and will be manned 24 hours a day 365 days per year. Therefore, there will be no "presence of a traditional land user who might come into contact with a COPC" during these Project phases. Thus, further human health risk assessment is not required. Note that the land use disruption agreement in the SEPA and BMC's existing agreements with the other RRDC trapline holders (in part) mitigates the disruption to this traditional land use.

The only potential for exposure to these particular creeks would be during the post-closure scenario. Therefore, the water quality model results during post-closure within Finlayson Creek were compared to the maximum acceptable concentration drinking water guidelines (as provided by Health Canada, 2014) (Appendix A of Appendix R2-N of Response Report #2). Finlayson Creek was selected for comparison because of the creeks in the Project area it has the potential to be used for drinking water purposes and has the potential to be impacted by the Project. However, no COPCs were estimated to exceed the drinking water quality guidelines during the post closure period. Therefore, there are no "COPCs that might pose a toxicological hazard" and thus no further risk assessment is required. Note that the model results for all Project phases have been included in

Appendix A (although only the post-closure phase results apply to this evaluation). It is noted that the water quality model was updated in response to IR3 (BMC, 2018b) and the updated model predicts even better water quality that what was described in (Appendix A of Appendix R2-N of Response Report #2), this further affirms the conclusions of the PQRA with respect to drinking water.

During all Project phases, people could access the creeks in the regional study area (i.e. lower Finlayson Creek, South Creek and North River). Therefore, the water quality model results were compared to the maximum acceptable concentration guidelines (Health Canada, 2014) during each of these Project phases (see Chapter 8 of the Project Proposal).

No COPCs assessed were estimated to exceed Canadian drinking water guidelines in the publicly accessible lower Finlayson Creek during the construction, operations or closure/post closure phases.

Similarly, no COPCs were estimated to exceed drinking water guidelines in South Creek during all Project phases. Since South Creek ultimately flows into North River, North River would also not be expected to exceed the applicable guidelines.

#### *2.5.1.9 Dam Failure of the Upper and Lower Water Management Ponds*

At the request of YESAB, BMC completed an "Assessment of the Impact of a Hypothetical Catastrophic Failure of the Proposed Water Management Ponds at the Kudz Ze Kayah Mine Site on Fish and Fish Habitat in Geona Creek" (Appendix R2-0 from Response Report #2 and updated in Response Report #3B) (BMC, 2017c and 2018b). The assessment included an evaluation of effects to the traditional use waterbodies of Genoa Creek, Finlayson Creek and as far downstream as Finlayson River. More specifically, it presents an evaluation of potential impacts to the downstream aquatic and riparian receiving environment from a 'worst-case' scenario of both (full) water management ponds breaching during a high runoff natural event when the downstream waters are already flowing at bankfull depths. Section 2.1 of the assessment (Appendix R2-0 of Response Report #2) discusses how the likelihood of all of these events co-occurring at the same time to produce the worst-case scenario evaluated is very unlikely. This likelihood does not produce a recommendation for substantial changes to planned management to reduce overall risk, regardless of the consequence. It is also noted that the dams will only be in place during the operations period and will be removed during active closure.

Peak flows in the Finlayson River are predicted to be lower than swimming velocities for sub-carangiform[1] swimmers in general (e.g., Katopodis 1992[2]) and Arctic grayling in particular (Omtzigt and Tobler, 2008; Larocque et al., 2014). Specifically, Arctic grayling are not found in velocities greater than 1.5 m/s (Larocque et al., 2014), maximum prolonged speed is 0.8 to 2.1 m/s, and maximum burst speed is 2.1-4.3 m/s (Omtzigt and Tobler, 2008). This suggest that fish mortalities would be limited as fish can move to quiescent areas and stranding is unlikely. No erosion is expected in the Finlayson River, but deposition of suspended sediments is expected.

Suspended particles from the upstream erosion have the potential to smother gills, as well as eggs and young-of-the-year (Minnow, 2017). However, such effects in the Finlayson River would be temporary, and would not be a concern once the sediments settle out after the initial flood wave has passed through the system. High suspended sediment loads can also have some effect on growth, depending upon the duration and timing of high turbidity (>25 nephelometric turbidity units (NTU) or > 100 mg/L TSS). Possible reduction in growth rates of the under-yearling salmonids including Arctic grayling was shown to occur at 25 NTU (BCMOE, 1997; McLeay et al., 1984). However, TSS elevations would be expected to be of durations lower than those at which growth impacts have been observed (i.e., 3 to 6 weeks; McLeay et al., 1984). It is [1]notable that the magnitude of potential effects associated with a failure would be dependent upon time of year. A failure and peak flood event during critical periods of migration, spawning, egg incubation, and rearing would result in greater impact than failure outside of these periods.

Arctic grayling are a widespread species in the north, and are found in most waters throughout the Yukon. Although Arctic grayling of the Project area are considered to be part of CRA (Commercial, Recreational, and/or Aboriginal) fisheries, Arctic grayling populations of the region are generally secure, although some spring spawning runs have declined and monitoring is ongoing to determine the success of regulatory changes limiting harvest (Environment Yukon, 2010). Thus, the Geona Creek, Finlayson Creek, and Finlayson River system does not provide unique or specialized habitat that provides critical life history function.

Additional details are provided in Appendix R2-0 (Response Report #2) and the response to R3-14 (Response Report #3B) (BMC, 2017c and 2018b). Based on the likelihood and consequence definitions from Chapter 17 of the Project Proposal, the risk of "*Impact of a Hypothetical Catastrophic*

[1] Sub-carangiform swimmers are fish that propel themselves primarily by tail movement, with the vast majority of the work being done by the rear half of the fish (although the body of sub carangiform swimmers is not completely rigid as with carangiform swimmers). Salmonids, including graylings, are sub-carangiform swimmers.

2 Burst speeds are the swimming velocities for escape and feeding that can be sustained for up to 165 sec (Katopodis 1992). Prolonged speeds are the swimming velocities that can be maintained for up to 200 min through difficult areas (Katopodis 1992).

*Failure of the Proposed Water Management Ponds at the Kudz Ze Kayah Mine Site on Fish and Fish Habitat in Geona Creek"* is rated as moderate (the likelihood is very unlikely with a medium consequence). Subsequently, no significant adverse effects from this hypothetical accident or malfunction are predicted.

#### *2.5.1.10 Class A Storage Facility - Failure Modes Effects Assessment*

At the request of YESAB (YESAB, 2017b), BMC conducted a Failure Modes Effects Assessment (FMEA) of the Class A Storage Facility (Appendix R2-A of Response Report #2) (BMC, 2017c). The FMEA involved the identification and characterization of risks specific to the Class A Storage Facility. The FMEA (in part) in part included consideration of the potential risks to the traditional land use waterbodies (Geona Creek and Finlayson Creek), if a failure of the facility or facility components occurred. A summary of the methods (as they relate to the potential environmental effects is provided below). Results of risks that were identified that could have a potential to effect to Geona Creek and Finlayson Creek are also provided below.

Risk is defined as likelihood multiplied by consequence:

***Risk = Likelihood x Consequence***

Ratings for likelihood and consequence range from 1 to 5. Table 2-21 summarizes the likelihood ratings.

**Table 2-21: Likelihood Descriptions**

| Likelihood | | | | | |
|---|---|---|---|---|---|
| **Rating** | **Rare** | **Unlikely** | **Possible** | **Likely** | **Highly likely** |
| | 1 | 2 | 3 | 4 | 5 |
| **Description** | 1 in 1,000 year event | 1 in 200 year event | 1 in 10 year event | Less than one event per year | More than one event per year |

Consequence ratings were developed for a range of Project impacts; however, for the purposes of identifying how the traditional land use waterbodies were considered only the environmental consequence ratings are summarized in this Response Report (Table 2-22).

**Table 2-22: Consequence Descriptions**

| Categories | Low | Minor | Moderate | Major | Critical |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **Environmental Impact (EI)** | No impact | Minor localized or short-term impacts | Significant impact on valued ecosystem component | Significant impact on valued ecosystem component and medium-term impairment of ecosystem function | Serious long-term impairment of ecosystem function |

Multiplying the likelihood and consequence scores will provide the risk rating from 1 to 25, as shown in Table 2-23.

**Table 2-23: Risk Rating**

| Risk | | |
|---|---|---|
| **Very Low** | 0 to 3 | Very Low |
| **Low** | 4 to 6 | Low |
| **Medium** | 7 to 12 | Medium |
| **High** | 13 to 20 | High |
| **Very High** | 21 to 25 | Very High |

All assessed risks fell within the "Low" to "Very Low" categories (Table 2-24). The highest risk identified was Risk #43 (*There is a failure to follow the Operations, Maintenance and Surveillance procedures for temporary closure of the Class A Storage Facility leading to an improper cover and an environmental consequence*) which had a risk rating score of 6. This risk is summarized as follows:

Key defensive measures in place include:

- Parties involved reduce likelihood (construction supervision and Quality Assurance / Quality Control (QA/QC), Engineer of Record, operators, supervisors, regulators), and
- Modern and routinely updated construction QA/QC practices reduce likelihood.

The following ratings were determined:

- Likelihood: 2 (unlikely, 1 in 200 year event), and
- Consequence: 3 (moderate, significant impact on valued ecosystem component).

## Table 2-24: Results of the Failure Modes Effects Assessment for the Class A Storage Facility for Potential Effects to Traditional Land Use Waterbodies

| RISK NO. | CATERGORY | PHASE | RISK DESCRIPTION | CONSEQUENCE | TYPE | KEY DEFENSIVE MEASURES IN PLACE | RISK RATING | | | CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | L | C | SCORE | |
| 3 | Non Contact Diversion Ditches | Construction | Precipitation or runoff event exceeding design of the diversion ditches (1 in 200 year 24-hr event) | Ditches overflowing over total length, beyond water management capability, incremental sediment load to downstream catchment | EI | • Emergency Management Plan will require timely repairs. | 1 | 2 | 2 | Very Low |
| 6 | Non Contact Diversion Ditches | Operations | Precipitation or runoff event exceeding design of the diversion ditches (1 in 200 year 24-hr event) | Ditches overflowing over total length, beyond water management capability, leading to incremental mobilization of tailings and waste rock contact water through site water management facilities and to downstream environment | EI | • Emergency Management Plan will require timely repairs. | 1 | 2 | 2 | Very Low |
| 10 | Contact Diversion Ditches | Operations | Overtopping or seepage in discrete areas | Contact water by-passes water collection systems, reporting to receiving environment and resulting in unacceptable downstream water quality (exceeding water quality objective) | EI | • Progressively reclaimed surface limits exposed Class A material.<br>• Design of facilities and site topography conveys runoff to Lower WMP. | 1 | 3 | 3 | Very Low |
| 14 | Contact Diversion Ditches | Operations | Precipitation or runoff event exceeding design event of the diversion ditches (1 in 200 year 24-hr event) | Ditches overflowing over total length, beyond water management capability, leading to incremental mobilization of tailings and waste rock contact water through site water management facilities and to downstream environment | EI | • Emergency Management Plan will require timely repairs. | 1 | 2 | 2 | Very Low |
| 22 | Collection Pond | Operations | Precipitation or runoff event exceeding design event of the Collection Pond (1 in 200 year 24-hr event) | Water released from pond beyond water management capability, leading to incremental release of Class A contact water through site water management facilities and to downstream environment | EI | • Design includes spillway to pass design storm events exceeding the Collection Pond capacity. | 1 | 2 | 2 | Very Low |
| 23 | Collection Pond | Operations | Precipitation or runoff event exceeding design event of the Collection Pond (1 in 200 year 24-hr event) | Embankment failure and release of Class A contact water to Lower WMP, water is managed by Lower WMP | EI | • Emergency Management Plan will require timely repairs. | 1 | 3 | 3 | Very Low |
| 27 | Collection Pond | Operations | Liner system not installed correctly, damaged | Class A Contact Water seepage from pond directly to the receiving environment creating unacceptable water quality | EI | • QA/QC during construction will identify and address construction issues.<br>• Liner replaced as required.<br>• Hydrostatic testing during construction to identify possible leaks. | 1 | 2 | 2 | Very Low |
| 31 | Buttress | Closure | Class A Storage Facility buttress slumping, deformation | Slow movement of buttress leading to cracks in cover and increased runoff contact with Class A Material and increased seepage | EI | • Emergency Management Plan will require timely repairs. | | | 0 | Very Low |
| 33 | Buttress | Operations | Class A Storage Facility buttress sudden failure | Movement of facility compromises contact diversion ditches, contact water routed to Lower WMP and managed accordingly (no release to environment) | EI | • Lower WMP located immediately down gradient, to collect and manage contact water.<br>• Buttress constructed on bedrock foundation.<br>• Constructed from non-reactive waste rock at a slope of 3H:1V. | 1 | 2 | 2 | Very Low |
| 35 | Buttress | Closure | Class A Storage Facility buttress sudden failure | Movement of facility causes damage to cover system and increases infiltration resulting in poor quality water released to downstream environment | EI | • Emergency Management Plan will require timely repairs. | 1 | 2 | 2 | Very Low |
| 38 | Class A Storage Facility | Operations | Inclusion of ice or snow in tailings and waste rock | Settlement of material (deformation) leads to damage of cover and increased seepage to downstream environment | EI | • Snow management included in tailings management plan. | 1 | 3 | 3 | Very Low |
| 39 | Class A Storage Facility | Closure | Inclusion of ice or snow in tailings and waste rock | Settlement of material (deformation) leads to damage of cover and increased seepage to downstream environment | EI | • Winter placement of tailings and waste rock material will require procedures for snow and ice removal. | 4 | 1 | 4 | Low |
| 40 | Class A Storage Facility | Construction | Failure to follow OMS | Facility not performing to design leads to environmental impact | EI | • Parties involved reduce likelihood (QA/QC, Engineer of Record, operators, supervisors, regulators). | 3 | 1 | 3 | Very Low |
| 41 | Class A Storage Facility | Operations | Failure to follow OMS | Facility not performing to design leads to environmental impact | EI | • Parties involved reduce likelihood (QA/QC, Engineer of Record, operators, supervisors, regulators). | 2 | 1 | 2 | Very Low |
| 43 | Class A Storage Facility | Closure | Failure to follow OMS | Temporary closure plan not followed leading to improper cover | EI | • Parties involved reduce likelihood (QA/QC, Engineer of Record, operators, supervisors, regulators). | 2 | 3 | 6 | Low |
| 45 | Class A Storage Facility | Operations | Liner construction | Liner system does not function as intended resulting in incremental seepage to | EI | • QA/QC during construction will identify and address construction issues.<br>• Regular OMS during operations will include daily inspections and monitoring. | 2 | 2 | 4 | Low |

***Summary***

Based on the above, BMC has thoroughly demonstrated how the Project Proposal and subsequent Response Reports have considered the importance of the traditional land use waterbodies. Potential effects to these waterbodies have largely been avoided due to Project design. Where potential effects could not be avoided, BMC has proposed mitigation measures that will minimize effects which will ensure that there are no significant adverse effects to these traditional land use waterbodies.

## 2.6 YESAB ISSUE

VESECs were developed based in part on Kaska traditional knowledge and traditional land use information. However, given the limited involvement of Liard First Nation and the broad nature of the Kaska documentation used to support the determination of VESECs, a more comprehensive consideration of the VESECs and associated effects assessment specific to information obtained from Liard First Nation is important.

### 2.6.1 R4-9

Further to the collection of the above requested information:

a) Confirm current VESECs used in the project proposal and include any new or additional VESECs identified through engaging Liard First Nation (LFN) and Ross River Dena Council (RRDC);

b) Demonstrate how traditional land use information has been applied to the determination of VESECs and identification of mitigations.

c) Provide a comprehensive effects assessment that:

   i. Is informed by information collected in response to questions R4-1 through R4-6 and through meaningful engagement with LFN and RRDC;

   ii. Considers how proposed project activities may impact the VESECs that are relevant to LFN and RRDC;

   iii. Considers potential mitigation measures ensuring that they are culturally relevant where possible; and

   iv. Where there may be new VESECs, update the sections of the proposal to reflect the effects assessment of those new VESECs.

Table 2-25 provides the list of the VCs assessed in the Project Proposal and identifies which VCs and sub-components were selected (in part based on direct engagement by BMC and our predecessors with LFN and RRDC Kaska Dena). It also includes identification of the VCs based on the Traditional

Knowledge Study that was conducted in 1995 as well as the Ethnography study included as Appendix F-3 of the Project Proposal.

Since BMC submitted the Project Proposal, there has been ongoing consultation with RRDC and LFN. This ongoing consultation has included community meetings that have been attended by LFN and RRDC citizens, Elders tours with LFN and RRDC Elders, RRDC Elders Oversight Committee meetings and meetings with LFN and RRDC Chief and Council. To date, no additional VCs have been identified through these efforts. It is noted that Dena Cho (in collaboration with RRDC Elders) has conducted a review of the Project Proposal and this review has also not identified any additional VCs requiring assessment. However, as described in Section 1.1.1 of this Response Report, additional information is likely to be provided to BMC through both RRDC and LFN over the life of the Project. As such, in the Proposal for development, BMC can only assess VCs that have currently been provided to us by RRDC and LFN Kaska Dena. Table 2-25 provides a list of the VCs and identifies which VCs and sub-components were selected (in part based on direct engagement by BMC and our predecessors with LFN and RRDC Kaska Dena). It also includes identification of the VCs based on the Traditional Knowledge Study that was conducted in 1995 as well as the Ethnography study included as Appendix F-3 of the Project Proposal.

## Table 2-25: Rationale for Selection of Environmental and Socio-economic Valued Components

| Valued Component (with Sub-components also listed as bullet points) | Rationale for Inclusion/Exclusion (From Chapter 5 of the Project Proposal) | Engagement with RRDC (Based on Table 2-3 of Chapter 2 of the Project Proposal) and ongoing engagement | Engagement with LFN (Based on Table 2-5 of Chapter 2 of the Project Proposal) and ongoing engagement | Ethnographic Study (No differentiation between LFN and RRDC) | TK Study from 1995 (RRDC only) |
|---|---|---|---|---|---|
| ***Air/Climate*** | | | | | |
| Air Quality<br>• Criteria Air Contaminants (CACs)<br>• Greenhouse Gases | Included.<br><br>Air Quality was selected as a VC due to its fundamental importance to the health and well-being of humans, wildlife, vegetation, and other biota. Assessment of air quality also considers project greenhouse gas emissions. Project activities will result in air emissions. | The Elders Oversight Committee have raised concerns about the potential for dust from the Class A facility to impact vegetation and wildlife.<br><br>Elders have expressed concerns that Haul Trucks will transport contaminants which will in turn kill the vegetation along the access road (which is what they observed at Faro). | Dust from the Class A facility has been raised as a concern. | n/a | n/a |
| Noise Levels<br>• Daytime Noise Level<br>• Night-time Noise Level<br>• Blasting Noise | Included.<br><br>Noise was selected as a VC because of its fundamental importance to the quality of life for humans and wildlife in the vicinity of the Project. Elevated noise levels may lead to negative health effects in humans. For wildlife, noise may lead to habitat avoidance as well as unfavourable physiological and behavioral responses, with concerns for potential effects of noise on wildlife raised through consultation (see Chapter 2). Project activities will generate noise. | Concerns with respect to noise during exploration have been raised and its potential effects to furbearers. It was assumed that the concern would also remain for the proposed Project. | n/a | n/a | n/a |
| ***Water Resources*** | | | | | |
| Surface Water<br>• Surface water quantity<br>• Surface water quality | Included.<br><br>Surface water was selected as a VC because of its important role in maintaining functioning aquatic and biophysical environments. Furthermore, water quality and quantity are highly valued by Yukon residents, including First Nations, with concerns regarding changes to surface water quality and quantity (flow) raised through consultation (see Chapter 2). Project activities have the potential to affect surface water quality and quantity. | The importance of protecting water quality has been raised numerous times particularly given its importance to traditional land use activities.<br><br>Fault Creek has been identified as an important drinking water source. | The importance of protecting water quality has been raised numerous times particularly given its importance to traditional land use activities. | Waterbodies used for traditional use purposes in the project area are Finlayson Creek and North Lakes.<br><br>In the more regional area Wolverine Lake, Francis Lake, Francis River, Hoole Canion along the Pelly River, Big Campbell Creek, Money Creek, Finlayson Lake, Finlayson River, Grass Lakes, and Fire Lake have been identified as important traditional land use areas. | Important waterbodies identified were Finlayson Creek/Lake, Wolverine Lake and North Lakes. The trails identified during the study also indicate that Geona Creek valley was also likely used for hunting waterfowl. |
| Groundwater<br>• Groundwater quality<br>• Groundwater quantity | Included.<br><br>Groundwater was selected as a VC because of its importance in maintaining function of aquatic and biophysical environments. Furthermore, water quality and quantity has been identified as highly valued by Yukon residents, including First Nations, with concerns regarding changes to groundwater raised through consultation (see Chapter 2). Project activities have the potential to affect groundwater flow and quality. | The Geona creek valley is known to have artesian seeps and so the question was raised if groundwater was going to be challenge for building the mine.<br><br>The Elders have raised concerns that the liners of waste rock storage facilities may not prevent the groundwater from becoming impacted, and since the groundwater flows to the creeks, the groundwater needs to be protected.<br><br>Also, concerns were raised that contamination of groundwater from the pit could flow south to the South Lakes drainage. | n/a | n/a | n/a |

| Valued Component (with Sub-components also listed as bullet points) | Rationale for Inclusion/Exclusion (From Chapter 5 of the Project Proposal) | Engagement with RRDC (Based on Table 2-3 of Chapter 2 of the Project Proposal) and ongoing engagement | Engagement with LFN (Based on Table 2-5 of Chapter 2 of the Project Proposal) and ongoing engagement | Ethnographic Study (No differentiation between LFN and RRDC) | TK Study from 1995 (RRDC only) |
|---|---|---|---|---|---|
| Aquatic Ecosystems and Resources<br>• Fish (Arctic grayling)<br>• Aquatic habitat<br>• Benthic invertebrates, periphyton and aquatic plants | Included.<br><br>Aquatic ecosystems and resources were selected as a VC because of their importance in maintaining function of aquatic and biophysical environments as well as the cultural and recreational importance of fish, with concerns regarding potential effects on fish and fish habitat raised through consultation (see Chapter 2). Aquatic resources may be affected by Project activities due to potential changes in water quality and flow. | An Elders knowledge of the area identified the fish barrier at the Finlayson Culverts at the Robert Campbell Highway.<br><br>An Elder has asked how the Fish in the Campbell river will be impacted. The Campbell River is important and it should be protected.<br><br>The Elders Oversight Committee has raised concerns that a slurry tailings dam in Geona creek could impact fish like what happened at Mt/Polly.<br><br>The Elders have raised concerns about cumulative effects from Non-Yukoners moving into the area and hunting and fishing their resources (impacting their traditional land use activities).<br><br>The Elders have indicated they want to use the Project area for hunting and fishing and other traditional uses. | Finlayson Lake and Francis Lake have been identified as important waterbodies. | Culturally important fish species include: grayling, lake trout, whitefish, and sucker.<br><br>Waterbodies used for traditional use purposes in the project area are Finlayson Creek and North Lakes.<br><br>In the more regional area Wolverine Lake, Francis Lake, Francis River, Hoole Canion along the Pelly River, Big Campbell Creek, Money Creek, Finlayson Lake, Finlayson River, Grass Lakes, and Fire Lake have been identified as important traditional land use areas. | Finlayson Lake/River, Wolverine Lake and North Lakes are used for fishing by the Ross River Dena. |
| ***Terrestrial Resources*** | | | | | |
| Terrain and Soils<br>• Terrain<br>• Soils | Included<br><br>Terrain and soils are closely interrelated and are considered as a single VC for the Project as they are vital to landscape and ecosystems that support aquatic, biophysical, and human environments. Project facilities have potential to change local terrain and result in local soil loss. Project activities may also affect soil quality. | Stability of the reclaimed Class A storage facility has been raised as a concern and how that might impact the water in Geona Creek.<br><br>The Elders Oversight committee has asked how any impacted soil would be remediated at closure.<br><br>Impacts to soil from dust has been raised by the Elders.<br><br>One Elder explained that the region is known for sink holes and that terrain stability could be a concern. | n/a | n/a | n/a |
| Vegetation Cover and Composition<br>• Wetland and riparian ecosystems<br>• Old growth forest<br>• Rare plants<br>• Invasive plants<br>• Metal concentrations in traditionally used plants or wildlife browse plants | Included.<br><br>Vegetation cover and composition were selected as a VC due to their importance to the health and well-being of the biophysical and human environment, as well as having high cultural and First Nations' value. Project activities have the potential to affect vegetation through clearing activities. | The Elders have identified several culturally important plant species at the site and have asked how the waste rock storage facilities can be reclaimed to include these species (they are not listed here due to potential confidentially conflicts). They have also been concerned about metals uptake in to the vegetation at closure.<br><br>Use of non-native seeds has also been raised as a concern. | Elders have identified some culturally important species (they are not listed here due to potential confidentially conflicts). | Culturally important plants include; blueberries, raspberries, strawberries, currants, salmonberries, cranberries, and soapberries, wild rhubarb, rose petals, spruce, birch, and willow. | n/a |

| Valued Component (with Sub-components also listed as bullet points) | Rationale for Inclusion/Exclusion (From Chapter 5 of the Project Proposal) | Engagement with RRDC (Based on Table 2-3 of Chapter 2 of the Project Proposal) and ongoing engagement | Engagement with LFN (Based on Table 2-5 of Chapter 2 of the Project Proposal) and ongoing engagement | Ethnographic Study (No differentiation between LFN and RRDC) | TK Study from 1995 (RRDC only) |
|---|---|---|---|---|---|
| Wildlife and Wildlife Habitat*<br>• Finlayson Caribou Herd<br>• Moose<br>• Grizzly Bear<br>• Wolverine<br>• Grey Wolf<br>• Collared Pika<br>• Little Brown Bat<br>• Cliff-Nesting Raptors<br>• Passerine birds<br>• Waterfowl<br>• Bumble bees | Included.<br><br>Wildlife and wildlife habitat were selected as a VC due to their importance to the health and function of the biophysical and human environment, as well as wildlife's high cultural and First Nations' value, with concerns about potential effects on wildlife raised through consultation (see Chapter 2). Project activities may have direct and indirect effects on wildlife. | Impacts to wildlife from increased access and increased hunting has been raised by the Elders as it effects their ability to harvest.<br><br>Impacts to wildlife from the open pit at closure has been raised by the Elders Oversite Committee.<br><br>The Elders noted that the Finlayson Caribou Heard is in decline.<br><br>The Elders noted that there are sheep south of the proposed Project.<br><br>Impacts to wildlife from contamination has also been raised.<br><br>Moose, caribou, furbearers, game birds have been identified as important species.<br><br>Impacts to traplines have been raised as a concern. | The importance of protecting wildlife and wildlife habitat has been raised several times particularly given its importance to traditional land use activities. | Culturally important species identified are: Caribou, moose, sheep, bear, and wolves, muskrat, beaver, marten, mink, porcupine, squirrel, fox, lynx, and gopher. | The Ross River Dena First Nation presently utilize the general area for hunting (fall-winter for caribou and moose) and fishing. Caribou have historically been a mainstay of their food supply and remain important.<br><br>The hunting of caribou, moose, sheep and small game, as well as fishing in the areas of North Lakes, Wolverine Lake and Finlayson Lake, were identified. The project area likely was used as one of the routes of travel to the North Lakes.<br><br>The Ross River Dena Council holds the group trapping rights for the project area. No one person owns a trapline, but trapping takes place on Group Traplines. The Ross River Dena Council has management responsibility for the Group Traplines. The access road location lies within the Ross River Group trapping area. Furbearers taken in traps include marten, mink, river otter, wolverine, fox, coyote, wolf and lynx. |
| Socio-economic Resources | | | | | |
| Heritage Resources<br>• Paleontological Resources<br>• Archaeological Resources<br>• Historic & Built Structural Resources<br>• Human Remains | Included.<br><br>Heritage resources were selected as a VC due to existing legislation and the high significance given them by the RRDC and LFN. Project activities may affect heritage resources present in the area. | Protection of culturally important sites have been raised by the Elders Oversite Committee.<br><br>RRDC TK Team has committed to providing BMC with their recommended buffers for sites that they have identified through the TK study.<br><br>As part of the RRDC TK study Elders have identified grave sites and old camp sites that were outside of the Project footprint.<br><br>The RRDC and elders have completed a land use plan for the traditional territory that is not yet public. There will be specific prescriptions for different parts of the KZK site, e.g., mineral lick and traditional trails that will be stronger than current YG rules (this plan has not been provided to BMC). | Elders have asked BMC if any heritage resources have been found at the site. | Grave sites are known to occur in the region outside of the Project footprint. | A heritage resource survey was undertaken in 1995 as part of the Environmental Assessment of the Advanced Exploration Project. The survey, undertaken by Doug Rutherford and a field assistant from the Ross River Band, consisted of an archaeological reconnaissance of the proposed road alignment and the mine development areas to assess the potential and test for the presence of archaeological resources. Concurrently, an oral history was conducted to determine traditional land use within the project area by an elder of the Ross River Dena Council. Seven elders were interviewed during the project. A final report was prepared by Rutherford and submitted to the Heritage Branch, Government of Yukon in early July of 1995.<br><br>No cultural material was observed in the surface survey. |

| Valued Component (with Sub-components also listed as bullet points) | Rationale for Inclusion/Exclusion (From Chapter 5 of the Project Proposal) | Engagement with RRDC (Based on Table 2-3 of Chapter 2 of the Project Proposal) and ongoing engagement | Engagement with LFN (Based on Table 2-5 of Chapter 2 of the Project Proposal) and ongoing engagement | Ethnographic Study (No differentiation between LFN and RRDC) | TK Study from 1995 (RRDC only) |
|---|---|---|---|---|---|
| Economy and Sustainable Livelihood<br>• Traditional economic activities — hunting, fishing, trapping, food gathering<br>• Economic growth<br>• Diverse and stable economy — discouraging boom and bust<br>• Employment<br>• Employability — education, training and experience<br>• Broad participation in economic development<br>• Business opportunities<br>• Government revenues | Included.<br><br>The affected communities and First Nations place a high value on a sustainable, diverse, and stable community economy that provides local employment and business opportunities and helps to support local government. Promoting the self-sufficiency of community members and avoiding the excesses of a boom and bust economy are also valued. Project activities have potential to contribute to local economies through employment and business opportunities. | On several occasions RRDC citizens have raised concerns that the tote road licence prevents them from using the access road to conduct that traditional land use activities (i.e. hunting, fishing, trapping and berry picking).<br><br>Impacts to the trapline holders has been raised as a concern.<br><br>On several occasions RRDC has raised the concerns regarding not getting jobs at other mine sites in the region or training/experience opportunities or contracting opportunities. They have also raised concerns that the government revenues YG receives from mining projects in their territory should go to RRDC.<br><br>RRDC would like BMC to ensure that the youth are included in the Project to ensure there is a future for the next generation. | LFN has identified that the project could prevent them from exercising their aboriginal land use rights.<br><br>LFN has indicated that they want re-assurance from BMC that LFN citizens and businesses will see the economic benefits of the KZK Project through jobs, training, and business opportunities.<br><br>Concerns have been raised that RRDC will get all of the opportunities and benefits. | Subsistence economy of RRDC contributes in a substantial way to the mixed cash and subsistence economy of the community.<br><br>Of particular note pertaining to the proposed Kudz Ze Kayah Project site is that it plays an important part in the Kaska harvesting system, especially when other places are depleted of wildlife, feeding other parts of the nation and its members.<br><br>The availability and productivity of moose, caribou, and to a lesser extent sheep is one of the main reasons that RRDC has remained one of the more traditional Indian bands in the Yukon even in the face of severe dislocations and resource impacts. | Today the Ross River economy is a mixed economy of wage labour, along with the subsistence activities of hunting, trapping and fishing. The traditional economy component based on hunting, trapping and fishing is important for cash generation as well as for satisfying cultural values. |
| Human Health and Well-being<br>• Individual health<br>• Family stress<br>• Reducing alcohol and drug abuse<br>• Gathering traditional medicine<br>• Public health and safety — increased traffic, hazardous material transport<br>• Workplace health and safety | Included.<br><br>Human health and well-being are universally Valued Components. Project activities may affect the health of individuals and community health in the area. | RRDC citizens have asked BMC how BMC will address addiction issues and also raised concerns that BMC's drug and alcohol policies were too strict.<br><br>The potential for gathering traditional medicines after the mine closed has been raised.<br><br>Training with respect to health and safety has been raised. | Concerns with increased traffic on the Robert Campbell highway have been raised. | Cultural fulfilment and wellbeing associated with land use activities.<br><br>Transition from land use from the Faro area towards KZK was identified, this likely included shifting of areas for gathering traditional medicines. | Traditional use of the Project area is primarily related to subsistence hunting, trapping and fishing activities of First Nations.<br><br>Locations of summer and winter trails, cabins and camping areas have been compiled by the Ross River Dena Development Corporation (these have not been included in this Response Report due to potential confidentiality conflicts).<br><br>The shift from a hunting and gathering economy to a fur trading economy occurred about 140 years ago as the demand for furs grew. This shift brought about substantial changes in the pattern of subsistence and social organization, including the need for considerable mobility and hardware. |

| Valued Component (with Sub-components also listed as bullet points) | Rationale for Inclusion/Exclusion (From Chapter 5 of the Project Proposal) | Engagement with RRDC (Based on Table 2-3 of Chapter 2 of the Project Proposal) and ongoing engagement | Engagement with LFN (Based on Table 2-5 of Chapter 2 of the Project Proposal) and ongoing engagement | Ethnographic Study (No differentiation between LFN and RRDC) | TK Study from 1995 (RRDC only) |
|---|---|---|---|---|---|
| Community Vitality<br>• Population — number of children<br>• Healthy local business sector — reducing the cost of living<br>• Reducing crime<br>• Reducing discrimination and racism<br>• Political structure<br>• Community events and volunteerism<br>• Recreational facilities and opportunities | Included.<br><br>Community vitality includes a number of economic and social factors, such as population structure, health of local businesses, crime rates, and community events. Project activities may contribute to local community vitality through population changes, business opportunities and community events. | Economic benefits from the Project have been raised.<br><br>Equal opportunities and treatment of staff has been raised based on bad experiences on other projects.<br><br>Working with the youth through community events and volunteerism has been raised. | Economic benefits from the Project have been raised. | n/a | n/a |
| Infrastructure and Services<br>• Housing and land availability<br>• Transportation infrastructure — roads and airports<br>• Municipal services — water, sewer, solid waste<br>• Healthcare services<br>• Police services<br>• Child care | Included.<br><br>Infrastructure and related services make up the physical core of any community. Project activities may affect the availability of infrastructure and services (e.g., transportation infrastructure, municipal services). | RRDC has indicated that they have a housing crisis in Ross River.<br><br>RRDC has asked several questions about the previously proposed upgrades to the Finlayson Airstrip as well as the conditions of the Robert Campbell Highway based on their experience with the Wolverine haul trucks. | LFN has asked about the haulage of concentrate along the Robert Campbell Highway. | n/a | n/a |
| Culture, History and Heritage<br>• Language preservation and restoration<br>• Traditional knowledge and practice preservation and restoration<br>• Heritage and historic sites | Included.<br><br>Culture, history and heritage form an important part of community identity. This VC considers language preservation and restoration, traditional knowledge and practice preservation and restoration, and heritage and historic sites. | Cross cultural training has been raised by RRDC and has been provided to BMC by Elders that are traditional land stewards for the Project area.<br><br>Protection of heritage and historic sites have also been raised by RRDC. | LFN Elders have asked if any heritage sites have been found at KZK. | n/a | n/a |
| Human Health Risk Assessment | Human health risk assessment was not initially included as there are no permanent or semi-permanent residents in the immediate vicinity of the Project and access to the mine will be prohibited as per the requirements of the road lease. General community health and well-being is considered through the human health and well-being VC for residents of local communities. | Added to the Effects Assessment during the Adequacy stage of the EA process in part due to RRDC's questions regarding the potential for water quality and vegetation impacts to culturally important plants and animals after the mine is reclaimed. | LFN Elders are concerned that what happened at Faro will happen at KZK (i.e. traditional land use activities will be impacted forever due to contamination). | n/a | n/a |

*Additional Rational for the Selection of Wildlife subcomponents is presented in Table 13-1 of the Project Proposal.

n/a = no information available.

Table 2-26 summarizes how traditional land use information has been considered in the identification of mitigation measures. YESAB has requested that BMC ensures that the migration measures are culturally relevant where possible. RRDC has indicated that they will provide culturally relevant mitigation measures to BMC as part of the on going TK program. LFN has indicated that they will review the Project Proposal and make a determination of the cultural relevance of the mitigation measures. The mitigation measures proposed to date will ensure that there are no significant adverse effects to the VCs, any additional mitigation measures that are proposed by LFN/RRDC (and implemented by BMC where appropriate) will further reduce any residual effects to the VCs.

In addition to the mitigation measures listed in Table 2-26, RRDC's Elders Oversight Committee has requested that BMC and RRDC develop a co-management program for fish and wildlife. In response to this request, BMC sent RRDC Chief and Council (in May 2017) a proposal for a BMC-Kaska Environmental, Cultural & Heritage Management Program for KZK. This Proposal was subsequently provided to LFN leadership (in March 2018) for discussion. Through this co-management program it is anticipated that the management of the environmental and heritage VCs during the all of the Project phases will incorporate culturally relevant mitigation measures.

### Table 2-26: Summary of how Traditional Land use has been Considered in the Identification of Mitigation Measures

| Valued Component | Traditional Land use Considerations* |
|---|---|
| ***Air/Climate*** | |
| Air Quality | All of the mitigation measures described in Section 6.4.2 (Mitigation Measures) and Section 18.11 (Conceptual Air Quality Management Plan) of the Project Proposal are aimed at minimizing the potential air quality effects that could subsequently effect water, soil, vegetation, wildlife and people (i.e. people on the land conducting traditional land use activities).<br><br>Based on the ongoing consultation with RRDC regarding the potential for dust to be generated from the mine site, BMC has installed 5 air quality monitoring stations at the site. These are sampled monthly and will continue to be sampled monthly throughout the Project phases. |
| Noise Levels | All of the mitigation measures described in Section 7.4.2 (Mitigation Measures) and Section 18.10 (Conceptual Noise Management Plan) of the Project Proposal are aimed at minimizing the potential effects from increased noise to wildlife and people (i.e. people on the land conducting traditional land use activities). |
| ***Water Resources*** | |
| Surface Water | See response to R4-8 |
| Groundwater | See response to R4-8 |
| Aquatic Ecosystems and Resources | BMC has established Environmental, No Hunting / No Fishing, No Recreational Use of ATVs and Snowmobiles, and No Feeding of Animals policies. These policies will (in part ensure that the traditionally harvested fish in the Project area are not impacted by BMC employees or contractors. These policies are included in Section 1.2.2 of the Project Proposal.<br><br>As described above, TK has been used to inform and prepare the Fish Offsetting Plan (FOP). The proposed Project is estimated to result in the loss of approximately 5.4 km of fish habitat in Geona Creek, covering an area of 15.35 km$^2$, which cannot be avoided. An additional 4.85 hectares (ha) of wetland/pond habitat in the headwaters of Geona is also predicted to be lost. To offset these losses BMC has proposed to facilitate the removal of the fisheries passage barrier at the RCH- on Finlayson Creek as part of the FOP. Preliminary results indicate that potential habitat available upstream of the RCH in Finlayson Creek itself, is a total stream length of 36.56 km and an estimated total wetted perimeter area of 225.4 km$^2$. Available wetland/pond habitat in the headwaters of Finlayson Creek has a total surface area of 36.47 ha. Although the percentage of Finlayson Creek tributaries that would be accessible to fish following the implementation of the fish passage plan at the RCH is currently unknown, they could provide an additional stream area of 26.63 km$^2$, and a total length of 31.51 km. The success of this FOP will be use of Finlayson Creek for fishing by RRDC and LFN citizens. This FOP would not have been proposed by BMC without the valuable TK provided by an RRDC Elder at one of the community meetings.<br><br>Mitigations to ensure traditional fishing activities are not impacted due to Project activities include not constructing any of the Project facilities outside of the Geona Creek Valley (i.e. the Project will not affect the ability of RRDC/LFN Kaska to fish in North Lakes, lower Finlayson Creek and other traditional land use waterbodies in the region). Additional mitigation measures to protect the aquatic ecosystems to the south is the pit crest height design of the open pit, which will ensure all groundwater and surface water from the pit will flow north.<br><br>Fish health will be monitored (including tissue collection) in collaboration, with RRDC/LFN Kaska, from fish in Finlayson Creek, South Lakes, downstream of the culverts at the RCH and at a reference lake to ensure the fish are safe to eat. All results will be communicated to RRDC and LFN citizens (likely by the RRDC/LFN Kaska citizen or consultant who participates in or leads the monitoring program – as part of the BMC-Kaska Co-management of Environment program). Details of the methods for the monitoring program are presented in Section 10.6.4 of the Project Proposal and in BMC's responses to YESAB's Information request R147 and R2-72 (BMC, 2017b and c). Collaboration by both parties in monitoring, reporting and communicating will to help ensure that the community is re-assured that the mitigation measures are in fact protecting fish health and that the fish can safely be consumed by the traditional land users. Preliminary fish tissue trigger levels are presented in response to YESAB's information request R3-27 (BMC, 2018a). |
| ***Terrestrial Resources*** | |
| Terrain and Soils | BMC has established No Recreational Use of ATVs and Snowmobiles Policy. This policy will (in part) ensure that terrain in the region of the Project (which is used for traditional activities) is not impacted by BMC employees or contractors. This policy is included in Section 1.2.2 of the Project Proposal. |
| Vegetation Cover and Composition (including rare or sensitive vegetation species/communities) | BMC has established a No Recreational Use of ATVs and Snowmobiles Policy. This policy will (in part) ensure that vegetation in the regional area of the Project (used for traditional berry and medicinal collection purposes) is not impacted by BMC employees or contractors. This policy is included in Section 1.2.2 of the Project Proposal.<br><br>Through BMC's cross-cultural awareness training program provided to BMC by two RRDC Elders (one of which is one of the traditional land stewards for the Project area) and several of the site tours with the Elders, BMC has learned a lot about the culturally important plants at KZK. Re-establishment of these plants during progressive and final reclamation will be critical to the success of the proposed Reclamation and Closure Plan (details are presented in Appendix H-1 of the Project Proposal), with the ultimate goal of "R*eturn the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities*". In 2017 BMC's Kaska Environmental Scientists (LFN and RRDC) initiated a revegetation research program which (in part) is evaluating which culturally important species are amenable for use in reclamation. This research is ongoing and in 2018 Elders from LFN and RRDC were on-site to help with this research.<br><br>BMC has committed to ongoing collaboration with both RRDC and LFN in continuing this research program in order to ensure that the land used for traditional hunting, trapping, and gathering which will be temporarily lost during mine operations will be restored through revegetation and reclaiming wildlife habitat at closure.<br><br>Invasive species are known to spread extensively, rapidly and can outcompete indigenous species resulting in decreased biodiversity. This in turn can have impacts on the abundance of culturally important plants used for food and medicines. In order to ensure invasive species don't cause such adverse effects, BMC has implemented an invasive species management program for exploration and this will continue throughout all of the proposed Project Phases. Details of this plan are presented in Section 18.8.1 of the Project Proposal (Invasive Plant Management Plan).<br><br>BMC has proposed a rare plant chance find procedure (Section 18.8.2 of the Project Proposal). If one of the plants listed in the procedure are confirmed to be at site, the protocol will be to contact Yukon Environment and the designated RRDC/LFN Kaska environmental contact to determine the appropriate mitigation measures to be taken if the area cannot be avoided. In this way RRDC/LFN Kaska can make the determination if the rare plant is considered culturally important and can help determine the best course of action.<br><br>The RRDC Elders have had concerns that the vegetation that is planted or re-established on the Class A Facility will accumulate metals from the tailings below the cover and subsequently the vegetation would not be safe to use for food or medicines. BMC has designed the covers (HDPE liner, 3 meters of clean waste rock, overburden and organic soil) to ensure that there is no possibility for the roots of any of the plants on the Class A Facility to come in contact with the tailings. The Class B facility has been designed the same. Therefore, in post closure the traditional use activities (i.e. berry picking, |

| Valued Component | Traditional Land use Considerations* |
|---|---|
| | traditional medicine gathering and hunting can safely resume). BMC has committed to monitoring the vegetation in collaboration with RRDC/LFN Kaska. Preliminary berry trigger levels are presented in response to YESAB's information request R3-27 (BMC, 2018a). Collaboration by both parties in monitoring, reporting and communicating will to help ensure that the community is re-assured that the design measures are in fact protecting vegetation and that is can safely be consumed by the traditional land users. This strategy is aimed at promoting traditional land use activities in post closure. |
| Wildlife and Wildlife Habitat | BMC has established Environmental, No Hunting / No Fishing, No Firearms, No Recreational Use of ATVs and Snowmobiles, and No Feeding of Animals policies. These policies will (in part) ensure that traditionally harvested wildlife in the Project area are not impacted by BMC employees or contractors. These policies are included in Section 1.2.2 of the Project Proposal.<br><br>In order to minimize the effects on wildlife and wildlife habitat, BMC has minimized the Project footprint so that all Project infrastructure is confined to one watershed. By minimizing the impact to the habitat, the effects on the land users who use the land base for hunting the wildlife are also reduced.<br><br>During one of the RRDC Elders Oversight Committee Meetings, one of the Elders indicated that wildlife (moose and caribou) could be at risk of falling in the open pit at closure, based on this knowledge BMC committed to constructing a bund around the highwall edges of the open pit to prevent inadvertent access by wildlife and people (Section 7.2.1 Appendix H-1 of the Project Proposal). In more recent discussions with RRDC Elders it was determined that a second bund would reduce this risk even further. Subsequently, BMC has committed to construct a second bund to ensure protection of wildlife and people (i.e. traditional land users).<br><br>Potential impacts to the Finlayson Caribou Herd during their annual migration route to their winter range has been raised as one of the main concerns of the RRDC Elders Oversight Committee. The primary risk is the potential for vehicle collisions along the Access Road when the animals are migrating. Mitigation measures to reduce this potential effect are:<br>• Wildlife will have the right-of-way along the entire Access Road<br>• If caribou are encountered on the road, the equipment and/or activity is to be halted until the wildlife has left the immediate area<br>• Radio communication among road users will be required to communicate information such as sightings of caribou<br>• The road will be plowed so that snow banks are less than 1 m in height<br>• All wildlife observations on access road will be reported<br>• Breaks in snow banks will be placed on both sides of the road to enable passage of large mammals<br>• Gravel and/or sand will be used on compacted snow or ice to improve road safety. Salt will not be used as it is a wildlife attractant<br>Additional mitigation measures to reduce the potential effects on this important traditionally harvested species is included in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).<br><br>It is understood that game birds are an important food source for the RRDC traditional land users. During construction BMC will avoid clearing during the breeding bird window (May 1st to August 15th), where practicable. This avoidance measure will ensure the populations of game birds used for traditional purposes are not impacted from Project activities. If construction during the breeding bird window cannot practicably be avoided, BMC has proposed nest surveys to be completed prior to clearing and if nests are identified (by the qualified and experienced person in collaboration with an RRDC/LFN Kaska representative) an avoidance buffer will be placed around the nest (30 to 200 m depending on the species) and no clearing will take place until the young have permanently left the nest. A summary of the survey results and proposed mitigation are to be provided to RRDC/LFN Kaska for their input and feedback. This mitigation measure will ensure the populations of game birds used for traditional purposes are not impacted from Project activities. More detailed information is presented in Section 13.4.2 of the Project Proposal and in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).<br><br>Increased hunting pressure has been raised as one of the key factors impacting RRDC's ability to harvest caribou and moose in their traditional territory. The most important mitigation measure that BMC will continue to implement is the operation of the manned gate to prevent hunter access to the Project (as per the lease requirements for the road). This is a proven mitigation measure which will continue for the life of the Project until the road is decommissioned and reclaimed. With this mitigation measure the KZK project will prevent overhunting and subsequent impacts to traditional land use activities.<br><br>BMC's wildlife monitoring program will focus on identifying changes to wildlife use and movement patterns resulting from Project development and operations. The monitoring program occur everyone to three years during operations and closure and will follow baseline study protocols with focus on key species and seasons. Traditional knowledge and scientific research will be integrated as it becomes available to help in the interpretation of ongoing monitoring data. In general, where possible and interest exists, one to two RRDC/LFN Kaska Land Stewards and/or TK Team with RRDC/LFN TK Kaska regarding wildlife will be contracted to participate in ongoing surveys of the wildlife monitoring programs. RRDC/LFN involvement will ensure their understanding of the effects of the mine on wildlife, especially culturally important species, and to ensure consideration and/or integration of RRDC/LFN Kaska TK into the monitoring program. RRDC/LFN Land Stewards and/or TK Team will review their contributions to the programs as part of the annual report before it goes to regulators. More detailed information is presented in Section 13.6 of the Project Proposal and in the Wildlife Protection Plan (Appendix R2-J of Response Report #2) (BMC, 2017c).<br><br>Additional mitigation measures to offset the impacts to the traditional land users of the area (specifically the trapline holders) includes land use disruption payments (for both Trapline #405 and #250).<br><br>Input from RRDC/LFN will be incorporated during WPP revisions and will ensure that the wildlife protection measures meet RRDC/LFN Kaska land stewardship requirements. Both RRDC and LFN members will be actively involved in the environmental management of the Project through the proposed Environmental and heritage Management Group. This will endure throughout the Project life. |

| Valued Component | Traditional Land use Considerations* |
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| ***Socio-economic Resources*** | |
| Heritage Resources | BMC acknowledges that the Geona Creek Valley and the alignment of the proposed Access Road have been traditionally used by RRDC and LFN and that identified heritage sites need to be carefully managed on a site by site basis. Under the *Yukon Historic Resources Act and Yukon Archaeological Sites Regulations*, effects to the heritage resources will be avoided, and if they cannot be avoided, they will be minimized where possible, or mitigated through systematic data recovery efforts.<br><br>The existing Project chance find procedure and the proposed Heritage Resource Management Plan requires that RRDC be notified of a chance find and that the assessment of potential significance of the materials will be assessed by a qualified archaeologist in collaboration with the YG Archaeology Department and RRDC Representative(s) and mitigative options will be identified. BMC will work with RRDC to ensure that any further action needed is taken. These procedures will be updated to also include LFN representatives.<br><br>The confidential TK Protocol with RRDC has provisions for the management/mitigation of heritage resources that identified during the TK study.<br><br>The confidential TK Protocol with LFN will also contain provisions for heritage resources (currently under negotiation). |
| Economy and Sustainable Livelihood | Traditional Economic Activities – Hunting, Fishing, Trapping and Food Gathering<br>BMC has established Environmental, No Hunting / No Fishing, No Firearms, No Recreational Use of ATVs and Snowmobiles, and No Feeding of Animals policies. These policies will (in part reduce any adverse effects of the Project on traditional economic activities. These policies are included in Section 1.2.2 of the Project Proposal.<br><br>Access and use of the Tote Road has been strictly controlled since the 1990s and there will be ongoing access control to the mine site, as per the requirements of the Tote Road Licence. Use of the Access Road during Project operations to access recreational areas for ATV and snowmobile use will be strictly prohibited.<br><br>Implementation of the Traffic and Access Management Plan (see Section 18.12 of the Project Proposal) will mitigate the adverse effect of increased traffic on area wildlife.<br><br>In order to minimize the effects on traditional land users, BMC had designed the Project such that all Project infrastructure is confined to one watershed. This will ensure that during operations RRDC and LFN can continue to conduct their traditional activities in the areas outside of the Geona Creek watershed.<br><br>As part of the SEPA BMC has agreed to pay a land use interruption supplement to mitigate the effects of the Project on the RRDC registered group trapline. BMC has also negotiated and finalized a trapping compensation agreement with one of families that are the traditional land stewards for the Project area who have a registered trapline in the Project area.<br><br>BMC's annual leave policy will result in up to two one-month periods of time off per annum for those on the 2-week-in, 1-week-out shift. This will allow for extended hunts and is intended to mitigate the effects created by shift work. |
| Human Health and Well-being | Gathering Traditional Medicine<br>See the mitigation measures summarized for the Vegetation Cover and Composition VC.<br><br>BMC will hire RRDC and LFN citizens to provide ongoing cultural awareness training to staff and contractors on-site.<br><br>Public Health and Safety — Increased Traffic, Hazardous Material Transport, Waste Disposal<br>The mitigation measures presented in: Section 15.6.5 of the Project Proposal; Traffic and Access Management Plan (Section 18.12 of the Project Proposal); Hazardous Materials Management Plan (Section 18.3); and Spill Contingency Plan (Section 18.5 of the Project Proposal) will minimize the potential health and safety effects to traditional land users who may be on the Robert Campbell Highway to access traditional use areas.<br><br>Further, to ensure public health (including traditional land users) is protected, BMC will follow all relevant regulations concerning potable water, food safety, and the disposal of sewage and garbage under the oversight of the Environmental Health Services Branch of YG. |
| Community Vitality | In its Community Relations Policy (Appendix A- of the Project Proposal) BMC states: "*We will strive for the improvement of cross-cultural awareness through the induction, training and education of our personnel in local Indigenous Peoples culture and workplace relationships.*"<br><br>BMC is committed to cross-cultural awareness training and has demonstrated this in its actions since it has acquired the Project. |
| Culture, History and Heritage | RRDC Elders have requested that BMC avoid the caribou fence and salt licks in the region. These culturally important sites do not overlap with the Project activities and will be avoided.<br>In its Community Relations Policy (Appendix A- of the Project Proposal) BMC states: "*We will strive for the improvement of cross-cultural awareness through the induction, training and education of our personnel in local Indigenous Peoples culture and workplace relationships.*"<br><br>BMC is committed to cross-cultural awareness training and has demonstrated this with its collaboration to date with families of the traditional land stewards for the Project area.<br><br>See mitigation measures summarized above for the Heritage VC. |

* Ongoing and future traditional knowledge data collection efforts, as well as consultation and engagement activities with the RRDC and LFN, may result in additional mitigation measures which will be added to the environmental and socio-economic management plans, as required.

Based on Table 2-25 all of the VCs assessed in the Project Proposal are directly or indirectly related to VCs that are relevant to RRDC and LFN. These assessments are presented in:

- Chapter 6 – Air Quality
- Chapter 7 – Noise Levels
- Chapter 8 – Surface Water Quality and Quantity
- Chapter 9 – Groundwater Quality and Flow
- Chapter 10 – Aquatic Ecosystems and Resources
- Chapter 11 – Terrain and Soils
- Chapter 12 – Vegetation Cover and Composition
- Chapter 13 – Wildlife and Wildlife Habitat
- Chapter 14 – Heritage Resources
- Chapter 15 – Socio-economic Effects Assessment

Additional assessments and/or additional information related to VCs that are relevant to RRDC and LFN were provided in BMC's responses to YESAB's IRs (YESAB, 2017a and b and YESAB, 2018a). A summary of the most relevant IRs and reference to the documents where the responses can be reviewed are presented in Table 2-27.

Although YESAB has requested that information already presented in the assessment process be repeated in this Response Report, it would not be prudent to repeat this volume of materials and YESAB, RRDC and LFN already have electronic and hard copies of these Response Reports. They are also posted on the Yukon Online Registry.

**Table 2-27: VCs relevant to RRDC and LFN that were assessed and/or further assessed in BMC's Response Reports**

| VC (and sub-component) | Information Request | Response Report Reference |
|---|---|---|
| Air Quality | R59 - Include emissions from off-site Criteria Air Contaminants (CACs) in the air quality assessment or provide a justification as to why this is not necessary. | BMC, 2017b |
| | R61 - Identify measures to mitigate VOC emissions associated with the Project. | BMC, 2017b |
| | R65 - Update the assessment to include relevant Criteria Air Contaminants (CACs) or provide justification for the exclusion of: metals in dusts; NH3; volatile organic compounds; polycyclic aromatic hydrocarbons; petroleum Hydrocarbons; and diesel particulate matter. | BMC, 2017b |
| | R66 - Update the air quality assessment of $PM_{2.5}$ using the federal guideline. | BMC, 2017b |
| | R67 - Update the air quality assessment of $SO_2$ using the 2025 federal guideline. | BMC, 2017b |
| | R68 - Develop and describe a monitoring program to: understand baseline conditions for environmental media, such as air, water, soil and country foods; monitor for increases in the environmental media as a result of project-related activities; provide relevant mitigative measures and alternatives to manage future risks. | BMC, 2017b |
| | R69 - Include the following as receptors in the air quality and noise assessments:<br>a. cabins located near the Project<br>b. any areas where traditional activities are taking place" | BMC, 2017b |
| | R73 - Provide an ambient air quality monitoring plan which describes the contingency measures and how they are triggered for implementation. | BMC, 2017b |
| | R74 - Revise section 6.6.1 of the proposal to reflect the proposed monitoring plan. | BMC, 2017b |
| | R75 Provide a Dust Management Plan that meets the criteria set out in Yukon Government – Department of Environment's Dust Management Guideline, including: description of all sources, and for each source a description of the primary dust control measures, thresholds/triggers for management and contingency dust control measures. | BMC, 2017b |
| Noise | R76 - Update the noise assessment to consider the impacts of tonal, impulsive, and highly impulsive noise on human health (e.g., from activities such as hammering and pile driving). Refer to Health Canada's "Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise", available here: https://www.canada.ca/en/services/health/publications/healthy-living.html#a2.5. | BMC, 2017b |
| | R78 - If trucks will be travelling at night through the communities of Watson Lake and Upper Liard, what is the anticipated frequency and volume of night-time traffic? | BMC, 2017b |
| | R79 - Provide baseline daytime and night-time noise measurements in the communities of Watson Lake and Upper Liard and apply appropriate modelling techniques to assess the significance of increased road traffic. | BMC, 2017b |
| | R81 - Describe steps that will be taken in future consultations with Liard First Nation and the Municipality of Watson Lake to address potential increases of highway noise. | BMC, 2017b |
| Surface Water Quality and Quantity | R102 - Update the Sediment and Erosion Control Plan to address:<br>a. management of water from dewatering activities; and<br>b. construction timing restrictions (e.g., for in-water/near water work). | BMC, 2017b |
| | R105 and R2-45 - Provide an assessment of impacts associated with the Project on erosion, stream morphology and riparian vegetation of all affected drainages from projected downstream flow changes during all Project phases. | BMC, 2017b and 2017c |
| | R116 and R2-55 - Provide justification and rationale for the proposed threshold criteria for surface water quantity and quality used to assess the magnitude of projected changes in the receiving environment. | BMC, 2017b and 2017c |
| | R117 - Provide additional rationale for the derivation of Preliminary Water Quality Objectives, including reference to recent, peer-reviewed literature, for the proposed approach to developing a water quality objective for selenium. The discussion should include consideration of alternative approaches. | BMC, 2017b |
| | R118 - Provide details on how variable Preliminary Water Quality Objectives would be applied and enforced on an operational basis from a practical perspective. | MC, 2017b |
| | R120 - Clarify how the 3:1 ratio at KZ-37 and 2:1 ratio at KZ-15 will be achieved and verified. | MC, 2017b |
| | R121 and R2-58 - Provide justification for the assumed treatment efficiencies. | BMC, 2017b and 2017c |
| | R122 and R2-59 - Provide contingency options in the event that proposed water treatment options do not achieve their intended efficiencies. | BMC, 2017b and 2017c |
| | R123 - Identify potential sources of water used for drinking and recreational purposes in the region of the proposed Project. | BMC, 2017b |
| | R124 - Provide an assessment of the potential for adverse human health effects from drinking and recreational waters impacted by the proposed Project. | BMC, 2017b |
| | R2-56 - The proponent should provide additional information regarding the proposed water quality thresholds that could be proposed as part of an AMP for the KZK project so as to allow the Executive Committee to determine if they have confidence in the effectiveness of the proposed approach. | BMC, 2017c |
| | R2-57 - The proponent should identify aspects of the Minto Mine and Sa Dena Hes Mine AMPs that could be pertinent for the KZK project. | BMC, 2017c |

| VC (and sub-component) | Information Request | Response Report Reference |
|---|---|---|
| | R3-1 - Provide updated hydrometric baseline information, water quality baseline information, water quality objectives, and water models (e.g., water quality model, site and watershed balance models, surface water flows, etc.) for the site. | BMC, 2018b |
| | R3-5 - Provide details on how the synthetic pond liners will be inspected, deficiencies repaired, and the liner replaced. | BMC, 2018a |
| | R3-6 - In the event that pond(s) need to be taken out of operation for liner repair or replacement, describe measures that will be taken to ensure water collection can continue | BMC, 2018a |
| Groundwater Quality and Quantity | R135 - Ensure the distribution, extent, and hydraulic properties of the permafrost areas are included in the groundwater flow and quality characterization. | BMC, 2017b |
| | R136 and R2-67 - Provide an assessment of the potential impacts of mine dewatering on quantity and quality of the head waters of Finlayson Creek, unnamed creeks south and southwest of the ABM pit, and the North Lake Systems. | BMC, 2017b and 2017c |
| | R141 - Provide well decommissioning information for the abandoned wells that will not be used for the monitoring program. | BMC, 2017b |
| Aquatic Ecosystems and Resources | R143 and R2-69 - Provide additional information in relation to the Fish Offsetting Plan as presented in Appendix 4. Details should include a discussion on:<br>a. the feasibility of including the culvert restoration as part of the plan given it is the jurisdiction of the Government of Yukon;<br>b. other potential offsetting measures that have been explored with reasons for discounting them;<br>c. how the plan will take into account the most recent DFO policy, Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting (DFO, 2013c), including how the guidance will be incorporated into a revised offsetting plan (e.g., quantifying losses and gains, and accounting for uncertainties). | BMC, 2017b and 2017c |
| | R144 - Provide baseline information for areas in Finlayson Creek downstream of the Robert Campbell Highway and in the surrounding areas of the Finlayson River. Contact Fisheries and Oceans Canada to determine what the specifics of baseline information requirements related to the Fish Offsetting Plan. | BMC, 2017b |
| | R145 - Provide a characterization of effects in relation to related to areal extent ($m^2$) alterations (i.e., area affected) as well as an accounting of this area by habitat type and reach. Details should include:<br>a. effects between each stage of these alterations should be evaluated and accounted for;<br>b. areal extent changes as a result of groundwater changes;<br>c. riparian clearing required for the Project;<br>d. impacts to fish habitat from the footprints for the overburden storage facility, Storage Facilities A/B/C and the associated runoff collection ponds | BMC, 2017b |
| | R146 - Provide a characterization of impacts to stream substrate recruitment and flushing in downstream areas of Genoa Creek. | BMC, 2017b |
| | R148 and R2-74 - Identify the criteria to be used in the interpretation of fish tissue monitoring data over the course of the Project. | BMC, 2017b and 2017c |
| | R149 - Provide rationale for not sampling and conducting metals testing on Arctic Grayling. | BMC, 2017b |
| | R152 - Identify the effluent quality parameters, the water quality parameters and control points that could be proposed to be specified for future license condition development. | BMC, 2017b |
| | R3-12 - Provide information on the types and amounts of fish habitat to made accessible by the restoration of fish passage for the Robert Campbell Highway culvert crossing of Finlayson Creek and a habitat assessment of areas of stream habitat to be made accessible. | BMC, 2018a |
| | R3-13 - In order to understand the potential impacts to fish habitat from flow alterations, the following information is requested: the monthly percent change in flow from existing conditions at each phase in flow changes and at a series of locations within impacted watercourses to demonstrate downstream attenuation and extent; a consideration of and accounting for potential effects between each phase of flow alterations; Information on the magnitude and areal extent ($m^2$) of altered fish habitat likely resulting in negative impacts to fish or fish habitat, including an accounting of this area by habitat type and reach. | BMC, 2018a |
| Terrain and Soils | R162 and R2-77 - Provide a terrain map, terrain stability and hazard map for the mine footprint and access road (including associated methodology and analysis) that:<br>a. Identifies surficial geology and related geomorphologic processes;<br>b. Identifies the type, nature, relative frequency and magnitude of hazards (baseline map);<br>c. Evaluates how current hazard dynamic may be altered due to changes in climate;<br>d. Identifies specific risks to the proposed infrastructure; and,<br>e. Identifies specific risks to the environment from the proposed project (e.g.: changes to slope stability). The risk map should include consideration of climate change over the life of the Project. | BMC, 2017b and 2017c |
| | R167 and R2-79 - Provide a comprehensive permafrost study, including mapping and related analysis indicating permafrost distribution within the mine footprint and access road area. Indicate the magnitude and extent of soil erosion potential within this area that is attributed to thermal erosion of permafrost. | BMC, 2017b and 2017c |
| | R3-24 - Provide rationale and references to support the claim that levels of particulate would not result in appreciable increases to metal concentrations in soil. | BMC, 2018a |
| | R3-25 - Provide a sensitivity analysis to demonstrate how any changes to the assumptions would impact the resulting conclusions and which of these changes will have the biggest impact on total suspended particles (TSP) levels in air and soil. | BMC, 2018a |
| | R3-26 - Discuss how the increases of total suspended particles (TSP) as a result of the project will not cause increases of metal in soil over the life of the project. | BMC, 2018a |
| Wildlife | R168 - Conduct surveys for the Common Nighthawk using standard methodologies using appropriate timing for the area and with particular emphasis on lower elevation habitats (e.g. along the Tote Road and the airstrip). | BMC, 2017b |

| VC (and sub-component) | Information Request | Response Report Reference |
|---|---|---|
| | R169 - In accordance with SARA subsection 79(2) provide an effects assessment for the Common Nighthawk. | BMC, 2017b |
| | R-172 - Provide information as to how the Wildlife Protection Plan will be updated to include measures to protect those species not adequately represented by collared pika. | BMC, 2017b |
| | R173 - Develop and incorporate measures to protect wood frog and wood frog habitat in the Wildlife Protection Plan. | BMC, 2017b |
| | R174 - Develop and incorporate measures to protect fishers and fisher habitat in the Wildlife Protection Plan. | BMC, 2017b |
| | R184 - Provide a late winter habitat suitability index (HSI) model to assess direct and indirect effects on late winter caribou habitat. | BMC, 2017b |
| | R187 and R2-87 - Traffic effects on other caribou herds: What are the potential effects of increased hauling traffic on other Yukon caribou populations along the haul route between the mine and the boundary with B.C. (Little Rancheria and Horseranch herds)? | BMC, 2017b and 2017c |
| | R190 - What is the Assessment Endpoint/Threshold Criteria for Health condition for caribou? | BMC, 2017b |
| | R196 and R2-95 - Discuss the geographical importance of the project area to caribou considering their continued use of the area despite population decline. | BMC, 2017b and 2017c |
| | R210 and R2-102- Provide a reference for the thresholds used regarding acceptable amounts of habitat loss and disturbance for grizzly bears. | BMC, 2017b and 2017c |
| | R212 - Discuss grizzly bear use of the area near the mine beyond the denning season. | BMC, 2017b |
| | R213 and R2-103 - Discuss the population of grizzly bears and mortality rates in the area. This should include a discussion of mortality of female bears. | BMC, 2017b and 2017c |
| | R220 - Why were black bear surveys not conducted? | BMC, 2017b |
| | R223 - How will mitigation for grizzly bears be adapted to also protect black bears, given the differences in den site use between the species? | BMC, 2017b |
| | R225 - A map of regional distribution of wolverines in the winter (ground based track counts). | BMC, 2017b |
| | R226 - A map of wolverine denning habitat including expert opinion of trappers. | BMC, 2017b |
| | R227 - A population estimate of the regional wolverine population if winter track surveys indicate that wolverines utilize habitat along the access road and around the mine site. | BMC, 2017b |
| | R232 - Provide maps showing the proposed flight path between Watson Lake and Finlayson Lake and Whitehorse and Finlayson Lake in relation to the Wildlife Key Areas in the baseline report. | BMC, 2017b |
| | R238 and R2-112- Provide methodology to monitor ponds for waterfowl use. | BMC, 2017b |
| | R240 - Provide mitigation measures for cliff-nesting raptors including: timing windows and disturbance buffer distances (in the event that an active nest is found). | BMC, 2017b |
| | R241 and R2-113- For the construction, operations, decommissioning and post-closure phases of the project, provide details on the monitoring plans. | BMC, 2017b and 2017c |
| | R242 - Provide rationale as to why the lick monitoring limited to April to October. | BMC, 2017b |
| | R243 - Will monitoring of the lick be continued throughout the life of the project? | BMC, 2017b |
| | R249 - Provide information as to whether any of the rare plants that were targeted in the survey are Beringian, or associated with hot springs, limestone, or alkaline wetlands. | BMC, 2017b |
| | R2-90 - Provide details about the methodology for the proposed qualitative assessment of no observable deterioration in physical condition for caribou, moose, grizzly bear, grey wolf, wolverine, and collared pika. | BMC, 2017b |
| | R3-8 - Provide available triggers and corresponding actions related to any adaptive management plans for wildlife to be considered in this assessment. | BMC, 2018a |
| | R3-9 - Identify seasonally important habitats for grizzly beats (foraging, travel corridors, etc.), and indicate how disturbance to these important habitats will be avoided or minimized. Assessment of project impacts should not be limited to the denning season | BMC, 2018a |
| | R3-11 - Assess population metrics, such as density, mortality rates, and trends at the scale of the Bear Management Unit. | BMC, 2018a |
| | R3-15 - Discuss the extent of water level fluctuation expected in the South Lakes system over the duration of the project in terms of potential impacts to nesting waterfowl and shorebirds. | BMC, 2018a |
| Heritage | R259 - Provide a heritage overview assessment for the Finlayson Lake Airstrip and mine access tote road. | BMC, 2017b |
| Socio-economic | R262 and R2-116 - Identify situations or scenarios where the project might operate on a reduced scale (including temporary or unplanned closure). This should include detail about assumptions made in the financial assessment of the prefeasibility study (referred to in Section 17.4 of the proposal). Characterize the potential effects of these scenario's and proposed mitigation. | BMC, 2017b and 2017c |
| | R266 - BMC has proposed mitigation measures on how to manage alcohol and drug abuse in local communities. Provide additional information on how you will be monitoring the effectiveness of proposed mitigation measures. | BMC, 2017b |
| | R267 and R2-119 - Provide a preliminary quantitative Human Health Risk Assessment for each stage of the project. This assessment should be informed by Heath Canada's Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA) Version 2.0 (2012). | BMC, 2017b and 2017c |

| VC (and sub-component) | Information Request | Response Report Reference |
|---|---|---|
| | R268 - Provide additional information on the identification of risks, effects of increased traffic along the entire route, and mitigations. Include communities, other road users, and wildlife in addition to the following:<br>a. strategies for avoidance of school children at the beginning and end of the school day,<br>b. logistics to reduce risks of driver fatigue in long haul truckers, and<br>c. risks to other users based on the transportation of fuel, supplies, and ore concentrate. | BMC, 2017b |
| | R274, R2-124, and R3-14 - Provide a discussion of the impacts on fish and fish habitat and the associated affects to Commercial, Recreational or Aboriginal (CRA) Fisheries that would result from a catastrophic failure of the water management ponds on Genoa Creek. | BMC, 2017b and 2017c and BMC 2018b |
| | R275 and R2-126 - Provide additional information on the risks of temporary or permanent unscheduled closure of the Project focusing on socio-economic effects to employees, contractors, and businesses, and others who have been impacted economically. Include details and description on how adverse socio-economic effects will be mitigated and financed, particularly if an unscheduled closure occurs (i.e., how will BMC be able to finance the costs associated with mitigation measures). | BMC, 2017b and 2017c |
| | R285 - Provide an analysis of potential risks and their implications of LNG operations onsite and during transportation. | BMC, 2017b |
| | R291 - Provide information on the following in relation to the Robert Campbell Highway:<br>a) current conditions with respect to expected road standards;<br>b) configuration and types of project related vehicles that will be using the highway;<br>c) discussion on how or whether the current conditions and state of the highway, and expected seasonal variances and effects of the environments, may affect or alter the project schedule and proposed use of the highway;<br>d) traffic management plan for proposed use of the Robert Campbell Highway including consideration for the varying physical state and condition of the road and with respect to other users; and mitigations and alternatives that could be implemented. | BMC, 2017b |
| | R3-16 - Describe measures to mitigate potentially significant adverse effects associated with the loss of employment at the end of the mine's operational life. | BMC, 2018a |
| | R3-17 - How will employees and contractors be meaningfully supported through the transition from operations to closure and closure to post-closure? | BMC, 2018a |
| | R3-21 - Provide the number of one-way trips per day for both heavy-duty vehicles and light duty vehicles for each road segment. Road segments include:<br>a. the Robert Campbell Highway between Watson Lake and the start of the Tote Road,<br>b. the start of the Tote Road to the mine site,<br>c. the start of the Tote Road to the Finlayson Lake airstrip,<br>d. Highway 37 from Watson Lake to Stewart,<br>e. the start of the Tote Road to Faro.<br>f. the start of the Tote Road to Whitehorse via the Klondike Highway, and<br>g. other major road segments used to conduct mining activities for the duration of the project. | BMC, 2018a |
| | R3-27 - Provide human health based target levels or screening levels and rationale explaining why these levels are appropriate in respect to the potential for adverse human health effects. | BMC, 2018a |
| | R3-29 - Provide rationale as to why additional media and additional contaminants of potential concerns (COPCs) were not considered | BMC, 2018a |
| | R3-31 - Include off-duty workers as a receptor in the human health risk assessment. | BMC, 2018a |
| | R3-32 - Describe how the effects assessment of accidents and malfunctions considered the risks associated with the LNG/Diesel power plant facility. | BMC, 2018a |
| | R3-38 - Describe the various safety concerns with the proposed use of the Robert Campbell Highway and BMC's role in addressing those concerns. | BMC, 2018a |

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# APPENDIX A.

## Summary of Cumulative Effects Assessments

# BMC MINERALS (NO.1) LTD

## KUDZ ZE KAYAH PROJECT

## SUMMARY OF CUMULATIVE EFFECTS ASSESSMENTS

November 2018

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## LIST OF ACRONYMS

| Acronym | Definition |
|---|---|
| CEA | Cumulative Effects Assessment |
| CEAA | Canadian Environmental Assessment Agency |
| CPUE | Catch per Unit Effort |
| EAP | Employee Assistance Program |
| FCH | Finlayson Caribou Herd |
| GHG | Green House Gas |
| GMS | Game Management Subzone |
| KZK | Kudz Ze Kayah |
| LFN | Liard First Nation |
| LSA | Local Study Area |
| ROM | Run of Mine |
| RRDC | Ross River Dene Council |
| RSA | Regional Study Area |
| SEPA | Socio-economic Participation Agreement |
| TSP | Total Suspended Particulate |
| TPD | Tonnes per Day |
| YESAA | Yukon Environmental and Socio-economic Assessment Act |
| YESAB | Yukon Environmental and Socio-economic Assessment Board |

## PREFACE

BMC Minerals (No.1) Ltd. (BMC) has collated the Cumulative Effects Assessments from BMC's Project Proposal to develop the Kudz Ze Kayah (KZK) Project in response to Yukon Environmental and Socio-economic Board's (YESAB) Information Request R4-5 *"Provide information on the past and current environmental and socio-economic effects of previous mine closures (planned or unplanned closures) on the Liard First Nation, Ross River Dena Council, and the residents of Ross River and Watson Lake to the extent that effects are unique to the community*" (YESAB, 2018).

The information in this report is compiled from Section 5.7 of the Project Proposal (which describes how the Cumulative Effects Assessments (CEA) were undertaken for both the environmental and socio-economic VCs). This assessment not only included previous mine closures; it included all past, present and reasonably foreseeable projects and activities (including: exploration projects; guide outfitting; access; trapping; etc.) In this way all potential cumulative effects were evaluated (including those of past mines). The cumulative effects assessments have been compiled for the environmental and socio-economic valued components which were presented in Chapters 6 through 15 (Sections 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5 and 15.11) of the Project Proposal. The only change to the CEA's from the Project Proposal in this response report is that potential effects to Liard First Nation, Ross River Dena Council and Residents of Ross River and Watson lake to the extent that effects are unique to the community have been identified (where possible).

In addition, Section 17.4 from the Project Proposal (Unplanned closure) has been included in this report as well as BMC's responses to previous information requests related to BMC's proposed mitigation measures for unplanned closure.

BMC's proposed reclamation plan to "*Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with traditional land use activities"* is presented in Appendix H of the Project Proposal and is not repeated in this report.

## 1. CUMULATIVE EFFECTS ASSESSMENT

Although *YESAA* does not provide a definition of cumulative effects, the concept is understood to be the combined environmental or socio-economic effects that accumulate from a series of similar or related individual actions, contaminants, or projects (YESAB, 2005).

The Cumulative Effects Assessment (CEA) considers that although the Project effects may not be significant, the combined effects with other projects and activities may result in significant effect. The CEA methods used for the project include scoping and assessment (including analysis, mitigation and significance determination) (CEAA, 2015). The scoping step of the assessment is provided below. The assessment methods are described in Section 1.2, with the VC-specific CEA provided in each corresponding VC chapter.

## 1.1 CUMULATIVE EFFECTS ASSESSMENT SCOPING

Identifying VCs for CEA is the first part of the scoping process. The CEA is conducted for those VCs for which residual effects are predicted after consideration of mitigation measures (including those that are predicted not to be significant) (CEAA, 2015). The residual effects and whether the CEA is completed are identified in each corresponding VC chapter.

The spatial and temporal boundaries considered for CEA are VC-specific and reflect the boundaries of the identified residual effects.

The final step in scoping is identifying other projects and activities to be considered in the CEA. The CEA defines the potential interaction of the Project's residual effects and the potential residual effects resulting from:

- Other past or present projects (where their effects may not be captured under the current conditions); and
- Reasonably foreseeable/known future projects.

In accordance with *YESAA*, reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB (as of December 2016). Potential futures projects that have not been submitted to YESAB for review could not be included in the CEA as their potential for temporal overlap, spatial overlap and residual effects were unknown at the time that this Project Proposal was prepared.

The projects for consideration in the CEA were identified through the review of the YESAB public registry for projects that may interact spatially with the Project. For potential interactions with environmental VCs, the projects within the Finlayson Caribou Herd range were considered, as that area represents the expected maximum extent of the environmental effects. Projects outside of Finlayson Caribou Herd range have been screened out for consideration of environmental cumulative effects (i.e., there is no anticipated spatial overlap). The list of the projects considered for the CEA for environmental VCs is included in Table 1-1. The activities listed for each project are based on the conditions of the respective permits that have been issued for the project. For most of the projects it is uncertain if the activities will overlap temporally with the Project as the permits are issued for several years, but that doesn't necessarily mean that activities will occur. The table provides information regarding activities (known and/or potential) for each project. It also lists the environmental VCs that could have residual adverse effects from those projects. In order to fully respond to YESAB's information request, two new columns have been added to Table 1-1 (in blue text). The first new column identifies if the potential residual effects of the project/activity have the potential to effect land users (i.e. Liard First Nation, Ross River Dena Council, and the residents of Ross River and Watson Lake). The second new column identifies if there is a potential residual effect of the project/activity to be unique to one of the four groups of land users. Figure 1-1 shows the approximate locations of the projects considered in the CEA for environmental VCs.

For potential socio-economic cumulative effects, the CEA focuses on the major mining projects in Kaska Traditional Territory and Yukon, as these types of projects are expected to overlap in types of effects for socio-economic VCs and contribute to cumulative effects. The list of projects considered for the CEA for socio-economic VCs is included in Table 1-2. The table provides a brief summary of each project; however, it does include a summary of residual adverse effects for each of the socio-economic VCs for each project. This information is included in Chapter 8 of this report. Figure 1-2 shows the approximate locations of the additional projects considered in the CEA for socio-economic VCs.

**Table 1-1: Projects to be Considered in the Cumulative Effects Assessment for Environmental Valued Components**

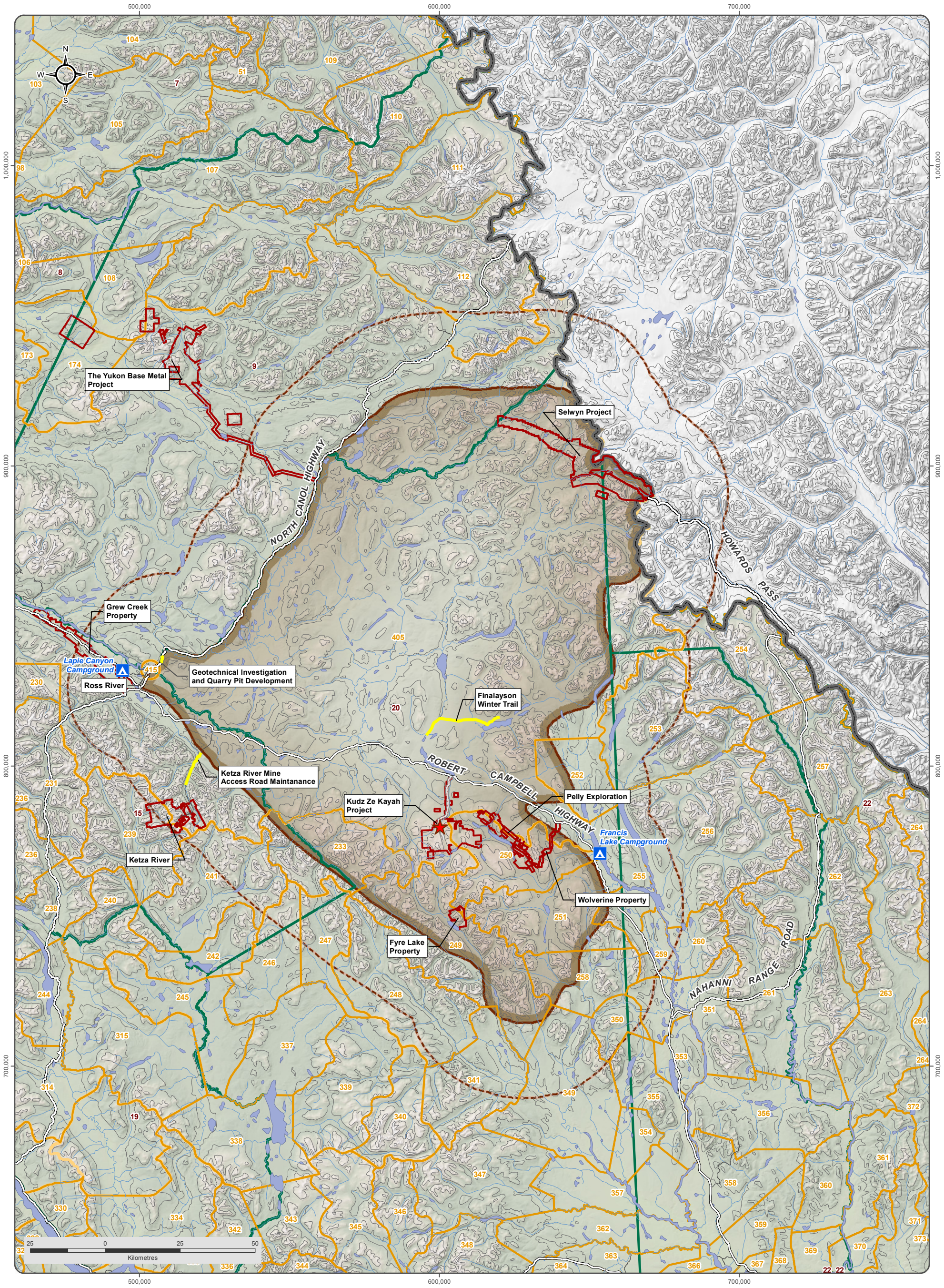
| Project (Proponent) | Associated YESAB Project #s | Approx. Distance to KZK Project | Timeline | General Description | Potential Activities/Effects | Potential for effects to land users from LFN, RRDC, residents of Ross River and Watson Lake | Potential for unique effects to land users (i.e. LFN, RRDC, residents of Ross River or Watson Lake)* |
|---|---|---|---|---|---|---|---|
| **Quartz Mining and Exploration** | | | | | | | |
| Fyre Lake Property (Pacific Ridge Exploration) | 2014-0204 | 30 km | Until 2020 | The Fyre Lake copper-cobalt-gold exploration project is located approximately 30 km south of the Project, approximately 250 km east of Whitehorse in southeastern Yukon Territory.<br>The project is a Class 3 mineral exploration program which consists of 169 claims over approximately 35.23 km$^2$. Access is via aircraft. Activities are scheduled to take place annually from March to October for 5 years, beginning March 2015.<br>Source: http://www.pacificridgeexploration.com/s/fyre_lake.asp | Project activities include:<br>• Exploration, geological mapping, soil sampling;<br>• Re-establishment and use of existing camp: maximum 20 people;<br>• Drill pad and heli-pad construction;<br>• Clearings: up to 10 drill/heli-pads below tree line requiring clearing (between 10 m x 10 m to 30 m x 30 m each, depending on terrain aspects);<br>• Drilling: up to 30 diamond drill holes (total 10,000 m);<br>• Use of helicopter and float-plane;<br>• Water use: 300 m$^3$/day for camp and drilling activities;<br>• Waste management;<br>• Fuel storage (maximum 30,000 l on site at any time); and<br>• Progressive reclamation and final camp decommissioning.<br><br>General exploration activities may include effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| Grew Creek (Golden Predator Corp.) | 2011-0168 | 135 km | Until 2016 | The Grew Creek Project consists of 546 claims located along the Robert Campbell Highway, midway between Faro and Ross River, Yukon. Golden Predator has conducted exploration programs and drilled more than 19,000 m on these claims.<br>Source: http://www.goldenpredator.com/grew-creek.html | Project activities include:<br>• Use of heavy equipment;<br>• Geological mapping and prospecting;<br>• Geochemical sampling;<br>• Airborne and ground geophysical surveying;<br>• Upgrades to existing access;<br>• New access development;<br>• Site preparation;<br>• Helicopter use;<br>• Water use (up to 100 m$^3$ per day for all project activities on all claims);<br>• Fuel storage (up to 10,000 l diesel; up to 1 ,000 l regular gas; up to 1 ,000 lb propane; up to 500 l oil per year) in a lined and bermed storage area if fuel volume exceeds 4000 l;<br>• Drilling; and<br>• On-going and final reclamation and decommissioning activities.<br><br>General exploration activities may include effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |

| Project (Proponent) | Associated YESAB Project #s | Approx. Distance to KZK Project | Timeline | General Description | Potential Activities/Effects | Potential for effects to land users from LFN, RRDC, residents of Ross River and Watson Lake | Potential for unique effects to land users (i.e. LFN, RRDC, residents of Ross River or Watson Lake)* |
|---|---|---|---|---|---|---|---|
| Ketza River Mine (Ketza Group/ Veris Group) | 2014-0096, 2011-0218, 2010-0196, 2010-0080, 2007-0148, 2007-0121, 2006-0021 | 92 km | Abandoned, in care and maintenance | The Ketza River gold mine, southwest of Ross River, operated at about 350 tonnes per day (tpd) from 1988 to 1991. Oxidized gold-bearing veins and mantos were mined until the oxide ore reserves were depleted. The mine was abandoned in 2015. | General care and maintenance activities include:<br>• Water quality monitoring and treatment;<br>• Maintenance of the tailings pond dam and emergency spillway;<br>• Maintenance of existing diversion ditches; and<br>• Maintenance of existing access roads.<br><br>General care and maintenance activities may include effects on:<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| Pelly Exploration (BMC Minerals (No.1) Ltd.) | 2016-0016 | 20 km | Until 2021 | Pelly Exploration project is a Class 3 mineral exploration program at the Pelly Property which consists of 422 claims in southeast Yukon, located 130 km southeast from Ross River and 160 km northwest from Watson Lake. The project will be accessed via an existing access road and/or helicopter. Activities are scheduled to take place year round for five years. | Project activities include:<br>• Establishment of a camp for up to 49 people;<br>• Use of heavy equipment;<br>• Prospecting, geological mapping;<br>• Airborne and ground geophysics;<br>• Rock, soil and silt sampling;<br>• Line cutting (500 km x less than 1 m);<br>• Clearing (up to approximately 151,000 $m^2$);<br>• Trail construction (40 km x 4 m);<br>• Diamond drilling (410 sites, 15 m x 15 m);<br>• Hydrogeologic drilling (50 sites, 15 m x 15 m);<br>• Sump construction;<br>• Water use (up to 270 $m^3$ per day);<br>• Helicopter use (2.5 to 4.5 hours per day);<br>• Fuel use and management (up to 107,000 l);<br>• Waste management;<br>• Environmental monitoring and data collection; and<br>• Progressive and final reclamation.<br><br>General exploration activities may include effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| Selwyn Project (Selwyn Chihong Mining Ltd) | 2015-0098, 2015-0072, 2009-0207, 2008-0280, 2006-029, 2010-0072 | 135 km | Assessed until 2021 | The Selwyn Project is a proposed zinc-lead mine, located in Howard's Pass in eastern Yukon. The Project is one of the largest undeveloped zinc-lead deposits in the world and is located 165 km east of Ross River and 280 km north of Watson Lake, straddling the border with the Northwest Territories.<br><br>The Selwyn Project is in the advanced exploration phase and has been conducting the technical and environmental research and studies required to design the proposed mine and begin preparing to apply for the Project to enter the environmental and social economic assessment process.<br>Sourcee: http://selwynchihong.com/ | Exploration activities include:<br>• Geophysical surveys, material sampling;<br>• Diamond drilling;<br>• Establishment of sumps for drill cuttings;<br>• Test pitting;<br>• Water Use;<br>• Clearings for drill pads and test pits;<br>• Line Cutting;<br>• Helicopter use;<br>• Trail construction;<br>• Watercourse crossings (approximately 7) by fording and/or snow/ice bridge construction;<br>• Temporary fuel storage: diesel, up to 1,230 l;<br>• Use of heavy equipment;<br>• Waste management; and<br>• Progressive reclamation.<br><br>General exploration activities may include effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |

| Project (Proponent) | Associated YESAB Project #s | Approx. Distance to KZK Project | Timeline | General Description | Potential Activities/Effects | Potential for effects to land users from LFN, RRDC, residents of Ross River and Watson Lake | Potential for unique effects to land users (i.e. LFN, RRDC, residents of Ross River or Watson Lake)* |
|---|---|---|---|---|---|---|---|
| The Yukon Base Metal Project (Overland Resources Ltd.) | 2014-0048 | 180 km | Assessed until 2019 | Overland Resources' Yukon Base Metal Project comprises in excess of 1,500 Mineral Claims covering approximately 300 km$^2$ within the highly prospective Selwyn Basin, Yukon Territory, Canada, approximately 125 km north of Ross River. Access is via the North Canol Road and existing winter trail (February to April), or aircraft. Included in this land package are the high grade Andrew Zinc Deposit, Darcy Zinc Deposit and Darin Zinc Deposits, and several other highly prospective target areas including the Myschka copper-gold target, Scott zinc-lead target, Riedell base metal target, and a large area of unexplored territory.<br>The project is a Class 3 mineral exploration program. Activities are schedule to take place throughout the year.<br><br>Source: http://www.overlandresources.com/content/index.php/projects/yukon-base-metal-project | Exploration activities include:<br>• Use of heavy equipment;<br>• Geophysical and geotechnical sampling, geological mapping, and soil sampling;<br>• Environmental monitoring and data collection;<br>• Heritage and socio-economic data collection;<br>• Use of existing camp: maximum 50 people;<br>• Use of existing winter trail (February to April);<br>• Construction of new trails;<br>• Clearing: up to 15 per claim (20 m$^2$ each), 210 m$^2$ total for up to 14 helipads<br>• Drill pad construction;<br>• Drilling: up to 50 reverse circulation drill holes and up to 15 diamond drill holes over a 5-year program;<br>• Helicopter use;<br>• Use of existing airstrip and use of fixed wing aircraft;<br>• Water use (less than 3 m$^3$/day for camp activities and less than 5 m$^3$/day for drilling activities);<br>• Waste management;<br>• Fuel storage; and<br>• Progressive reclamation and final camp decommissioning.<br><br>General exploration activities may include effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| Wolverine Mine (Yukon Zinc Corp.) | 2016-0007<br>2009-0209 | 25 km | Currently in care and maintenance, approximate mine life is 9.5 years | The Wolverine Mine is located in southeast Yukon, 282 km northeast from Whitehorse, and 190 km (by road) north of Watson Lake and 180 km south of Ross River via the Robert Campbell Highway. The Wolverine property encompasses 107 square kilometres and is accessible either via a 26 km access road west from the Robert Campbell Highway or a 1,200 m long all-season gravel airstrip.<br>Yukon Zinc's Wolverine Mine is a high grade zinc-silver-copper-lead-gold underground mine, with on site milling capabilities of 1,700 tpd to produce zinc, copper and lead concentrates. The current mine life is 9.5 years based on a 5.2 million tonne deposit and there is potential to expand the reserve through drilling. Yukon Zinc completed major site construction at Wolverine throughout 2009 and 2010. Mill commissioning commenced in late 2010 and operations started in 2011. In March 2012, commercial production was achieved and in the first quarter of 2013, full design capacity was reached. The majority of the concentrate from Wolverine is trucked to the port at Stewart, British Columbia. The Wolverine Mine was put on care and maintenance in January 2015. Yukon Zinc is fully permitted to operate the Wolverine Mine. Yukon Zinc was issued a Quartz Mining License by the Yukon Government in December 2006 and a Type A Water Licence by the Yukon Water Board in October 2007. | General care and maintenance activities include:<br>• Maintenance of site infrastructure;<br>• Water treatment and monitoring; and<br>• Waste management.<br><br>General care and maintenance activities may include effects on:<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife.<br><br>As the mine is licensed to operate, the operations of the mine may have potential effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |

| Project (Proponent) | Associated YESAB Project #s | Approx. Distance to KZK Project | Timeline | General Description | Potential Activities/Effects | Potential for effects to land users from LFN, RRDC, residents of Ross River and Watson Lake | Potential for unique effects to land users (i.e. LFN, RRDC, residents of Ross River or Watson Lake)* |
|---|---|---|---|---|---|---|---|
| **Roads, Access Roads and Trails** | | | | | | | |
| Geotechnical Investigation and Quarry Pit Development (Transportation Engineering Branch) | 2014-0058 | 110 km | 2014 to 2039 | Government of Yukon, Highways and Public Works, Transportation Engineering Branch is proposing geotechnical testing and development of an aggregate pit on a 5 hectare (ha) parcel of land, located at km 237.5 of the North Canol Road, approximately 11 km northeast of Ross River. The purpose of the project is to develop a long-term source (25 to 50 years) of granular material for road reconstruction, watercourse crossings and annual road erosion control and slope stabilization for the Deep Creek watercourse crossing, and for erosion control at the Ross River Ferry Crossing. Pit development was to begin August 2014. Future geotechnical and pit development activities will occur between June and October, annually. The temporal scope for the assessment of the project is 25 years. | Project activities include:<br>• Use of heavy equipment;<br>• Access construction;<br>• Clearing, grubbing, stripping and site preparation;<br>• Burning of brush and slash;<br>• Quarry pit development;<br>• Blasting, granular extraction (total of approximately 150 000 $m^3$), and stockpiling on site;<br>• Geotechnical investigations;<br>• Establishment of a temporary camp at km 235.5 (8 to12 people) to support blasting, sorting and stockpiling activities every 4 to 5 years for approximately 2 weeks;<br>• Establishment of fuel storage and equipment maintenance/storage areas at camp;<br>• Waste management and disposal; and<br>• Decommissioning and reclamation.<br><br>The project activities include potential effects on:<br>• Air quality;<br>• Noise levels;<br>• Surface water quality;<br>• Aquatic resources;<br>• Soil;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| Finlayson Winter Trail (Inconnu Lodge Limited) | 2015-0175 | 40 km | 2016-2017 | Inconnu Lodge Limited is proposing to use an existing winter trail, approximately 35 km, from the Robert Campbell Highway (at approximately km 248) to the west side of McEvoy Lake in southeast Yukon. From McEvoy Lake, the existing route follows the lakeshore (on the lake side) for about 3 km. From this location, a 3 km diversion will be constructed/utilized from the lake to the Inconnu airstrip. In 2016, Inconnu Lodge Limited intends to utilize the portion of the winter trail from the airstrip to the lake, along the lakeshore and continue for approximately 100 m west of the lake to recover and transport a broken-down bulldozer and a fuel tank back to the airstrip. In 2017, Inconnu Lodge Limited plans to walk a D7 bulldozer out to the Robert Campbell Highway and possibly walk a small excavator back to the airstrip. The use of the winter trail is expected to occur over two years. | Project Activities:<br>• Use of an existing winter trail to McEvoy Lake and along the shoreline of the lake crossing of two completely frozen creeks in 2017 (creeks less than 1 m wide and less than 0.5 m deep);<br>• Diversion from the existing winter trail around a swampy area (less than 300 m), potentially need to remove a few small trees; no brushing;<br>• Diversion from McEvoy Lake to airstrip (approximately 3 km x up to 4 m); some brushing and removal of small trees;<br>• Transport of a broken bulldozer and 5,000 gallon fuel tank from the existing trail to the airstrip; and<br>• Transport of a D7 bulldozer from the airstrip to the highway and potential transport of a small excavator from the highway to the airstrip.<br><br>The project activities include potential effects on:<br>• Air quality;<br>• Noise levels;<br>• Vegetation; and<br>• Wildlife. | Yes | Unknown |
| **Other Activities** | | | | | | | |
| Single/Group Trapline Concessions | N/A | N/A | Ongoing (generally, October to March trapping season) | The following single trapline concessions are present within Finlayson Caribou Herd range: 415; 252; 255; 233; 250; 251; 249; 258; 349; and 341.<br>The following group trapline concessions are present within Finlayson Caribou Herd range: 405. | Potential effects of trapping activities include those on:<br>• Wildlife. | Yes | Unknown |
| Outfitting Concessions | N/A | N/A | Ongoing (generally, August to October season) | The following outfitting concessions are present within Finlayson Caribou Herd range: 9; 20; 22; and 15. | Potential effects of use of outfitting concessions include those on:<br>• Wildlife. | | Unknown |
| Campgrounds | N/A | N/A | Ongoing | The following campgrounds are present in the region:<br>• Lapie Canyon Campground; and<br>• Francis Lake Campground. | Potential effects of campground use include those on:<br>• Wildlife. | Yes | Unknown |

*To date no unique effects have been identified during BMC's engagement with LFN, RRDC, or residents of Watson Lake and Ross River.




Kudz Ze Kayah Project

Campground

Quartz Mining Activity

FCH Habitat Range 25km Buffer

FCH Habitat Range

Trapline Concession

Outfitting Concession

Transportation Projects

Tote Road/Proposed Access Road

Primary road

Secondary Road

Yukon Territory Border

BMC MINERALS

ALEXCO ENVIRONMENTAL GROUP

# KUDZ ZE KAYAH PROJECT

## FIGURE 1-1

## PROJECTS AND ACTIVITIES TO BE CONSIDERED IN THE ENVIRONMENTAL CUMULATIVE EFFECTS ASSESSMENT

OCTOBER 2018

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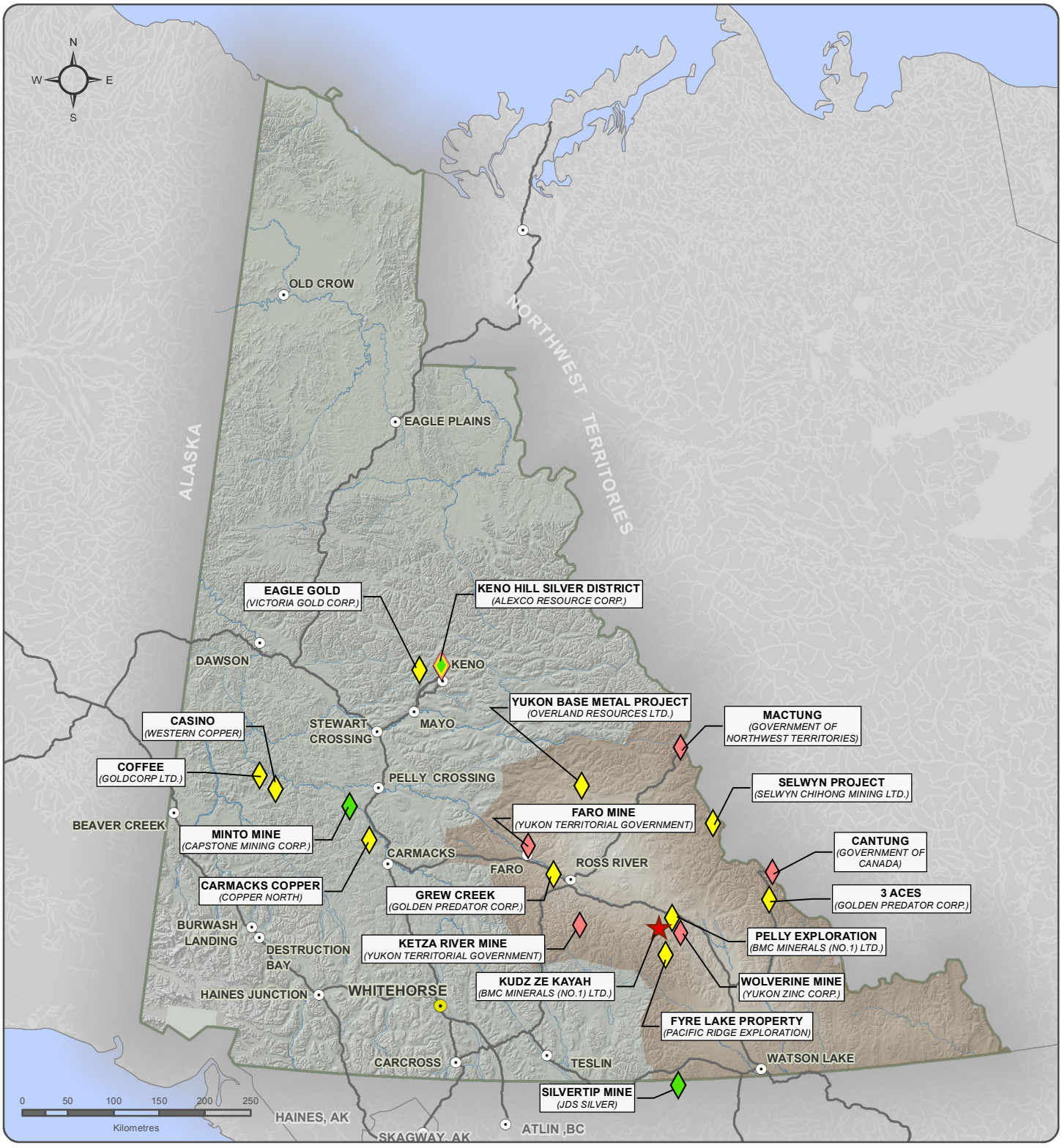
## Table 1-2: Projects and Activities to be Considered in the Cumulative Effects Assessment for Socio-economic Valued Components

| Project (Proponent) | Description |
|---|---|
| **Kaska Traditional Territory** | |
| 3 Aces (Golden Predator Corp.) | An advanced exploration gold project located in the southeast Yukon approximately 40 km south of the Cantung mine and accessed from the Nahanni Range Road. |
| Cantung Mine (Abandoned) | Tungsten mine located in the Northwest Territories near the Yukon border and accessed through the Yukon via the Nahanni Range Road. Began production in 1962 and operated till 1986. Intermittent operations from 2002 through 2015. Abandoned by North American Tungsten in 2015 and now under care and maintenance by the federal government. |
| Faro Mine (Abandoned) | Major lead-zinc producer through three periods beginning in 1969 and the late 1990s when the last owner went bankrupt and abandoned the site. Site is under Yukon government care and maintenance. Planning and engineering studies for reclamation underway since 2009 with some cleanup and remediation work completed but most still to do. |
| Fyre Lake Property (Pacific Ridge Exploration) | Copper-cobalt-gold exploration project located approximately 30 km south of the Project. |
| Grew Creek (Golden Predator Corp.) | Gold exploration project located along the Robert Campbell Highway between Ross River and Faro. |
| Ketza River Mine (Abandoned) | Gold mine in production from 1988 to 1991. Abandoned by owners in 2015 and currently under Yukon government care and maintenance. |
| Mactung (Government of Northwest Territories) | Tungsten deposit located on the Yukon-NWT border and accessed by the North Canol Road. Entered the permitting stage in 2009 as an underground mine with screening completed in 2014. Purchased by the Government of the Northwest Territories in November 2015 after North American Tungsten declared bankruptcy. |
| Pelly Exploration (BMC Minerals (No.1) Ltd.) | A Class 3 mineral exploration program at the Pelly Property located 130 km southeast from Ross River and 160 km northwest from Watson Lake. The project will be accessed via an existing access road and/or helicopter. Activities are scheduled to take place year round for five years. |
| Selwyn Project (Selwyn Chihong Mining Ltd.) | Proposed lead-zinc mine at Howard's Pass along Yukon-NWT border. A large-scale deposit with expected 11-year mine life and employment of 750. In the advanced exploration stage and some studies begun in preparation for entering permitting stage however the project was put on hold by the company in February 2016. |
| Silvertip Mine (JDS Silver) | Silver-lead-zinc mine under construction in BC 16 km south of the Yukon border approximately 90 km south west of Watson Lake, and was scheduled to begin production in Q4 2016. |
| Wolverine Mine (Yukon Zinc Corp.) | Underground zinc mine with 300 employees that went into full production in 2013. Mine life estimated at 9.5 years. Production stopped in January 2015 and company placed under court protection while going through bankruptcy reorganization. Creditors accepted repayment plan in 2015. Property is on care and maintenance but underground has been flooding. |
| Yukon Base Metal Project (Overland Resources Ltd.) | Lead-zinc exploration project located west of the North Canol Road approximately 125 km north of Ross River. |
| **Yukon** | |
| Carmacks Copper (Copper North) | Located west of Carmacks. Planned open pit copper-gold-silver mine with an expected life of 7 years with estimated 180 jobs at full production. Initially proposed to use sulphuric acid heap leach technique, which local First Nation and others protested. Conditionally approved by YESAB and issued mining licence by YG in 2008/09 but refused water licence by Water Board. Lost court proceedings against Water Board and has now re-engineered the project to address concerns. |
| Casino (Western Copper) | Proposed copper-gold mine located west of Pelly Crossing. In the permitting stage. Expected capital costs in the $2.5 billion range with a 22 year mine life. |

| Project (Proponent) | Description |
|---|---|
| Coffee (Goldcorp Ltd.) | Planned open pit gold mine in the White Gold district south of Dawson City, with 10 year mine life. Currently in exploration phase. Purchased by Goldcorp in May 2016. |
| Eagle Gold (Victoria Gold Corp.) | Fully permitted open pit gold mine awaiting production decision. Located approximately 80 km north of Mayo in the central Yukon. Planned 10 year mine life with expected employment of 350. |
| Keno Hill Silver District (Alexco Resource Corp.) | The Keno district produced silver from numerous mines from 1920 to 1989 with a temporary closure in the mid-1940s. Alexco resumed underground silver production at Bellekeno in late 2011 until shutting down in 2013. The company has other deposits in the district and is also responsible for overall site reclamation on behalf of government. |
| Minto Mine (Capstone Mining Corp.) | Copper mine located west of the Yukon River near Pelly Crossing in the central Yukon. Began production in 2007. Open pit mining ceased in October 2016. Underground mining and milling continue with a temporary closure planned for mid to late 2017. |
| **Other activities** | |
| Single/Group Trapline Concessions<br>Outfitting Concessions<br>(see Figure 1-1) | Trapline and outfitting concessions contribute to the economy of Yukon and are considered for potential cumulative effects with the Project. |




**PROJECT STATUS**

- Construction/Active
- Exploration/Licencing
- Temporary Closure/Reclamation/Closed/Abandoned
- Exploration/Licencing/Temporary Closure/Reclamation/Closed/Abandoned
- Kaska Dena First Nation (Ross River Dena Council and Liard) Traditional Territory



AEG

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## KUDZ ZE KAYAH PROJECT

# FIGURE 1-2

## PROJECTS AND ACTIVITIES TO BE CONSIDERED IN THE SOCIO-ECONOMIC CUMULATIVE EFFECTS ASSESSMENT

OCTOBER 2018

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## 1.2 Cumulative Effects Assessment Methods

The CEA for each VC is completed in each VC chapter. The overall CEA approach includes the following steps:

- Consider how residual effects associated with the Project may interact with effects of other projects in the area to cumulatively impact VCs. Cumulative effects are considered for each VC for which it is shown there are Project-specific residual effects; however, not all residual effects will contribute to measurable cumulative effects. In order to be considered in the CEA, the following conditions must be met:
  - There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
  - The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area); and
  - The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time).
- Characterize and analyze cumulative effects interactions identified from the previous step;
- Develop mitigation measures to reduce or eliminate potential cumulative effects so they are not significant. As required in the Proponent's Guide to Executive Committee Screenings (YESAB, 2005a), the rationale for the expected success of these mitigation measures will also be provided, including the results of any field studies and research;
- Identify and define residual cumulative effects after application of the mitigation measures. Where identified, the residual cumulative effects will be characterized by direction, magnitude, geographic extent, frequency and timing, duration, reversibility, and context using the same definitions as those used for Project-specific residual effects; and
- Determine the significance of residual cumulative effects. Similar to the Project-specific methods, a determination of significance will be made for each cumulative effect based on the definition developed for the VC.

# 2. AIR QUALITY

## 2.1 ASSESSMENT BOUNDARIES

The local and regional study areas for air quality are described in the table below and are shown in Figure 2-1. The study area boundaries have been selected to include areas where measurable changes in ambient air quality might be caused by the Project, and include camp as a sensitive receptor. The camp was selected as a receptor because ambient air contaminant concentrations at the camp will be representative of exposure to off-duty workers. Modelling results are also presented graphically for the entire modelling domain, corresponding to the regional study area, to evaluate the extent of predicted changes in air contaminant concentrations associated with Project activities.

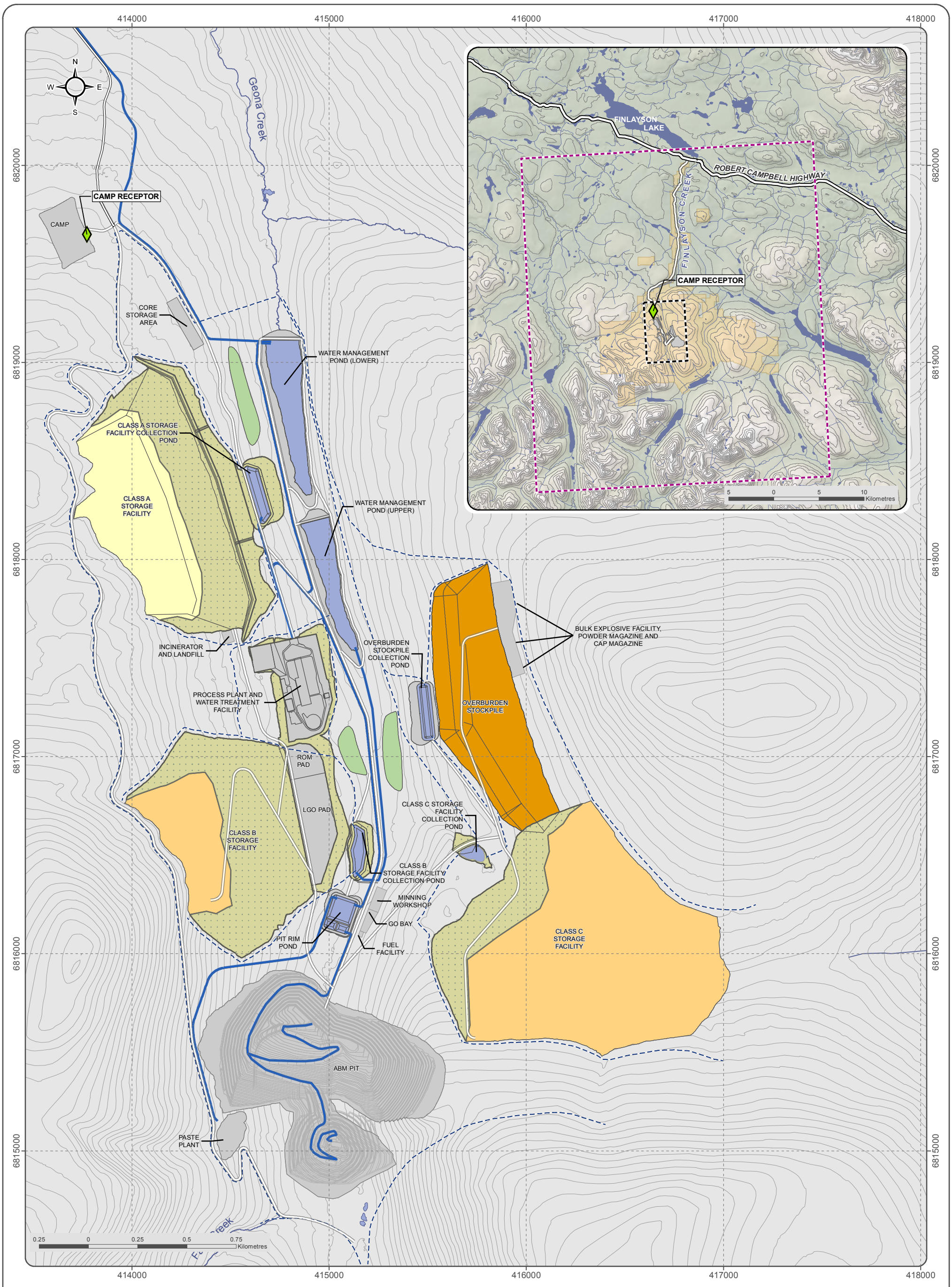
**Table 2-1: Proposed Study Areas for Air Quality**

| Study Area | Air Quality Specific Study Area Description |
|---|---|
| Local Study Area | The local study area is 5 km by 5 km, centered on the mine footprint, and includes the camp as a receptor. |
| Regional Study Area | The regional study area is 40 km by 40 km and encompasses the mine footprint and the entire Tote Road/Proposed Access Road. Grid spacing is smaller in the local study area than in the regional study area. |

Temporal boundaries are defined to include all Project phases in which effects are expected to occur. The Project phases considered in the air quality EA include the following:

- **Construction Phase**: will last approximately two years and includes Project site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: will last approximately 10 years and includes open pit and underground mining and ore processing; and
- **Decommissioning, Reclamation and Active Closure Phase** (referred to as Closure Phase): will last approximately three years.

As there are minimal or no physical activities during the transition closure period and the post-closure period, minimal air emissions are expected during these phases (i.e., less than those assessed for Closure Phase) and they have not been included in the assessment of air quality.




Noise Receptor
Pipeline
Diversion Ditch
Class A Storage Facility
Class B and C Storage Facility
Overburden Stockpile
Topsoil Stockpile
Progressive Reclamation, Footprint
Pond/Water
Footprints
Regional Study Area
Local Study Area
Tote Road/Proposed Access Road
Proposed Project Site Road
Contours (10 m)



Datum: NAD 83; Projection: UTM Zone 9N



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# KUDZ ZE KAYAH PROJECT

## FIGURE 2-1

## PROJECT SITE LAYOUT AND ASSESSMENT BOUNDARIES

OCTOBER 2018

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(*Last edited by: amatlashevska;10/10/2018/10:11AM*)

## 2.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for air quality and are considered through the CEA:

- Increase in ambient concentrations of particulate matter (TSP, $PM_{10}$, $PM_{2.5}$) at receptors from fugitive dust;
- Increase in ambient concentrations of air contaminants (TSP, $PM_{10}$, $PM_{2.5}$, CO, $NO_2$, $SO_2$) at receptors from stationary equipment and vehicle emissions; and
- Emission of Greenhouse Gases contributing to territorial and national inventories.

## 2.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present, and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the Project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for air quality are identified through the screening in Table 2-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 2-2: Cumulative Effects Screening for Air Quality**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| *Quartz Mining and Exploration* | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | Yes | Yes |
| Grew Creek (*Golden Predator Corp.*) | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | No | No |

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Ketza River Mine *(Ketza Group/ Veris Group)* | Yes | No | N/A | N/A |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | Yes | Yes |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | Yes | Yes |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | No | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | Yes | No | Yes | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | Yes | Yes (Emission of Greenhouse Gases contributing to territorial and national inventories) | Yes | Yes |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | Yes | No | N/A | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | Yes | No | N/A | No |
| Outfitting Concessions | Yes | No | N/A | No |
| Campgrounds | Yes | No | N/A | No |

No overlap in space is identified with any of the projects listed in Table 2-2 for the air contaminants subcomponent of the air quality VC. However, greenhouse gases overlap both in time and space with most of the projects listed, because they have effects on the global scale and over the long-term.

The Fyre Lake Property project could overlap in time with the construction phase of the KZK Project as its timeline is until 2020. The Fyre Lake Property project activities that could result in emissions of GHGs (Green house gasses) include exploration, re-establishment and use of existing camp, drill pad and heli-pad construction, clearing, drilling, use of helicopter and float plane, waste management, progressive reclamation, and final decommissioning. The magnitude of the residual effects of the Fyre Lake Property project on green house gas (GHG) emissions is not known, and are assumed to be less than that of the KZK Project.

The Grew Creek project is expected to be completed in 2016, therefore no overlap in time is expected with the Project. The Ketza River Mine is currently under care and maintenance and GHG emissions are expected to be minimal, so there is no overlap in type of effect.

The Pelly Exploration project could overlap in time with the construction phase of the KZK Project as its timeline is until 2021. The Pelly Construction project activities that could result in emissions of GHGs include the establishment of a camp, the use of heavy equipment, clearing, trail construction, drilling, helicopter use, fuel use, waste management, progressive and final reclamation. The magnitude of the residual effects of the Pelly Exploration project on GHG emissions is not known, but assumed to be less than that of the KZK Project.

The Selwyn project could overlap in time with the construction phase of the KZK Project as it is assessed until 2021. The Selwyn project activities that could result in emissions of GHGs include drilling, clearing, line cutting, helicopter use, trail construction, use of heavy equipment, waste management and progressive reclamation. The magnitude of the residual effects of the Selwyn project on GHG emissions is not known, but assumed to be less than that of the KZK Project.

The Yukon Base Metal project is only assessed until 2019 and should therefore not overlap in time with the KZK Project.

The Wolverine Mine is currently in care and maintenance and has a 9.5 year mine life should it return to operation. Under care and maintenance, the GHG emissions are expected to be minimal so there is no overlap in type of effect. Because it is unknown if or when Wolverine Mine will return to operation, it was not considered to have cumulative effects with the KZK Project.

Geotechnical investigation and quarry pit development are expected to overlap in time with all Project phases. Transportation Engineering Branch activities that could result in emissions of GHGs include the use of heavy equipment, access construction, clearing, grubbing, stripping and site preparation, burning of brush and slash, quarry pit development, blasting, granular extraction, establishment of a temporary camp, waste management, decommissioning, and reclamation. The magnitude of the residual effects of geotechnical investigation and quarry pit development on GHG emissions is not known, but assumed to be less than that of the KZK Project.

The Finlayson winter trail, trapline and outfitting concessions, and campgrounds are not expected to result in substantial emissions of GHGs and are not considered to have cumulative effects with the Project.

In summary, the following potential cumulative effects have been identified for air quality:

- Emission of Greenhouse Gases contributing to territorial and national inventories.

## 2.4 CUMULATIVE EFFECTS MITIGATION MEASURES

Potential cumulative effects on air quality and identified mitigation measures are summarized in Table 2-3 and discussed further below.

**Table 2-3: Proposed Cumulative Effects Mitigation Measures for Air Quality**

| Potential Cumulative Effect | Mitigation Measures Identified for Project Effects | Additional Mitigation Measures (if practicable) | Predicted Effectiveness of Mitigation Measure (high, medium, low) | Residual cumulative effect identified? (Yes/No) |
|---|---|---|---|---|
| Greenhouse Gas Emissions | Use filters, scrubbers, and other pollution control devices at processing facilities | No additional mitigation measures are identified | High | Yes |
| | Avoid engine idling | | Medium | |
| | Ensure vehicles and equipment are maintained according to manufacturers' guidelines | | Medium | |
| | Waste reduction at source and recycling | | Medium | |
| | Waste segregation | | Medium | |
| | Incinerator operation for optimum combustion | | Medium | |
| | Regular inspection and maintenance of incinerator | | Medium | |

## 2.5 CUMULATIVE EFFECTS SIGNIFICANCE ASSESSMENT

The significance of cumulative residual effects on air quality is summarized in Table 2-4.

Overall the significance criteria for greenhouse gas emissions cumulative effects are the same as for the Project effects (presented in Section 6.4.3 of the Project Proposal). However, little information is available on the GHG emissions of other projects, resulting in high uncertainty. It is expected that the overall contribution to Canadian GHG inventory will remain small, and therefore magnitude is anticipated to be low and an overall rating of not significant.

**Table 2-4: Cumulative Effects Significance Assessment for Air Quality**

| Residual Cumulative Effect | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Economic and Social Context | Probability | Cumulative Effect Significance (Significant/ Not significant) |
|---|---|---|---|---|---|---|---|---|---|
| Greenhouse Gas Emissions | Adverse | Low | Beyond Regional | Far future | Continuous | Reversible Long-term | Neutral | Very Likely | Not significant |

Note: Criteria definitions are provided in Section 6.4.3 of the Project Proposal

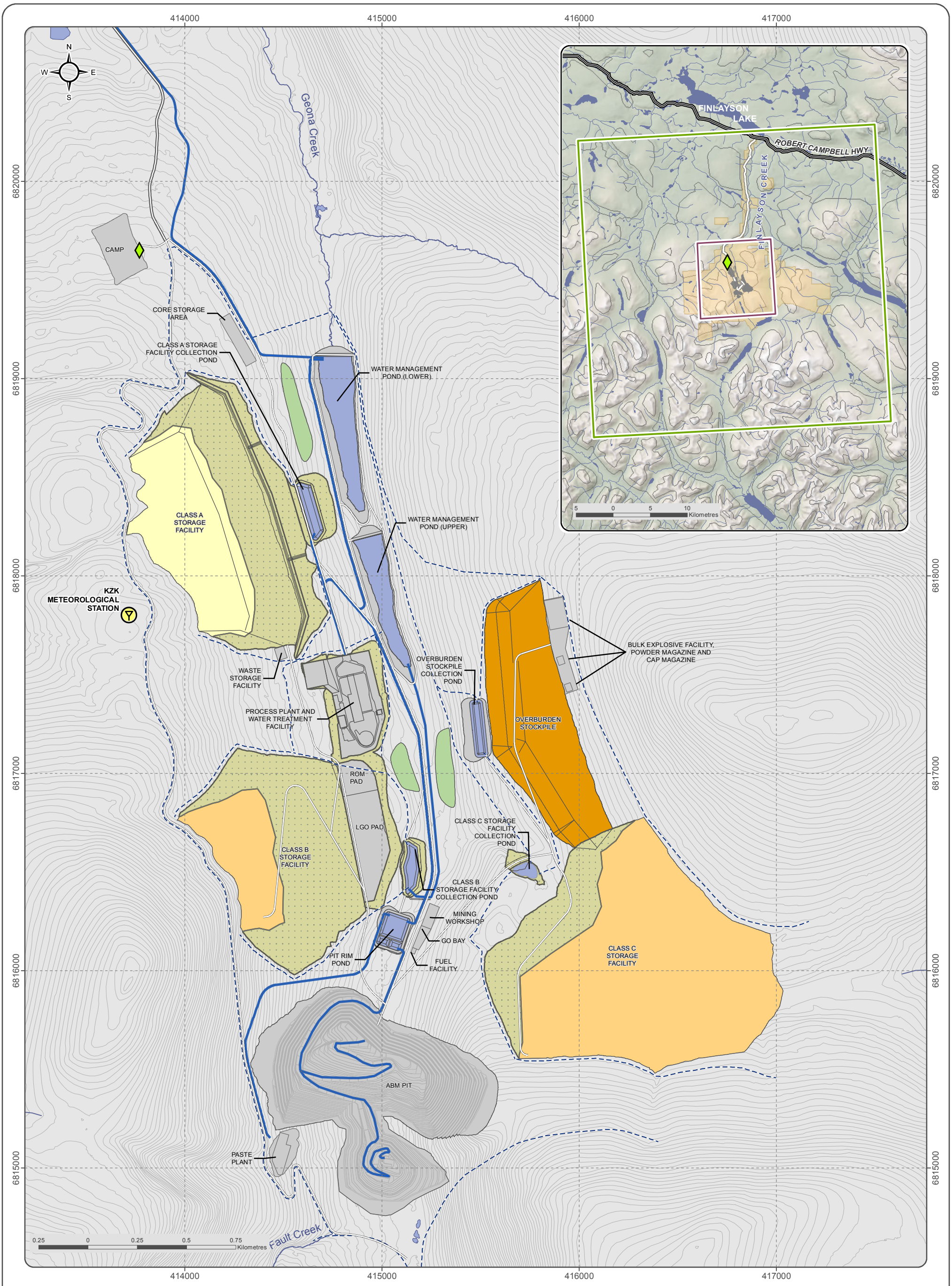
# 3. NOISE

## 3.1 ASSESSMENT BOUNDARIES

The local and regional study areas for noise levels are described in the table below and are shown in Figure 3-1. The study area boundaries have been selected to include areas where measurable changes in sound levels might be caused by the Project, and include the camp as a sensitive receptor. The camp was selected as a receptor because the noise level at camp will be representative of exposure to off-shift workers. The regional study area was selected to evaluate the potential effects of increased traffic on the Access Road, and the extent of predicted changes in baseline noise levels associated with the Project activities.

**Table 3-1: Proposed Study Areas for Noise**

| Study Area | Noise Specific Study Area Description |
|---|---|
| Local Study Area | The local study area is 4.6 km by 6.0 km, centered on the Project Footprint, and includes camp as a sensitive receptor. |
| Regional Study Area | The regional study area is 32 km by 36 km and encompasses the Project Footprint and the entire Tote Road/proposed Access Road. |




Receptor
Meteorological Station
Pipeline
Diversion Ditch

Class A Storage Facility
Class B and C Storage Facility
Overburden Stockpile
Topsoil Stockpile
Progressive Reclamation
Pond/Water

Local Study Area
Regional Study Area
Tote Road/Proposed Access Road
Proposed Project Site Road

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# KUDZ ZE KAYAH PROJECT

## FIGURE 3-1

## NOISE LOCAL AND REGIONAL STUDY AREAS

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Datum: NAD 83; Projection: UTM Zone 9N

## 3.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following residual effects for the Project have been identified for noise and are considered through the CEA:

- Increase in daytime noise levels at camp receptor;
- Increase in night-time noise level at camp receptor; and
- Blasting noise perceptible at camp receptor.

## 3.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present and future projects/activities to be considered all of the following conditions must be met:

1. There is information available to identify if the Project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other projects or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other projects or activity (i.e., effects occur in the same area).

The potential cumulative effects for noise are identified through the screening in Table 3-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 3-2: Cumulative Effects Screening for Noise**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| *Quartz Mining and Exploration* | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp.*) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |
| Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | No | N/A | N/A | No |
| Outfitting Concessions | No | N/A | N/A | No |
| Campgrounds | No | N/A | N/A | No |

Note: If "No" is indicated for a condition the remaining conditions are indicated as N/A (not applicable) as all conditions must be met for potential cumulative effect to be identified.

As indicated in the table above, no projects or activities have been identified to overlap with the Project's residual effects in type of effect, in time, and in space simultaneously. Therefore, no potential cumulative effects have been identified for noise. No further assessment is required.

# 4. SURFACE WATER

## 4.1 ASSESSMENT BOUNDARIES

The local and regional study areas for surface water quality and quantity are described in Table 4-1 and shown in Figure 4-1.

The local study area (LSA) is defined as the Geona Creek catchment, including the footprint of the proposed mine infrastructure, and Geona Creek downstream to the confluence with Finlayson Creek (KZ-15). These areas are where surface water quantity and/or quality may be affected by the Project activities including the final effluent discharge locations.

The regional study area (RSA) is defined as the LSA (Geona Creek) and the Finlayson Creek catchment downstream of the LSA to the Robert Campbell Highway (KZ-26), and includes South Creek at monitoring location KZ-13 (due to the planned diversion of Fault Creek (KZ-2) into the South Creek catchment). This definition is based on the surface water quality and quantity for the Project area and the location of the discharge points (Geona Creek at KZ-9 and Finlayson Creek at KZ-15).

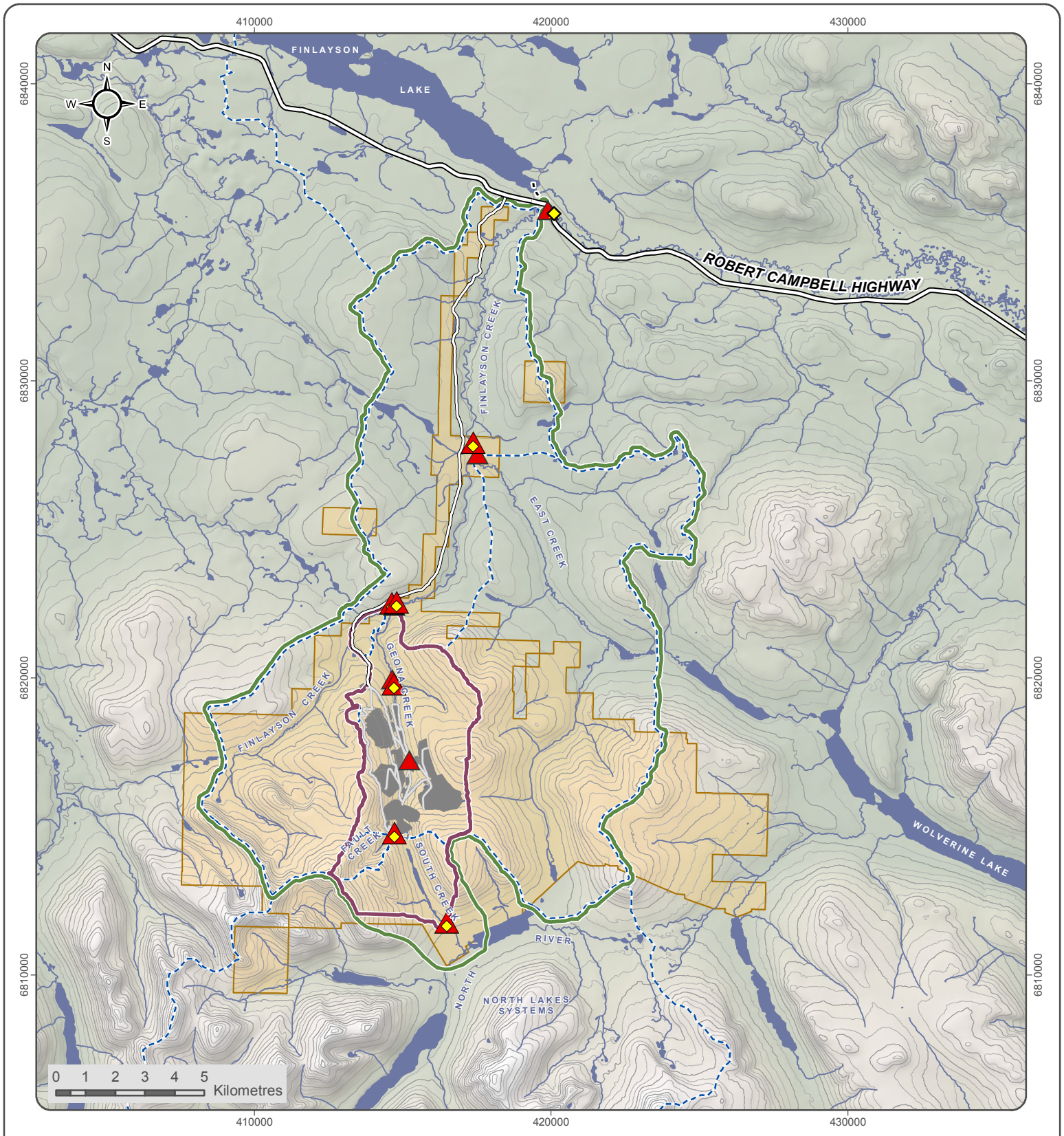
Based on the predicted changes to surface water quality and quantity, assessment of potential effects of the Project on surface water will be restricted to the LSA and RSA, as defined here.

**Table 4-1: Study Areas for Surface Water Quality and Quantity**

| Study Area | Surface Water Specific Study Area Description |
|---|---|
| Local Study Area | Geona Creek (KZ-37), South Creek (KZ-13), and upper Finlayson Creek (KZ-15) |
| Regional Study Area | Lower Finlayson Creek (KZ-26), and North River |

Temporal boundaries are defined to include all Project phases within which effects are expected to occur. The Project phases considered in the surface water EA include the following:

- **Construction Phase**: will last approximately two years and includes site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: will last approximately 10 years and includes open pit and underground development and ore processing;
- **Decommissioning, Reclamation and Closure Phase** (referred to as closure phase): will last approximately three years; and
- **Post-closure Phase**: is assumed to begin once all physical activities have finished on site and will continue until active monitoring is no longer required; the phase is split into two periods: transitional 13-year period during which the ABM open pit continues to fill, ending when the ABM lake begins to spill to Geona Creek (assumed 16 years for the pit to flood following the end of operations) and a 10-year post-closure monitoring period.




- Hydrometric Station
- Water Quality and Hydrometric Station
- Water Quality Sampling Location
- Local Study Area for Surface Water
- Regoinal Study Area for Surface Water
- Location of Proposed Infrastructure
- Drainages/Catchments
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Tote Road/Proposed Access Road
- Proposed Mine Road

# KUDZ ZE KAYAH PROJECT

## FIGURE 4-1

## LOCAL AND REGIONAL STUDY AREA FOR SURFACE WATER

OCTOBER 2018

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## 4.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for surface water and are considered through the CEA:

- Changes in surface water quantity and quality as a result of water diversions and dewatering activities during construction;
- Changes in surface water quantity and quality as a result of water management and discharge during operations;
- Changes in surface water quantity and quality as a result of flooding of ABM Open Pit at closure and ABM lake formation; and
- Changes in surface water quantity and quality as a result of water management and discharge during closure.

## 4.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on surface water;
2. The Project-specific residual effect on surface water overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on surface water overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for surface water are identified through the screening in Table 4-2 and Table 4-3. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

### 4.3.1 Surface Water Quantity

The results of the surface water quantity CEA are presented in Table 4-2.

**Table 4-2: Cumulative Effects Screening for Surface Water Quantity**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| ***Quartz Mining and Exploration*** | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/Veris Group*) | No | N/A | N/A | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | No | *N/A* | *N/A* | No |
| Outfitting Concessions | No | *N/A* | *N/A* | No |
| Campgrounds | No | *N/A* | *N/A* | No |

As indicated in Table 4-2, no projects or activities have been identified to overlap with Project residual effects for surface water quantity in type of effect, in time and in space. Therefore, no potential cumulative effects have been identified for surface water quantity and no further assessment is required.

### 4.3.2 Surface Water Quality

The results of the surface water quality CEA are presented in Table 4-3.

**Table 4-3: Cumulative Effects Screening for Surface Water Quality**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| ***Quartz Mining and Exploration*** | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | No | N/A | N/A | No |

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | *N/A* | *N/A* | No |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | *N/A* | *N/A* | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | *N/A* | *N/A* | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | *N/A* | *N/A* | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | *N/A* | *N/A* | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | No | *N/A* | *N/A* | No |
| Outfitting Concessions | No | *N/A* | *N/A* | No |
| Campgrounds | No | *N/A* | *N/A* | No |

As indicated in Table 4-3, no projects or activities have been identified to overlap with Project residual effects for surface water quality in type of effect, in time and in space. Therefore, no potential cumulative effects have been identified for surface water quality and no further assessment is required.

# 5. GROUNDWATER

## 5.1 ASSESSMENT BOUNDARIES

The local and regional study areas for groundwater are described in Table 5-1 and are shown in Figure 5-1. The local study area (LSA) is defined as the footprint of the proposed mine infrastructure and areas immediately downgradient of these areas where groundwater quantity and/or quality may be affected by the Project activities.

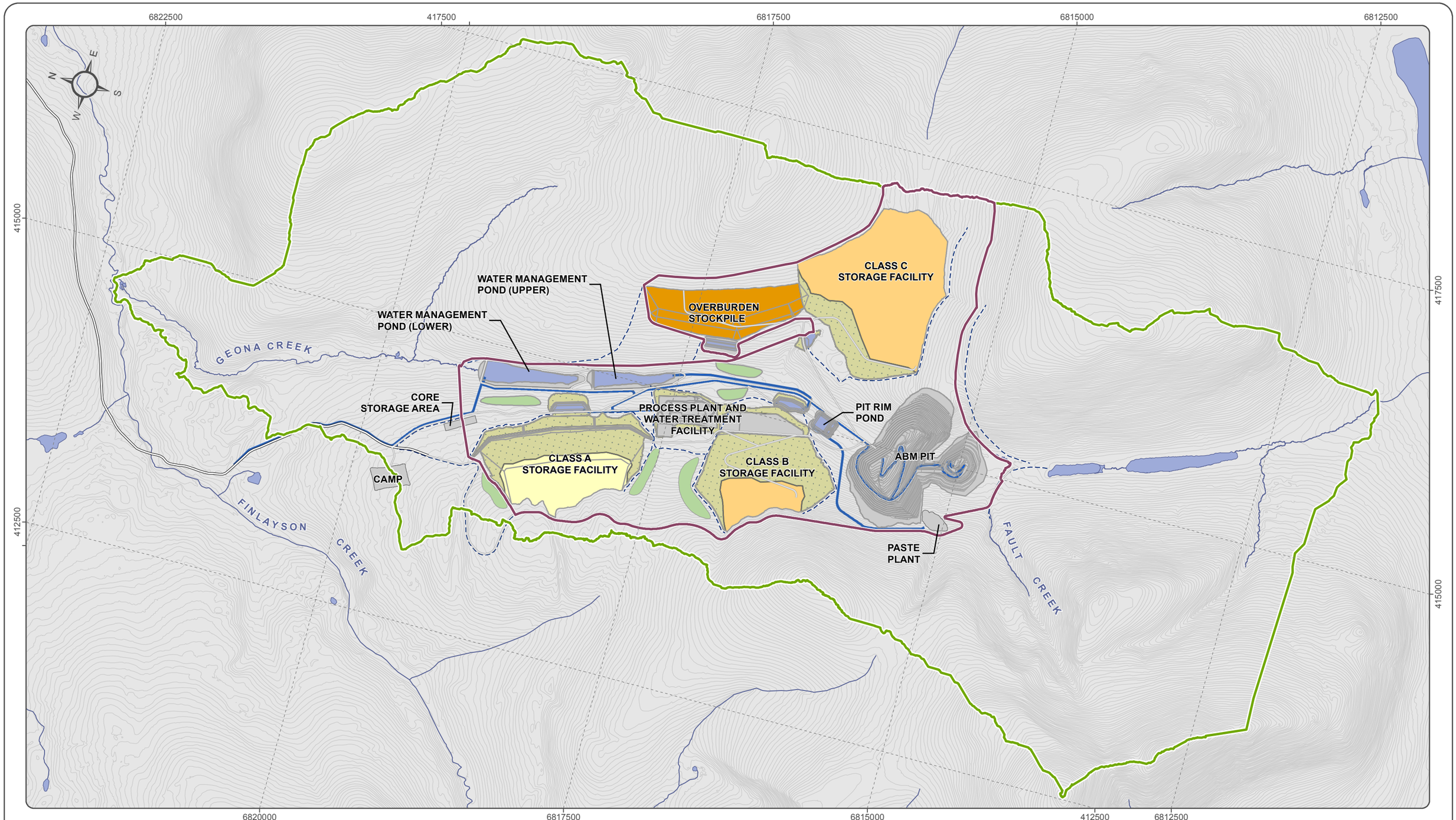
The regional study area (RSA) is defined as the Geona Creek valley downstream of the proposed mine and the upper portion of the watershed to the south of the ABM Deposit. This definition is based on the groundwater flow regime in the area of the Project with groundwater flowing from the west and east valley flanks toward Geona Creek and either discharging directly to Geona Creek or following the valley floor for some distance, primarily within the conductive overburden aquifer, before ultimately discharging to Geona Creek. Based on the observed groundwater flow regime, potential effects from the Project on groundwater will be restricted to the LSA and RSA, as defined here.

**Table 5-1: Proposed Study Areas for Groundwater**

| Study Area | Groundwater Specific Study Area Description |
|---|---|
| Local Study Area | Footprint of proposed mine infrastructure and areas immediately hydraulically downgradient. |
| Regional Study Area | Geona Creek valley downstream of proposed mine and upper portion of watershed to the south of the ABM Deposit. |

Temporal boundaries are defined to include all Project phases within which effects are expected to occur. The Project phases considered in the groundwater EA include the following:

- **Construction Phase**: will last approximately two years and includes site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: will last approximately 10 years and includes open pit and underground development and ore processing;
- **Decommissioning, Reclamation and Closure Phase** (referred to as Closure Phase): will last approximately three years; and
- **Post-closure Phase**: is assumed to begin once all physical activities have finished on site and will continue until active monitoring is no longer required; the phase is split into two periods: transitional 13-year period during which the ABM open pit continues to fill, ending when the ABM lake begins to spill to Geona Creek (assumed 16 years for the pit to flood following the end of operations) and a 10-year post-closure monitoring period.






Datum: NAD 83; Map Projection: UTM Zone 9N



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- Local Study Area
- Regional Study Area
- Class A Storage Facility
- Class B and C Storage Facility
- Overburden Stockpile
- Topsoil Stockpile
- Progressive Reclamation
- Pond/Water
- Pipeline
- Diversion Ditch
- Tote Road/Proposed Access Road
- Proposed Mine Road

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**FIGURE 9-5**

**GROUNDWATER LOCAL AND REGIONAL STUDY AREAS**

OCTOBER 2018

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## 5.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for groundwater and are considered through the CEA:

- Lowering of groundwater table for dewatering of mine workings;
- ABM lake formation and long-term effects on groundwater table;
- Indirect effects from ABM lake formation on Geona Creek and South Creek; and
- Drawdown of groundwater table and reduced baseflow to Geona and Finlayson Creek due to groundwater extraction for camp potable water use and reagent mixing at Process Plant.

## 5.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the Project or activity results in a demonstrable or measurable effect on groundwater;
2. The Project-specific residual effect on groundwater overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on groundwater overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for groundwater are identified through the screening in Table 5-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 5-2: Cumulative Effects Screening for Groundwater**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| ***Quartz Mining and Exploration*** | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | No | N/A | N/A | No |
| Outfitting Concessions | No | N/A | N/A | No |
| Campgrounds | No | N/A | N/A | No |

Note: If "No" is indicated for a condition the remaining conditions are indicated as N/A (not applicable) as all conditions must be met for potential cumulative effect to be identified.

As indicated in Table 5-2, no projects or activities have been identified to overlap with Project residual effects for groundwater in type of effect, in time and in space. Therefore, no potential cumulative effects have been identified for groundwater. No further assessment is required.

# 6. AQUATIC ECOSYSTEMS AND RESOURCES

## 6.1 ASSESSMENT BOUNDARIES

### 6.1.1 Local Study Area

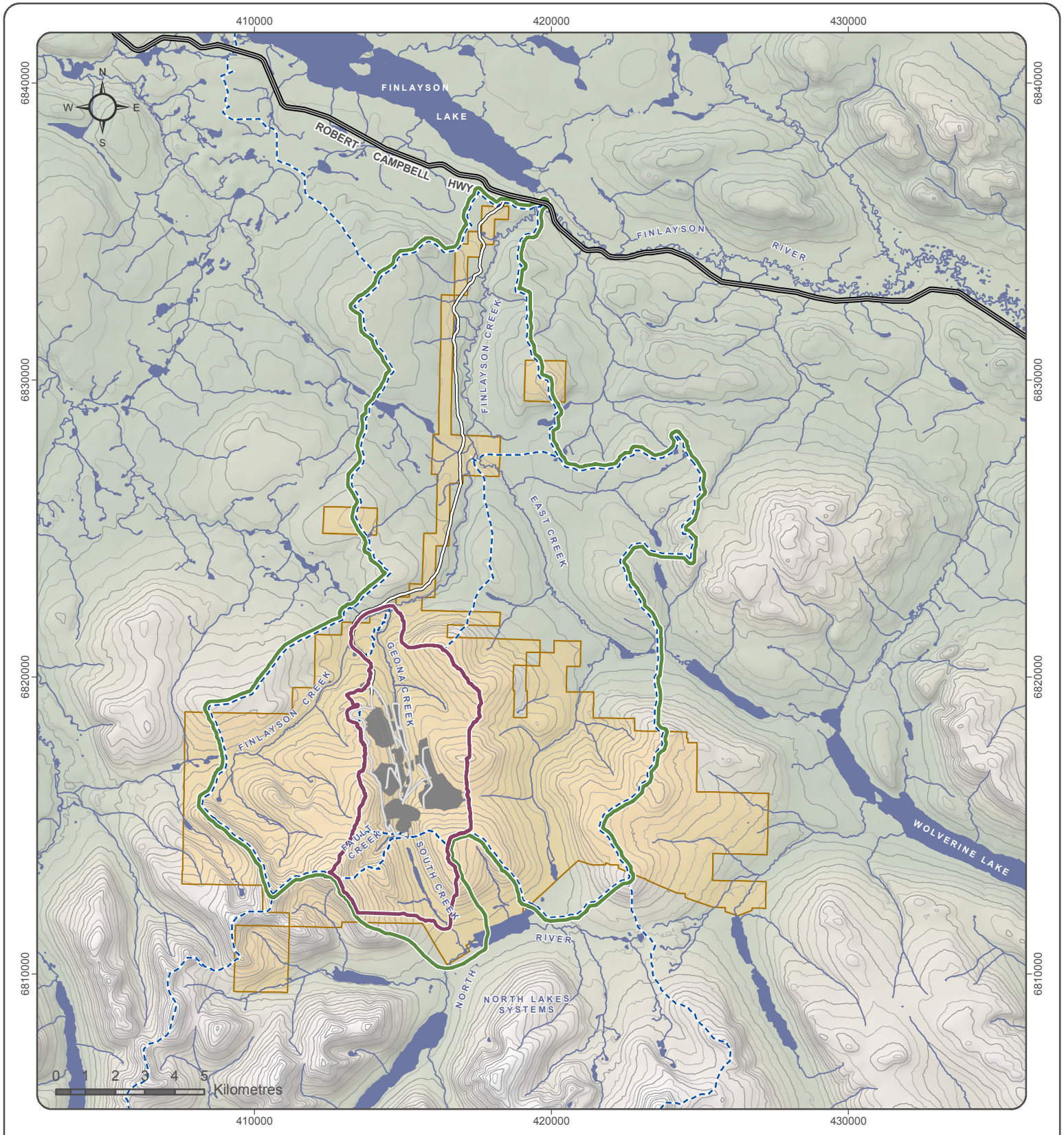
The local study area (LSA) consists of freshwater fish habitats within the Project perimeter, including Geona Creek from its headwaters until its confluence with Finlayson Creek (Figure 6-1). Finlayson Creek upstream of the confluence until the location where non-contact water will be discharged into the creek as well as the South Creek catchment and Fault Creek are located within the LSA.

### 6.1.2 Regional Study Area

The regional study area (RSA) includes the Finlayson Creek, and East Creek catchments (Figure 6-1). The local and regional study areas for aquatic ecosystems and resources are described in Table 6-1.

**Table 6-1: Local and Regional Study Areas for Aquatic Ecosystems and Resources**

| Study Area | Aquatic Ecosystems and Resources Study Area Description |
|---|---|
| Local Study Area | Geona Creek Watershed, Fault Creek Watershed, South Creek Watershed |
| Regional Study Area | Finlayson Creek Watershed, East Creek Watershed |




Local Study Area for Aquatic Studies

Regional Study Area for Aquatic Studies

Location of Mine Infrastructure

Drainages/Catchments

BMC Minerals (No.1) Ltd. Mineral Claim Areas

Tote Road/Proposed Access Road

Proposed Mine Road

# KUDZ ZE KAYAH PROJECT

## FIGURE 6-1

## KZK LOCAL AND REGIONAL STUDY AREA FOR AQUATIC ECOSYSTEMS AND RESOURCES

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## 6.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for aquatic ecosystems and resources and are considered through the CEA:

- Changes in Arctic grayling population Catch per Unit Effort (CPUE) or condition factor;
- Changes in habitat availability, distribution and connectivity;
- Change in surface water quality;
- Change in stream sediment chemistry and particle size distribution;
- Changes in benthic invertebrate community;
- Changes in abundance and diversity of periphyton communities; and
- Changes in chlorophyll *a*.

## 6.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present, and future projects and activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for VC are identified through the screening in Table 6-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 6-2: Cumulative Effects Screening for Aquatic Ecosystems and Resources**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| ***Quartz Mining and Exploration*** | | | | |
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | No |
| ***Roads, Access Roads and Trails*** | | | | |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | No |
| ***Other Activities*** | | | | |
| Single/Group Trapline Concessions | No | N/A | N/A | No |
| Outfitting Concessions | No | N/A | N/A | No |
| Campgrounds | No | N/A | N/A | No |

As indicated in Table 6-2 above, no projects or activities have been identified to overlap with Project residual effects in type of effect, in time, and in space. Therefore, no potential cumulative effects have been identified for aquatic ecosystems and resources. No further assessment is required.

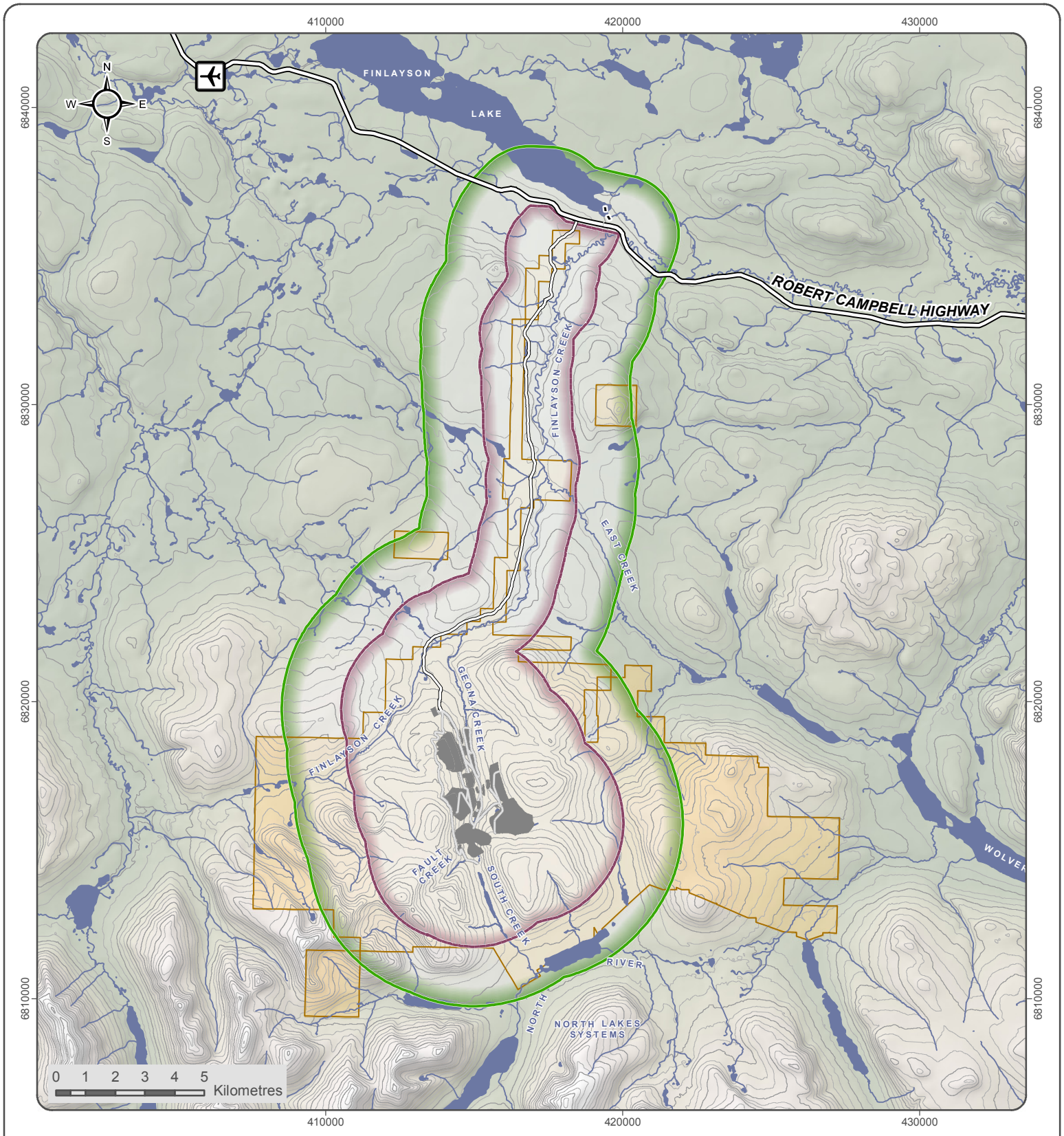
# 7. TERRAIN AND SOILS

## 7.1 ASSESSMENT BOUNDARIES

The local and regional study areas (LSA and RSA) for terrain and soils are described in Table 7-1 and are shown in Figure 7-1.

The LSA encompasses the entire Project Footprint which includes all mine features and clearing areas, including the Access Road and Finlayson Lake airstrip. The total area of the LSA is 12,440.5 ha, while the Project Footprint including infrastructure and mine features is 655.6 ha.

The RSA encompasses the LSA and a 2 km buffer surrounding the LSA.




Finlayson Lake Airstrip Location

Local Study

Regoinal Study

Location of Proposed Infrastructure

BMC Minerals (No.1) Ltd. Mineral Claim Areas

Tote Road/Proposed Access Road

Proposed Mine Road

# KUDZ ZE KAYAH PROJECT

## FIGURE 7-1

## TERRAIN AND SOIL STUDY AREA

OCTOBER 2018



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**Table 7-1: Study Areas for Terrain and Soils**

| Study Area | Terrain and Soils Specific Study Area Description |
|---|---|
| Local Study Area | The local study area encompasses all the Project infrastructure, including the Access Road and the Finlayson Lake airstrip. |
| Regional Study Area | The regional study area includes a 2 km buffer around the LSA. |

The temporal boundaries below are used for the assessment of Project effects on terrain and soils:

- **Construction Phase**: approximately 2-year period including site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: approximately 10-year period including open pit and underground mining and ore processing;
- **Decommissioning, Reclamation and Closure Phase** (referred to as closure phase): approximately 3-year period for decommissioning, reclamation and closure; and
- **Post-closure Phase**: is assumed to begin once all physical activities have finished on site and will continue until active monitoring is no longer required; the phase is split into two periods: a transitional 13-year period during which the ABM open pit continues to fill, ending when the ABM lake begins to spill to Geona Creek (assumed 16 years for the pit to flood following the end of operations) and a 10-year post-closure monitoring period.

## 7.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for terrain and soils and are considered through the CEA:

- Increase in geohazards due to temporarily increased slope instability;
- Loss of soil under Project Footprint; and
- Degradation of soil quality in reclaimed areas.

## 7.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present, and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and

3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for terrain and soils are identified through the screening in Table 7-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 7-2: Cumulative Effects Screening for Terrain and Soils VC**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Fyre Lake Property (*Pacific Ridge Exploration*) | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp.*) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |
| Pelly Explorations (*BMC Minerals (No.1) Ltd.*) | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | *No* |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | *No* |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | *No* |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | *No* |
| Single/Group Trapline Concessions | Yes | No | N/A | *No* |
| Outfitting Concessions | Yes | No | N/A | *No* |
| Campgrounds | No | N/A | N/A | *No* |

Note: If "No" is indicated for a condition the remaining conditions are indicated as N/A (not applicable) as all conditions must be met for potential cumulative effect to be identified.

As indicated in Table 7-2 above, no projects or activities have been identified to overlap with Project residual effects in type of effect, in time, and in space. Therefore, no potential cumulative effects have been identified for terrain and soils. No further assessment is required.

## 7.4 VEGETATION COVER AND COMPOSITION

## 7.5 ASSESSMENT BOUNDARIES

The local and regional study areas (LSA and RSA) for vegetation cover and composition are described in Table 12-3. Figure 7-2 shows the LSA and RSA boundaries.

**Table 7-3: Proposed Study Areas for Vegetation Cover and Composition**

| Study Area | Vegetation Study Area Description |
|---|---|
| Local Study Area (LSA) | The vegetation local study area is centered on the proposed Project Footprint and includes a 3 km buffer around the Project Footprint. The vegetation local study area also includes the Access Road and 1.5 km buffer on either side of the existing road alignment. |
| Regional Study Area (RSA) | Based on ecoregions defined for Yukon Territory, the Project is situated in the Pelly Mountains ecoregion and the Access Road is located in the Yukon Plateau North ecoregion. The vegetation regional study area encompasses both of these ecoregions but is limited to the extent of game management subzone 10-07 due to the direct relationship between ecosystem composition and wildlife. Rare plant species that are known to exist in the southeast section of Yukon were considered for rare plant surveys. |

Temporal boundaries are defined to include all Project phases within which effects are expected to occur. The Project phases considered in the vegetation EA include the following:

- **Construction Phase**: will last approximately two years and includes site preparation and clearing and establishment of Project infrastructure;
- **Operations Phase**: will last approximately 10 years and includes open pit and underground development and ore processing;
- **Decommissioning, Reclamation and Closure Phase** (referred to as closure phase): will last approximately three years; and
- **Post-closure Phase**: is assumed to begin once all physical activities have finished on site and will continue until active monitoring is no longer required.

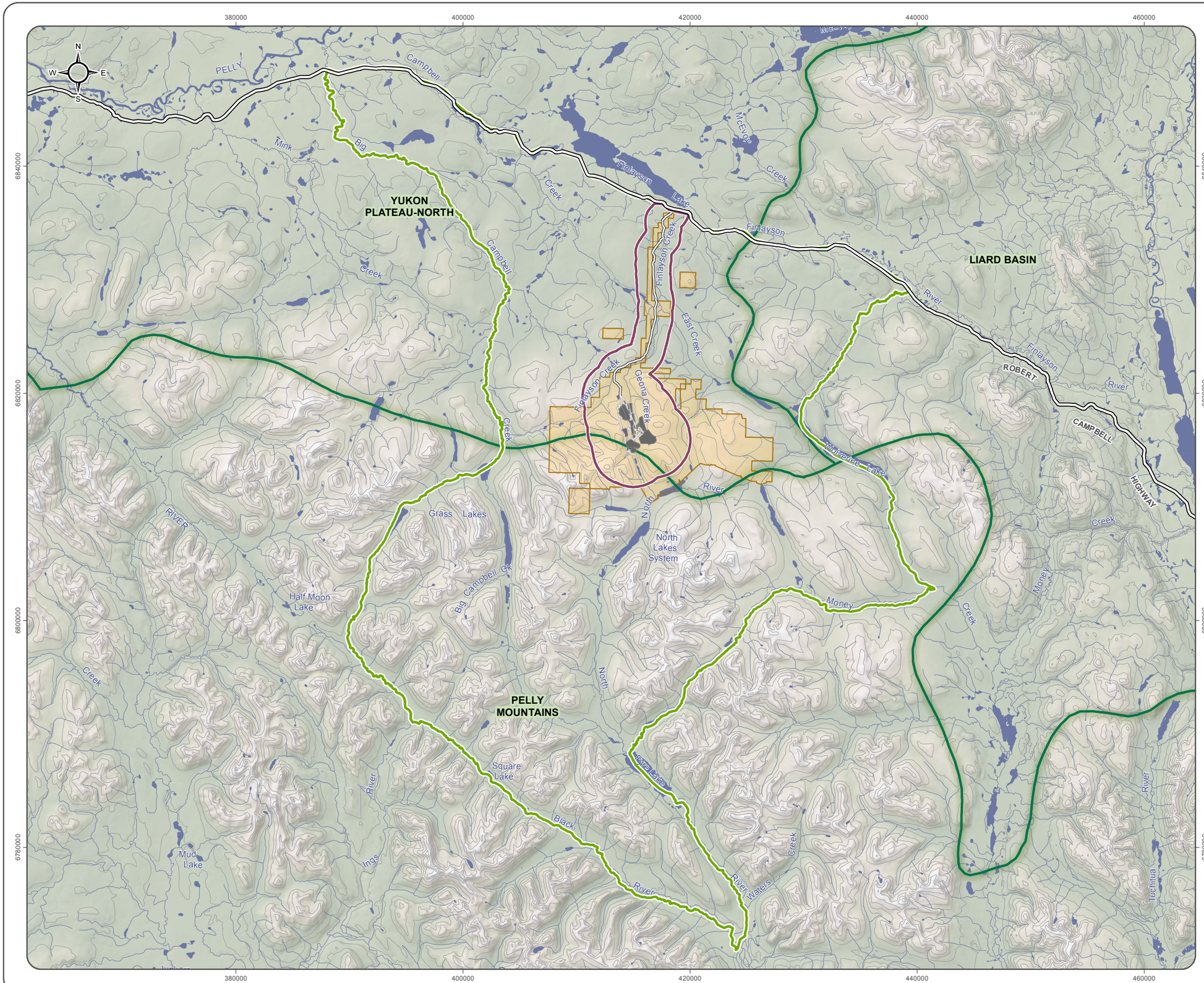


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**FIGURE 7-2**

**REGIONAL AND LOCAL STUDY AREAS FOR VEGETATION COVER AND COMPOSITION**

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- Local Study Area
- Regional Study Area (Game Management Subzone 10-07)
- Ecoregion Boundary Area
- Location of Mine Infrastructure
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Tote Road/Proposed Access Road
- Proposed Mine Road Watercourse
- Waterbody

ALEXCO ENVIRONMENTAL GROUP



Datum: NAD 83; Projection UTM Zone 9N



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## 7.6 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. The following Project residual effects have been identified for vegetation cover and composition and are considered through the CEA:

- Loss of wetland and riparian ecosystems;
- Loss of old growth forest;
- Invasive plant species; and
- Metal increase in traditional use plants or wildlife browse.

## 7.7 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present, and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for vegetation cover and composition are identified through the screening in Table 2-2. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

As indicated in table below, no projects or activities have been identified to overlap with Project residual effects in type of effect, in time and in space. Therefore, no potential cumulative effects have been identified for vegetation cover and composition. No further assessment is required.

**Table 7-4: Cumulative Effects Screening for Vegetation Cover and Composition**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Fyre Lake Property (*Pacific Ridge Exploration)* | No | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No | N/A | N/A | No |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No | N/A | N/A | No |
| Pelly Explorations (*BMC Minerals (No.1) Ltd.*) | No | N/A | N/A | No |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | No | N/A | N/A | No |
| The Yukon Base Metal Project *(Overland Resources Ltd.)* | No | N/A | N/A | No |
| Wolverine Mine (*Yukon Zinc Corp.)* | No | N/A | N/A | No |
| Geotechnical Investigation and Quarry Pit Development *(Transportation Engineering Branch)* | No | N/A | N/A | No |
| Finlayson Winter Trail *(Inconnu Lodge Limited)* | No | N/A | N/A | No |
| Robert Campbell Highway Traffic | No | N/A | N/A | No |
| Single/Group Trapline Concessions | Yes | No | N/A | No |
| Outfitting Concessions | Yes | No | N/A | No |
| Campgrounds | No | N/A | N/A | No |

Note: If "No" is indicated for a condition the remaining conditions are indicated as N/A (not applicable) as all conditions must be met for potential cumulative effect to be identified.

# 8. WILDLIFE AND WILDLIFE HABITAT

## 8.1 ASSESSMENT BOUNDARIES

The local and regional study areas (LSA and RSA) for wildlife and wildlife habitat are described in Table 8-1. Figure 8-1 shows the LSA and RSAs for the Finlayson Caribou Herd (FCH), including their rutting and post calving ranges around the Project, as well as the entire herd range. Figure 8-2 outlines the LSA and RSAs used to assess the other wildlife species. The RSA is defined as Game Management Subzone (GMS 10-07) for species other than caribou. This subzone was defined as the RSA because it is the defined area that Yukon Government (YG) uses for large mammal management

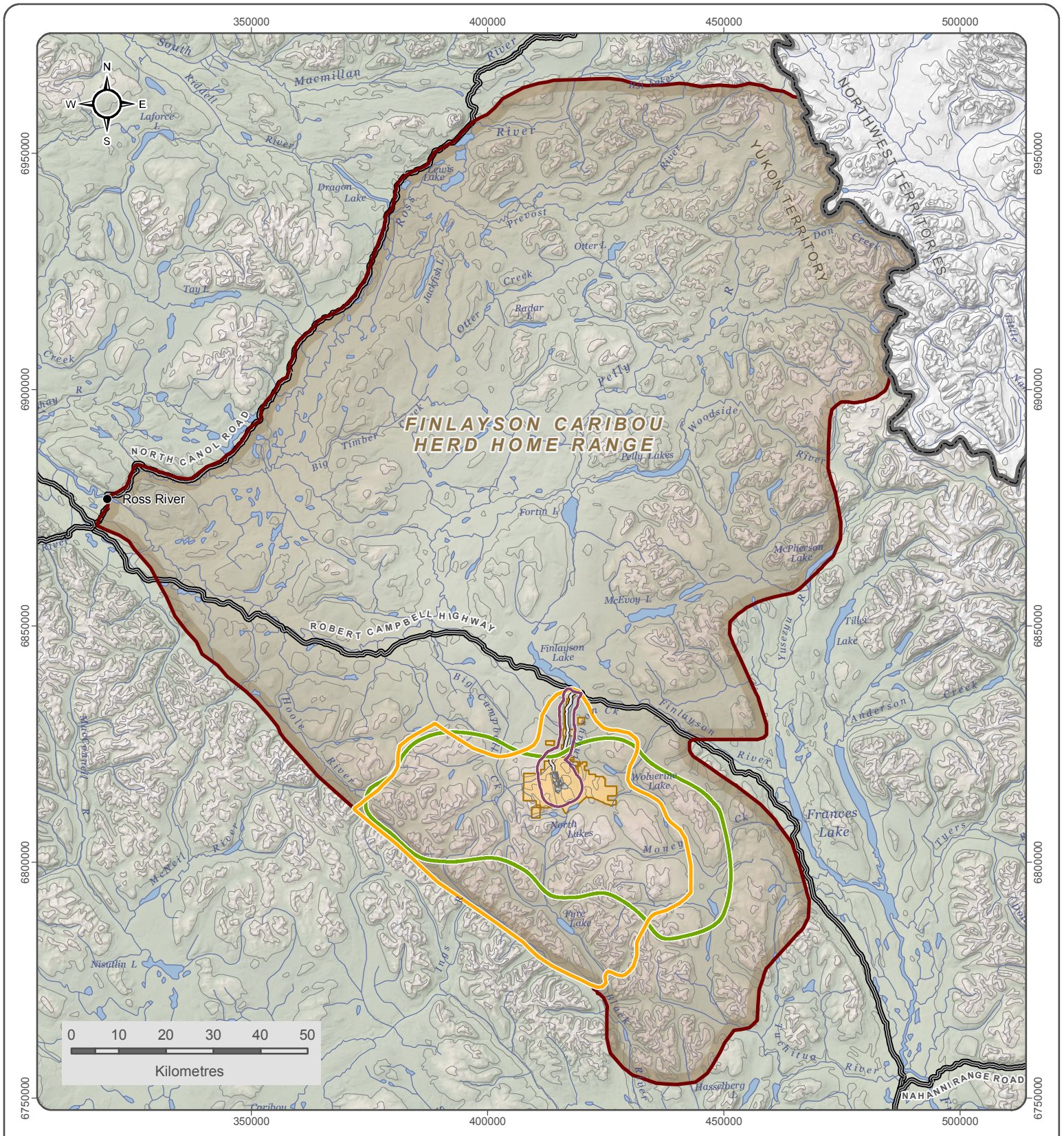
in the region. It has an area of 2,063 km$^2$. The LSA was delineated by a 3 km buffer around the Project Footprint, as well as a 1.5 km buffer around the existing Tote Road alignment, and encompasses an area of 124 km$^2$. The LSA was used to assess birds and smaller mammals since most of their habitat needs are met in the Geona Creek and Finlayson Creek watershed.

The temporal boundaries used in this assessment include all phases of the Project including:

- **Construction**: approximately 2-year period including site preparation and clearing and establishment of Project infrastructure;
- **Operations**: approximately 10-year period including open pit and underground development and ore processing;
- **Closure**: approximately 3-year period for decommissioning, reclamation and closure; and
- **Post-closure**: is assumed to begin once all physical activities have finished on site and will continue until active monitoring is no longer required; the phase is split into two periods: a transitional 13-year period during which the ABM open pit continues to fill, ending when the ABM lake begins to spill to Geona Creek (assumed 16 years for the pit to flood following the end of operations) and a 10-year post-closure monitoring period.

**Table 8-1: Study Areas for Wildlife and Wildlife Habitat**

| Subcomponents | Spatial Boundary | Specific Study Area Description |
|---|---|---|
| Finlayson Caribou Herd | LSA<br>RSA - (1) rutting range, (2) post calving, (3) entire FCH range | LSA is the Project Footprint plus a 3 km radius around the mine and infrastructure, and 1.5 km on either side of the Tote Road;<br>Three RSAs include (1) the rutting range around the Project, (2) post calving range around the Project, and (3) overall FCH range; and<br>Consideration was also given to the FCH population in GMS 10-07. |
| Moose | LSA<br>RSA | LSA is the Project Footprint plus a 3 km radius around the mine and infrastructure, and 1.5 km on either side of the Tote Road; and<br>RSA is the YG management unit GMS 10-07. |
| Grizzly Bear | LSA<br>RSA (1) 10 km radius centered on the proposed ABM open pit, RSA (2) game boundary GMS 10-07 | LSA is the Project Footprint plus a 3 km radius around the mine and infrastructure, and 1.5 km on either side of the Tote Road;<br>Two RSAs include (1) Denning surveys focused on a 10 km radius centered on the proposed ABM open pit where there's higher potential denning habitat; and RSA (2) Game management subzone GMS 10-07 for comparison with harvest data and to look at regional suitable growing and denning habitat. |
| Wolverine, Wolf, Bats, Collared Pika | LSA | LSA is the Project Footprint plus a 3 km radius around the mine and infrastructure, and 1.5 km on either side of the Tote Road which is the zone of influence for these species that includes Geona Creek and Finlayson Creek watersheds to the Robert Campbell Highway. |
| Cliff Nesting Raptors, Olive-sided Flycatcher, Waterfowl | LSA | LSA is the Project Footprint plus a 3 km radius around the mine and infrastructure, and 1.5 km on either side of the Tote Road which includes Geona Creek and Finlayson Creek watersheds to the Robert Campbell Highway; the northern range of bird species is known to breed in Central Yukon; control sites established outside the zone of influence in similar habitats as those surveyed in the LSA. |




Local Study Area
Caribou Post Calving Study Area
Caribou Rut Study Area
Finlayson Caribou Herd Home Range (and Late Winter Study Area)

Robert Cambell Highway
Tote Road/Proposed Access Road
Proposed Mine Road
Location of Proposed Infrastructure
BMC Minerals (No.1) Ltd. Mineral Claim Areas

# KUDZ ZE KAYAH PROJECT

## FIGURE 8-1
## FINLAYSON CARIBOU HERD HOME RANGE AND STUDY AREAS

JANUARY 2018



BMC MINERALS

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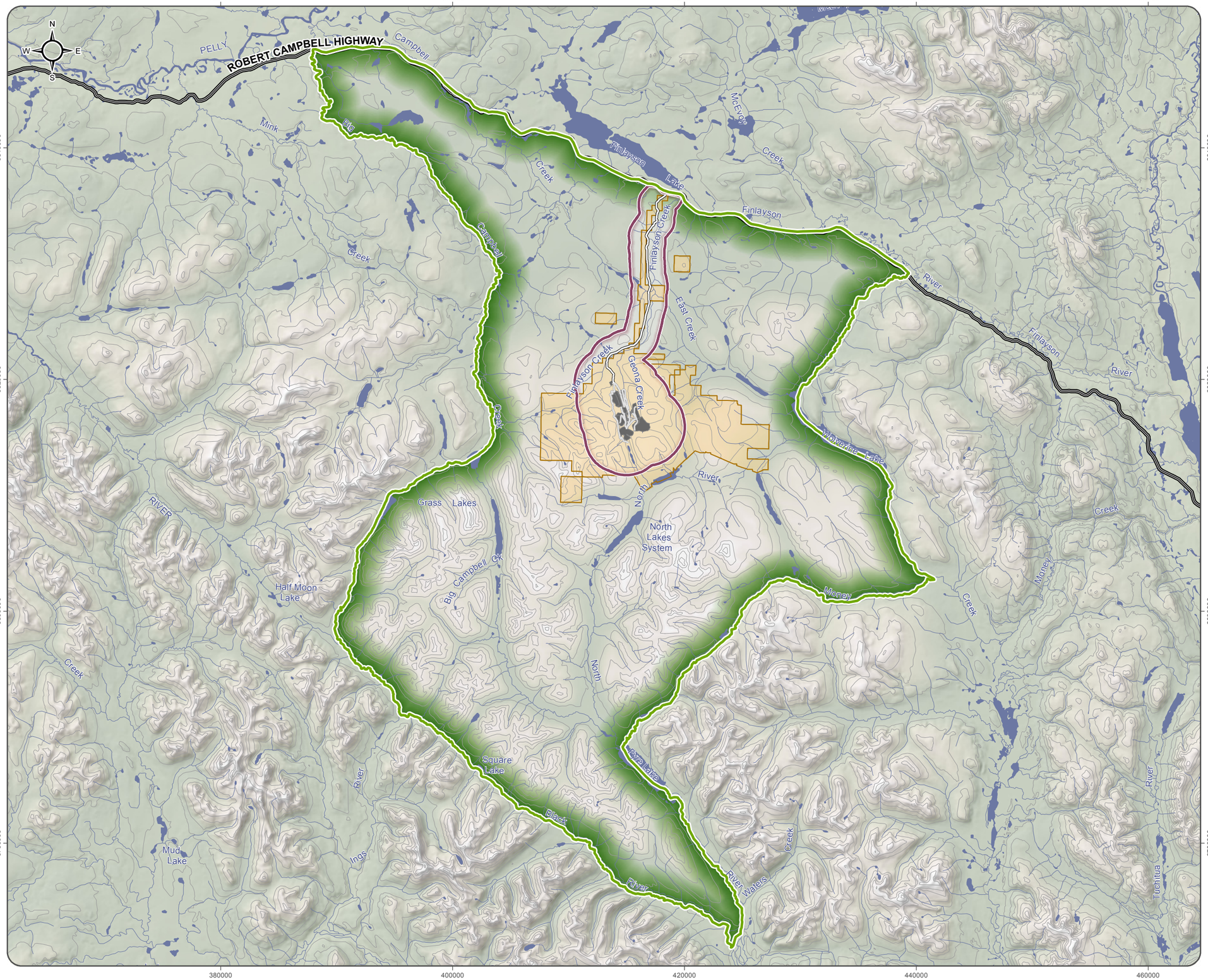


# KUDZ ZE KAYAH PROJECT

## FIGURE 8-2
## REGIONAL AND LOCAL STUDY AREAS FOR WILDLIFE

OCTOBER 2018

- Local Study Area
- Regional Study Area (Game Management Subzone 10-07)
- Location of Proposed Infrastructure
- BMC Minerals (No.1) Ltd. Mineral Claim Areas
- Tote Road/Proposed Access Road
- Proposed Mine Road
- Watercourse
- Waterbody

ALEXCO ENVIRONMENTAL GROUP

Digital elevation model created by the Yukon Department of the Environment interpolated from the digital 1:50,000 Canadian National Topographic Database (NTDB Edition 2) contour and watercourse layers. Obtained from Geomatics Yukon.

Canvec compiled by Natural Resources Canada at a scale of 1:10,000 - 1:50,000. Reproduced under license from Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Projection UTM Zone 9N



1:325,000 when printed on 11 x 17 inch paper

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## 8.2 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. Cumulative effects are of particular importance and focus for the Kaska Nation (both LFN {Liard First Nation} and RRDC {Ross River Dene Council}); sustainability of resources in their traditional territory depends on effectively managing the pace and scale of resource development to reduce long-term adverse effects and enhance benefits (Dena Kayeh Institute, 2010). The following Project residual effects have been identified for wildlife and wildlife habitat and are considered through the CEA.

**Table 8-2: Residual Effects on Wildlife and Wildlife Habitat**

| Subcomponent | Residual Effect |
|---|---|
| Caribou | Direct rut and post calving habitat loss |
| Caribou | Indirect rut and post calving habitat loss |
| Caribou | Disturbance of late winter range from aircraft |
| Caribou | Mortality from collisions with vehicles |
| Caribou | Increased predation due to increased wolf access on cleared roads |
| Moose | Direct early winter and late winter habitat loss |
| Moose | Indirect early winter and late winter habitat loss |
| Moose | Disturbance of late winter range from aircraft |
| Moose | Mortality from collisions with vehicles |
| Moose | Increased predation due to increased wolf access on cleared roads |
| Grizzly bear | Direct and indirect growing season habitat loss |
| Grizzly bear | Direct and indirect denning habitat loss |
| Grey wolf | Direct and indirect loss of habitat due to ungulate loss of habitat |
| Wolverine | Habitat avoidance from road density |
| Collared pika | Loss of highly suitable habitat |
| Bats | Loss of highly suitable habitat |
| Passerines (olive-sided flycatcher) | Loss of highly suitable habitat |
| Cliff-nesting raptors | Loss of highly suitable habitat |
| Waterfowl | Loss of highly suitable habitat |
| Bumble bee | Loss of habitat |

## 8.3 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present, and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The potential cumulative effects for wildlife and wildlife habitat are identified through the screening in Table 8-3. Further detail on the projects and activities considered below is provided in Table 1-1. Where the above conditions are met, the potential cumulative effects are described further below.

**Table 8-3: Cumulative Effects Screening for Wildlife and Wildlife Habitat**

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Wolverine Mine (*Yukon Zinc Corp.)* | Yes (project occurs in the FCH habitat range; project occurs in GMS 10-07) | Yes (loss of habitat; all species, with focus on ungulates) | Yes (mine was abandoned in 2015 – but habitat loss is still a residual effect) | Yes |
| Fyre Lake Property (*Pacific Ridge Exploration)* | Yes (project occurs in the FCH habitat range; project occurs in GMS 10-07) | Yes (loss of habitat; all species, with focus on ungulates) | Yes (project activities scheduled to occur annually beginning in 2015) | Yes |
| Selwyn Project *(Selwyn Chihong Mining Ltd)* | Yes (project occurs in the FCH habitat range) | Yes (loss of habitat; partial movement barrier; all species, with focus on ungulates) | Yes (current project activities assessed until 2021) | Yes |
| Ketza River Mine *(Ketza Group/ Veris Group*) | No (project occurs outside the FCH habitat range and outside GMS 10-07) | Yes (indirect effects on FCH) | No (mine abandoned) | No |
| Yukon Base Metal Project *(Overland Resources Ltd.)* | No (project occurs outside the FCH habitat range and outside GMS 10-07) | N/A | N/A | No |
| Grew Creek (*Golden Predator Corp*.) | No (project occurs outside the FCH habitat range and outside GMS 10-07) | N/A | N/A | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | Yes (project occurs in the FCH habitat range; project occurs in GMS 10-07) | Yes (loss of habitat; partial movement barrier; mortality from collisions; all species, with focus on ungulates) | Yes (current exploration activities assessed until 2021) | Yes |
| 3 Aces Property (*Golden Predator Corp*.) | No (project occurs outside the FCH habitat range and outside GMS 10-07) | N/A | N/A | No |

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| Robert Campbell Highway | Yes (highway occurs in the FCH habitat range; highway occurs in GMS 10-07) | Yes (loss of habitat along alignment; partial movement barrier; mortality from collisions; all species, with focus on ungulates) | Yes (highway is active) | Yes |
| North Canol Road | No (highway is located outside the FCH habitat range and outside GMS 10-07) | N/A | N/A | No |
| Ross River | Yes (Ross River is in the FCH habitat range) | Yes (loss of habitat, including a 3 km perimeter of indirect loss around the townsites) | Yes (communities are active) | Yes |
| Guided Outfitting | Yes (outfitting occurs in the FCH habitat range; outfitting occurs in GMS 10-07) | Yes (direct risk of mortality – ungulates, grizzly bear) | Yes (guided outfitting is active) | Yes |
| Recreational Hunting | Yes (hunting occurs in the FCH habitat range; hunting occurs in GMS 10-07) | Yes (direct risk of mortality – ungulates, grizzly bear) | Yes (recreational hunting currently active) | Yes |
| First Nation Hunting | Yes (hunting occurs in the FCH habitat range; hunting occurs in GMS 10-07) | Yes (direct risk of mortality – ungulates, grizzly bear) | Yes (First Nations hunting currently active) | Yes |
| Traplines | Yes (traplines) | Yes (direct mortality risk of - furbearers) | Yes (traplines are current) | Yes |

Note: If "No" is indicated for a condition the remaining conditions are indicated as N/A (not applicable) as all conditions must be met for potential cumulative effect to be identified.

As seen in the table above, there are potential cumulative effects for the Project in combination with the Wolverine Mine, Fyre Lake Property, Selwyn Project, Pelly Exploration, Robert Campbell Highway, guided outfitting, recreational hunting, First Nation hunting, and traplines. The significance of the cumulative effects of these projects/activities for caribou, moose, grizzly bear, and furbearers are discussed below. Cumulative effects were not assessed for all other species because their life-cycle range does not extend beyond the LSA and therefore will not be affected by other projects occurring concurrently. The following subsections discuss cumulative effects for caribou, moose, grizzly bear, and furbearers.

### CARIBOU

Caribou are particularly sensitive to cumulative effects. Firstly, they are not well adapted to habitat degradation, fragmentation, and human disturbance (Vors and Boyce, 2009). Management experience has shown that human infrastructure that greatly increases access by humans combined with herd fragmentation will lead to an eventual decline in caribou (Johnson et al., 2005; Wittmer et al., 2005). Moreover, they are a wide-ranging species across the landscape that utilize

many different habitats throughout their life-cycle, and are therefore susceptible to human disturbance across a large spatial scale. Although companies monitor wildlife movements and behavior across their own development sites, there are few studies that quantify disturbance effects across the wider geographic range of caribou herds.

Zone of influence analyses can assist cumulative effects analyses. As described in Section 13.4.1, a study was conducted on northern mountain woodland caribou over an area of 11,594 km$^2$ near Atlin, BC. The cumulative effect of roads, mines, and towns was quantified as an indirect high quality habitat loss of 8% in winter and 2% in summer due to avoidance in the zones of influence (Polfus et al, 2011). In a study of the Carcross herd winter range in the southern lakes district, Florkiewicz et al. (2007) found that caribou were spaced significantly further from an estimated zone of influence ranging from 250 m to 1,000 m based on identified land use activities and infrastructure. However, although some level of cumulative effect will occur, a clear separation of the cumulative effect from development and the effect from the natural variation in caribou range use and demography is challenging.

The continual development of land and increasing pressure from multiple land uses, especially on ranges and habitats for key life stages of caribou, are important factors that play a key role in the reduction of the overall abundance of herds. These key life stage habitats are finite, so maintaining their integrity is essential to maintaining the posterity of the species. An increase of human disturbance can lead to range abandonment and fragmentation, which can result in a large-scale loss of range or extirpation in a given area, such as what has happened in Europe (Nellemann et al., 2003).

For this study, cumulative effects on the FCH were assessed based on a quantification of the zones of influence from the various projects and activities in the herd's range (Figure 8-3). This figure illustrates how the FCH range is bounded on the west by the North Canol road and the Town of Ross River, and partitioned north and south by the Robert Campbell Highway. Mineral properties of Fyre Lake, Wolverine, Pelly Exploration, and KZK influence caribou rut habitat in the FCH range south of the Robert Campbell Highway; the Selwyn mineral property influences rut habitat at the north end of the FCH range. Together, these activities influence approximately 12% (2,365 km$^2$) of the FCH range (20,369 km$^2$) after adding the direct footprints of the claims and roads and a 2 km avoidance zone supported by the study by Polfus et al. (2011). The Project and associated claims equates to 2% (375 km$^2$) of the 12% cumulative disturbance in the FCH range. It should be noted that disturbance is conservatively based on claim boundaries since information is limited for specific footprints of disturbance. Actual footprints will be less, but this provides a coarse estimate to gauge relative and worst case cumulative disturbance.

Other pressures on the herd include First Nation, guided, and recreational hunting, which cannot be easily mapped; however, hunting has been found to generally occur within 1 km of roads (Daust and Morgan, 2013). The resulting magnitude of cumulative effect from habitat loss and fragmentation is considered low, less than 10% when actual footprints are considered rather than overly conservative mineral claim blocks.

It should also be noted that the human development is just part of the complex set of factors affecting the FCH population. Other major influencing factors include predation, annual weather variability

(especially snow depth and distribution), and climate change. Predation is known to be one of the most significant factors affecting the herd population given the results from the wolf control program discussed in Section 13.3.1 of the Project Proposal. Also discussed in Section 13.4.1.1 (of the Project Proposal), the available habitat could support a larger herd; therefore, the incremental increase of development of the Project is not expected to be a large contributor to cumulative effects on the herd. Causes of population change appear to be less likely attributed to habitat losses than to predator and climate changes. A consistent monitoring program (lead by YG) over time would help track variations in the population and give clues to the causes of population changes.

### MOOSE

Moose are more resilient to habitat changes than caribou, and in some instances, clearing of land can increase moose populations because the new growth is a desired food source. Nonetheless, moose are sensitive to human activity, especially hunting, and avoid roads except during migrations when they use trails and corridors; these disturbances affect ungulate energetics and populations (Neumann, 2009).

Figure 8-3 illustrates the areas of development in relation to the zones of influence for GMS 10-07. In GMS 10-07, moose are or will be affected by the mineral properties of Fyre Lake, Wolverine, Pelly Exploration, and KZK, the Robert Campbell Highway, and First Nation, guided, and recreational hunting. Exploration and mining claims and the highway plus a 2 km buffer around all boundaries covers 32% of the GMS 10-07 area. These activities fragment the habitat in GMS 10-07; however, the actual footprints of disturbance of projects are estimated at less than 10% resulting in a low magnitude rating for cumulative direct and indirect effects on the moose habitat and population. Large stretches of undisturbed tracts of land will still be available in GMS 10-07. It should be noted that following Kaska land management guidance, cumulative effects from habitat fragmentation can be minimized in the future by avoiding construction of roads that create circle routes that connect main roads (Dena Kayeh Institute, 2010). There are no circle routes created by any of the projects in the RSA which helps minimize fragmentation.

### GRIZZLY BEAR

Cumulative effects on grizzly bear in GMS 10-07 are expected from combined effects of the mineral properties of Fyre Lake, Wolverine, Pelly Exploration, and KZK, the Robert Campbell Highway, and First Nation, guided, and recreational hunting.

Grizzly bear densities in the Southern Lakes region of Yukon were estimated at 10 to 16 bears per 1,000 $km^2$ (Larsen et al., 1989). Densities are expected to be higher in the east-central Yukon compared to the Southern Lake region, as there is less human effect on wilderness, fewer roads, and lower hunting pressure (Desrochers et al., 2002; Environment Yukon, 2005); therefore, it is estimated there would be more than 30 grizzly bears in GMS 10-07. YG recorded harvest data averaged one grizzly bear per year from 1998 to 2014. No grizzly bears were harvested in GMS 10-07 in 2015 or 2016.

The thresholds chosen in Section 13.1.2 indicate that there should not be grizzly bear mortalities and road densities should be below 0.6 roads/ km$^2$. For GMS 10-07, there is the risk that grizzly bear mortalities could have a higher occurrence from multiple projects and activities for this region due to the overall increase in frequency of human-bear encounters. However, no grizzly bear mortalities should cumulatively occur from vehicle collisions or project conflicts if all projects follow appropriate practices for working in bear country. If one or two mortalities occur in the region, this would represent a 4% to 7% loss in the population. This is above the conservation threshold for the Project presented; however, a loss of one to two bears in the RSA would be similar to historic harvest numbers that have not reduced the regional grizzly bear population. Road densities are expected to remain below 0.6 roads/km$^2$ in GMS 10-07.

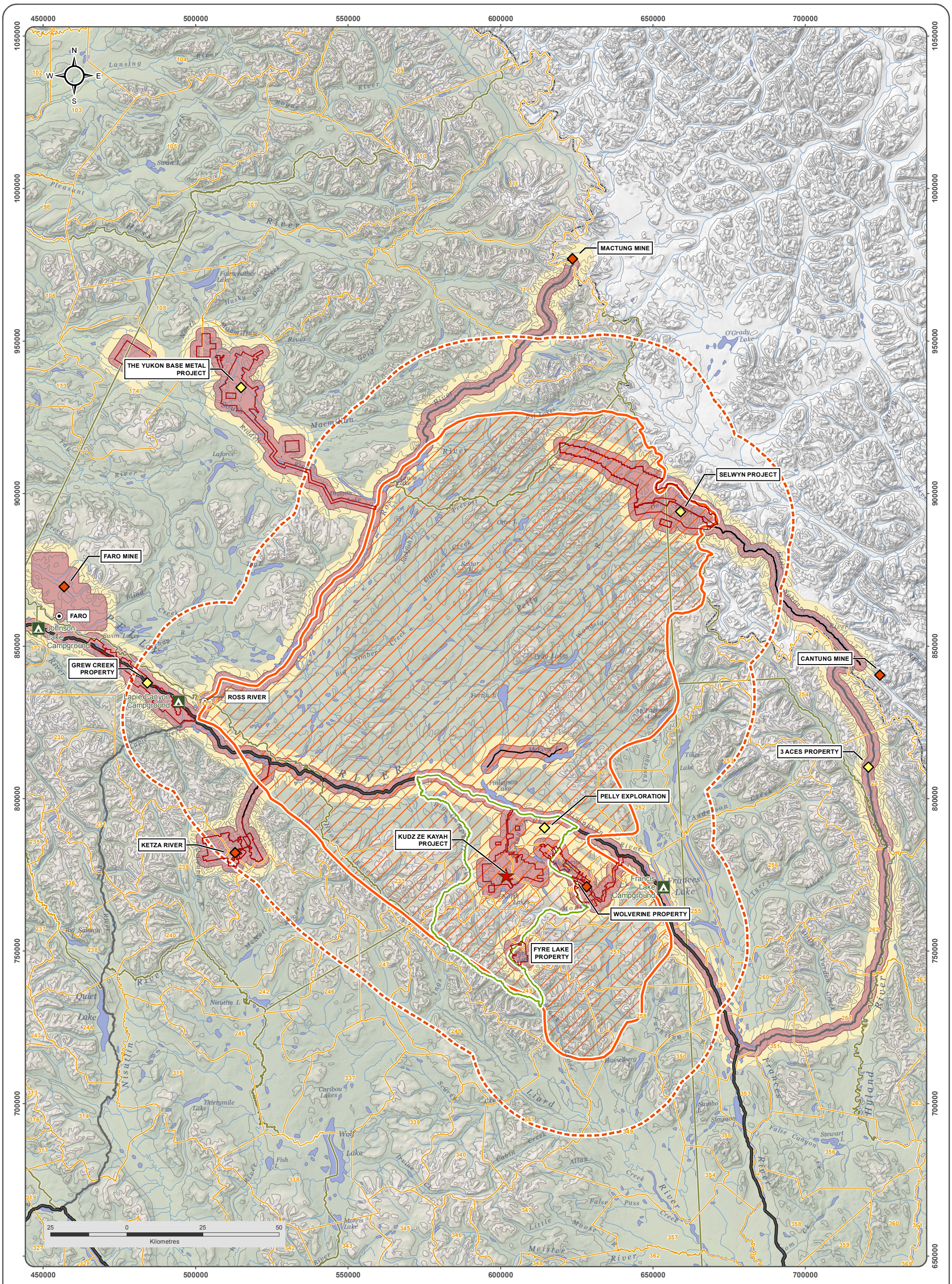
### FURBEARERS (GREY WOLF AND WOLVERINE)

Cumulative effects on furbearers are expected from combined effects of the mineral properties of Fyre Lake, Wolverine, Pelly Exploration, and KZK, the Robert Campbell Highway, and traplines. The two representative furbearers for this EA are grey wolf and wolverine.

Grey wolf populations follow caribou and moose populations; therefore, it is expected that cumulative effects to caribou and moose populations would also result in cumulative effects to wolf populations. The cumulative effects for both caribou and moose are considered low magnitude, therefore the cumulative effects on wolf populations are also considered low. This estimate is based on cumulative effects of the surrounding mineral properties, the highway, and trapline harvest. The level of cumulative effect is unknown because harvest is not reported; however, the regional wolf populations appear to be healthy and widespread based on the extent of wolf sightings and signs. These populations are already affected by the Robert Campbell Highway, the Wolverine mine, and surrounding exploration activities.

Effects on wolverine were considered moderate magnitude for the Project; however, road densities are low (less than 0.6 roads/km$^2$) and are expected to remain at less than 0.6 roads/km$^2$ in the RSA even if all proposed projects proceed. Therefore, no cumulative effect is expected.

Habitat fragmentation and movement barriers at the regional scale are less important for some of the smaller furbearers than larger mammals simply because of the size of the ranges. The trapline harvest in combination with accidental mortalities and habitat losses from activity on the mineral properties are also not expected to have residual cumulative effects. The mineral properties are widespread and would not create barriers for small mammals nor affect any significant areas of important habitat.




Kudz Ze Kayah Project

Exploration/Licencing

Temporary Closure/Reclamation/Closed/ Abandoned

Community

Campground

FCH Habitat Range

FCH Habitat Range 25 km Buffer

Potential Disturbance/Activity (5 km Buffer)

Potential Disturbance/Activity (10 km Buffer)

Quartz Mining Activity

Regional Study Area (Game Management Subzone 10-07)

Trapline Concession

Outfitting Concession

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# KUDZ ZE KAYAH PROJECT

## FIGURE 8-3

## WILDLIFE CUMULATIVE EFFECTS ASSESSMENT

OCTOBER 2018



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In summary, the following potential cumulative effects have been identified for wildlife and wildlife habitat:

- FCH habitat loss and fragmentation;
- Moose habitat loss and fragmentation; and
- Grizzly bear habitat loss and fragmentation.

## 8.4 CUMULATIVE EFFECTS MITIGATION MEASURES

Potential cumulative effects on wildlife and wildlife habitat and identified mitigation measures are summarized in and discussed further below.

It should be noted that cumulative effects need to be managed at the land use planning level with a variety of parties, including YG and RRDC Land Stewards. BMC is committed to working with YG, LFN RRDC, other project proponents, and other stakeholders to address potential cumulative effects on FCH.

**Table 8-4: Proposed Cumulative Effects Mitigation Measures for Wildlife and Wildlife Habitat**

| Potential Cumulative Effect | Mitigation Measures Identified for Project Effects | Additional Mitigation Measures (if possible) | Predicted Effectiveness of Mitigation Measure (high, medium, low) | Residual cumulative effect identified? (Yes/No) |
|---|---|---|---|---|
| FCH habitat loss and fragmentation | Reclamation<br>Speed limits<br>Radio controlled Access Road<br>Signage at road crossings on movement corridors | Collaboration with YG, RRDC Land Stewards, and other project owners | Medium | Yes |
| Moose habitat loss and fragmentation | Reclamation<br>Speed limits<br>Radio controlled Access Road<br>Signage at road crossings on movement corridors | Collaboration with YG, RRDC Land Stewards, and other project owners | Medium | Yes |
| Grizzly bear habitat loss and fragmentation | Reclamation<br>Speed limits<br>Radio controlled Access Road | Collaboration with YG, RRDC Land Stewards, and other project owners | Medium | Yes |

## 8.5 CUMULATIVE EFFECTS SIGNIFICANCE ASSESSMENT

The significance of residual effects as a result of the Project on wildlife and wildlife habitat are summarized in Table 8-5.

Cumulative effects on caribou in the FCH range are assessed as low magnitude, regional, long-term, continuous, and reversible. The FCH has a high context, the effects are likely with a medium uncertainty. The result is a rating of not significant cumulative effects mainly because the magnitude of effects is low. Nonetheless, the FCH is considered the valued subcomponent with the highest social context for the Project, and BMC is committed to continue to work with government, RRDC and other stakeholders during the life of the mine to monitor the FCH population. Data from the monitoring program can be used by YG to help manage the herd.

Cumulative effects on moose were deemed low magnitude, regional, long-term, continuous, reversible, high context, and medium uncertainty. The resulting rating was not significant. Moose occurrences at the Project will be recorded over time to track use around the Project and follow up on predicted effects.

Cumulative effects on grizzly bear were deemed low magnitude, regional, long-term, continuous, reversible, high context, and medium uncertainty. The resulting rating was not significant. Similar to moose, grizzly bear occurrences will be tracked with the wildlife log.

**Table 8-5: Cumulative Effects Significance Assessment for Wildlife and Wildlife Habitat**

| Residual Cumulative Effect | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Environmental and Socio-economic Context | Likelihood | Cumulative Effect Significance |
|---|---|---|---|---|---|---|---|---|---|
| FCH habitat loss and fragmentation | Adverse | Low | Regional | Long-term | Continuous | Reversible long term | High | Likely Medium uncertainty | Not significant |
| Moose habitat loss and fragmentation | Adverse | Low | Regional | Long-term | Continuous | Reversible long term | High | Likely Medium uncertainty | Not significant |
| Grizzly bear habitat loss and fragmentation | Adverse | Low | Regional | Long-term | Continuous | Reversible long term | High | Likely Medium uncertainty | Not significant |

Note: Criteria definitions are provided in Section 13.1.3 of the Project Proposal

# 9. HERITAGE

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. As no residual effects have been identified for heritage resources, no cumulative effects are expected.

# 10. SOCIO-ECONOMICS

## 10.1 SUMMARY OF RESIDUAL EFFECTS

The CEA defines the potential interaction of the Project residual effects and the potential residual effects resulting from other past or present projects (where their effects may not be captured under the current conditions), as well as reasonably foreseeable/known future projects. Reasonably foreseeable/known future projects are those projects or land use activities for which proposals have been submitted to YESAB. CEA for socio-economic VCs focuses on adverse residual effects. YESAB's *Guide to Socio-economic Effects Assessments* states that an examination of cumulative socio-economic effects should:

- Estimate potential cumulative effects on culture –values, traditions, language, spirituality;
- Estimate potential cumulative effects on social cohesion, quality of life and ability to adapt beneficially to pace of economic change; and

- Estimate potential cumulative effects on land usability for traditional economy and/or other alternative economic activities.

Table 10-1 summarizes the Project's adverse residual effects have been identified for the socio-economic VCs.

**Table 10-1: Residual Effects Considered in the Cumulative Effects Assessment**

| Valued Component | Subcomponent | Residual Adverse Effect |
|---|---|---|
| Economy and Sustainable Livelihood | Traditional economic activities — hunting, fishing, trapping, food gathering | Potentially reduced opportunity to pursue traditional economic activities. |
| | Traditional economic activities — hunting, fishing, trapping, food gathering | Increased traffic and industrial activity in the region may act to drive wildlife away. |
| | Traditional economic activities — hunting, fishing, trapping, food gathering | Disruption and loss of access. |
| | Diverse and stable economy — discouraging boom and bust | Creation of boom and bust cycle through relatively short Project life, particularly in small communities. |
| Human Health and Well-being | Family Stress | The combination of a sudden increase in income and the absence of the employed spouse/ parent during each shift rotation can have adverse effects on family health and well-being. |
| | Reducing Alcohol and Drug Abuse | Substantial increases in income can lead to increases in drug and alcohol abuse as these substances become relatively more affordable. |
| | Gathering traditional medicine | Possible reduction in traditional medicine use due to rotation shift work. |
| Community Vitality | Reducing Crime | The Project can potentially reduce crime through employment opportunities. But if increased incomes lead to increases in alcohol and drug abuse, then crime levels are likely to rise. |

## 10.2 CUMULATIVE EFFECTS CHARACTERIZATION

For past, present and future projects/activities to be considered the following conditions must be met:

1. There is information available to identify if the project or activity results in a demonstrable or measurable effect on the VC;
2. The Project-specific residual effect on the VC overlaps in time with the effects from other project or activity (i.e., effects happen at the same time); and
3. The Project-specific residual effect on the VC overlaps spatially with the effects from other project or activity (i.e., effects occur in the same area).

The cumulative socio-economic effects will consequently depend on the status of other projects in the region and in Yukon.

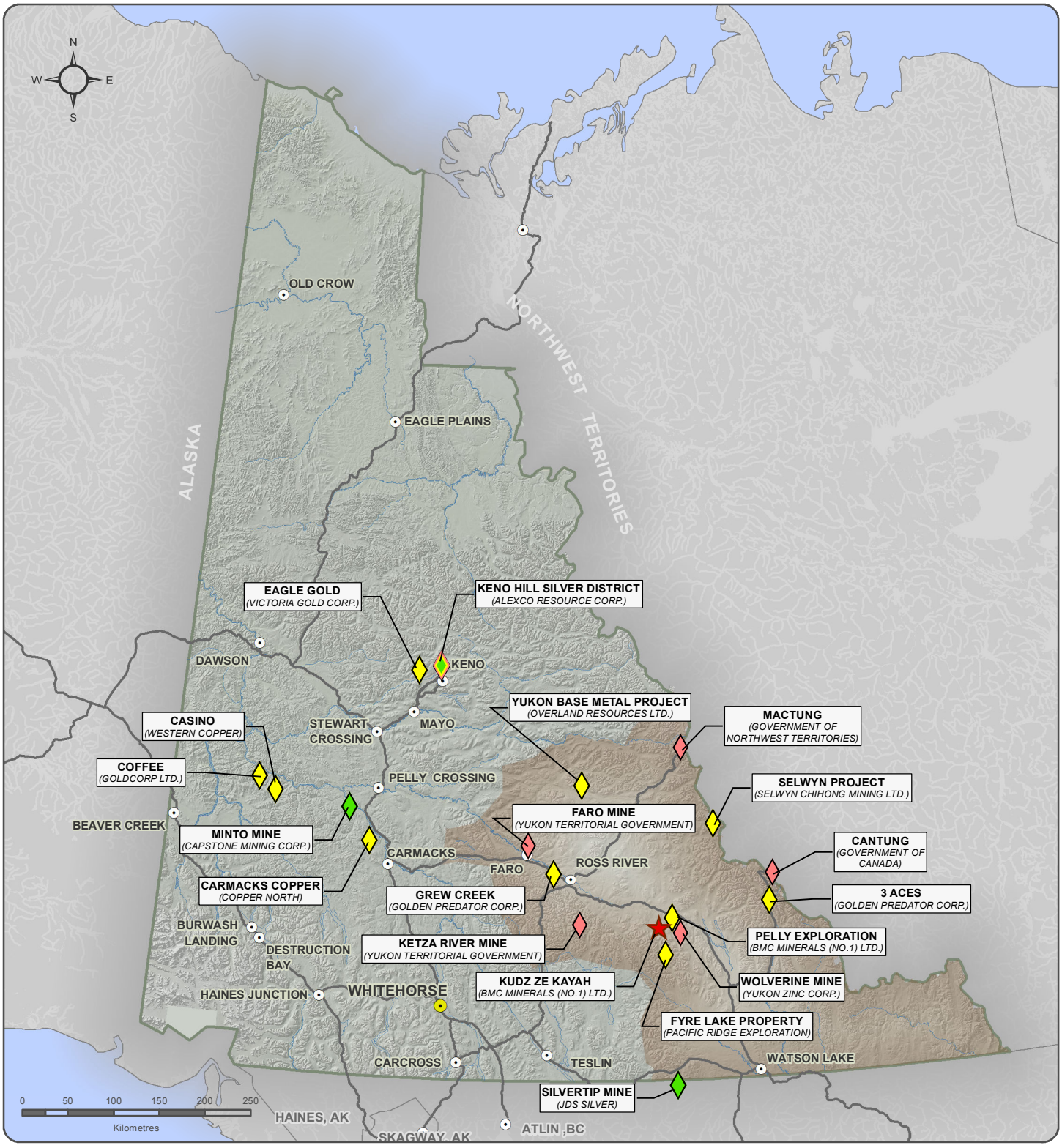
Table 10-2 screens known projects and activities that may overlap sufficiently with the Project to interact with one of the eight residual adverse Project effects listed in Table 10-1 and produce

cumulative socio-economic effects. The projects and activities considered in the socio-economic cumulative effects assessment are shown in Figure 10-1.

Overlap in space is defined for this assessment as whether the project may occur in Kaska Traditional Territory or in Yukon. All of the projects and activities listed in Table 10-2 are considered to overlap in space with Project's residual effects.

Whether there is a likely overlap in time with the Project is difficult to predict as it is unknown which (if any) projects will proceed within the next decade.

All of the projects listed in Table 10-2 that have an overlap in type of effect, whether in Kaska Traditional Territory or in other parts of the Yukon, have the potential to interact with one of the residual adverse effects of the Project.




**PROJECT STATUS**

- Construction/Active
- Exploration/Licencing
- Temporary Closure/Reclamation/Closed/Abandoned
- Exploration/Licencing/Temporary Closure/Reclamation/Closed/Abandoned
- Kaska Dena First Nation (Ross River Dena Council and Liard) Traditional Territory



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## KUDZ ZE KAYAH PROJECT

# FIGURE 10-1

## PROJECTS AND ACTIVITIES TO BE CONSIDERED IN THE SOCIO-ECONOMIC CUMULATIVE EFFECTS ASSESSMENT

OCTOBER 2018

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## Table 10-2: Screening Table for Socio-economic Cumulative Effects

| Project/Activity | Overlap in Space (Yes/No) | Overlap in Type of Effect (Yes/No) | Overlap in Time (Yes/No) | Considered Further for Potential Cumulative Effect? (Yes/No) |
|---|---|---|---|---|
| ***Kaska Traditional Territory*** | | | | |
| 3 Aces (*Golden Predator Corp.*) | Yes | Yes | Yes | Yes |
| Cantung Mine (*Abandoned*) | Yes | Yes | No | No |
| Faro Mine (*Abandoned*) | Yes | Yes | Yes | Yes |
| Fyre Lake Property (*Pacific Ridge Exploration Ltd.)* | Yes | Yes | No | No |
| Grew Creek (*Golden Predator Corp*.) | Yes | Yes | No | No |
| Ketza River Mine (*Abandoned*) | Yes | Yes | Yes | Yes |
| Mactung (*Government of Northwest Territories*) | Yes | Yes | No | No |
| Pelly Exploration (*BMC Minerals (No.1) Ltd.)* | Yes | Yes | Yes | Yes |
| Selwyn Project (*Selwyn Chihong Mining Ltd.)* | Yes | Yes | Yes | Yes |
| Silvertip Mine (*JDS Silver*) | Yes | Yes | Yes | Yes |
| Wolverine Mine (*Yukon Zinc Corp.*) | Yes | Yes | Yes | Yes |
| Yukon Base Metal Project (*Overland Resources Ltd.*) | Yes | Yes | No | No |
| ***Yukon*** | | | | |
| Carmacks Copper (*Copper North*) | Yes | Yes | No | No |
| Casino (*Western Copper*) | Yes | Yes | No | No |
| Coffee (*Goldcorp Ltd*.) | Yes | Yes | Yes | Yes |
| Eagle Gold (*Victoria Gold Corp*.) | Yes | Yes | Yes | Yes |
| Keno Hill Silver District (*Alexco Resource Corp*.) | Yes | Yes | Yes | Yes |
| Minto Mine (*Capstone Mining Corp*.) | Yes | Yes | No | No |
| ***Other activities*** | | | | |
| Single/Group Trapline Concessions<br>Outfitting Concessions | Yes | No | Yes | No |

Based on the screening against the projects in Table 10-2, the summary of potential cumulative effects interactions is presented in Table 10-3. Each of the identified interactions is carried forward for consideration of mitigation measures.

**Table 10-3: Cumulative Effects Potential Interactions**

| Project Residual Adverse Effect | Potential Interactions |
|---|---|
| Potentially reduced opportunity to pursue traditional economic activities. | All projects that require employees to work in camp on shift rotations potentially reduce the opportunity of employees to pursue traditional economic activities. For the individual, this effect is non-cumulative as one can only work one job at a time. A cumulative effect is possible at the extended family or community level if sufficient numbers go to work on different projects and different rotations. |
| Increased traffic and industrial activity in the region may act to drive wildlife away. | The Wolverine mine and the Pelly Exploration project are the two projects in closest spatial proximity to the Project and so most likely to create a demonstrable cumulative effect with this subcomponent of the economy and sustainable livelihood VC. However, Wolverine is now closed, reducing traffic and activity and Pelly Exploration is an exploration project that adds little to the level of industrial activity. |
| Disruption and loss of access. | All of the Kaska Traditional Territory projects considered for cumulative effects: 3 Aces, Faro, Ketza, Pelly Exploration, Selwyn, Silvertip and Wolverine will result in a certain amount of disruption and loss of access for traditional economic activities. BMC has agreed to pay a land use interruption supplement. The Kaska adapt by shifting their traditional activities temporarily to other areas. |
| Creation of boom and bust cycle through relatively short Project life, particularly in small communities. | The potential for interactions that lead to cumulative effects for this Project effect is determined by the business decisions made by the owners and managers of all of the projects listed to be considered for potential cumulative effects in Table 10-2. If several projects proceed near-simultaneously they will quickly exceed the labour force and business capacity to supply them creating a boom. And several near-simultaneous shut-downs will create a bust. On the other hand, sequential openings, with one mine starting up as another enter closure could mitigate the boom and bust cycle. |
| The combination of a sudden increase in income and the absence of the employed spouse/ parent during each shift rotation can have adverse effects on family health and well-being. | All projects that require employees to work in camp on shift rotations potentially create adverse effects on family health and well-being. For the individual, this effect is non-cumulative as one can only work one job at a time. A cumulative effect is possible at the extended family or community level if sufficient numbers go to work on different projects and different rotations. |
| Substantial increases in income can lead to increases in drug and alcohol abuse as these substances become relatively more affordable. | All projects that provide relatively well paying work, especially for individuals who have not been accustomed to the level of income, risk being the cause of increased alcohol and drug abuse. For the individual, this effect is non-cumulative as one can only work one job at a time. A cumulative effect is possible at the extended family or community level if sufficient numbers go to work on different projects and different rotations. |
| Possible reduction in traditional medicine use due to rotation shift work. | All projects that require employees to work in camp on shift rotations potentially reduce the opportunity of employees to gather and use traditional medicines. For the individual, this effect is non-cumulative as one can only work one job at a time. A cumulative effect is possible at the extended family or community level if sufficient numbers go to work on different projects and different rotations. However, this cumulative effect tends to be self-limiting as only individuals willing to work on extended rotations will do so. |
| The Project can potentially reduce crime through employment opportunities. But if increased incomes lead to increases in alcohol and drug abuse, then crime levels are likely to rise. | All projects that provide relatively well paying work, especially for individuals who have not been accustomed to the level of income, risk being the cause of increased alcohol and drug abuse. For the individual, this effect is non-cumulative as one can only work one job at a time. A cumulative effect is possible at the extended family or community level if sufficient numbers go to work on different projects and different rotations. |

## 10.3 CUMULATIVE EFFECTS MITIGATION MEASURES

Proposed cumulative effects mitigation measures are presented in Table 10-4. Where residual cumulative effects are identified, they are carried forward in the assessment for consideration of significance.

**Table 10-4: Socio-economic Cumulative Effects Mitigation Measures**

| Project Residual Adverse Effect | Cumulative Effects Mitigation Measures | Residual Cumulative Effect Identified (Yes/No) |
|---|---|---|
| Potentially reduced opportunity to pursue traditional economic activities. | Projects implementing the common shift rotation of two weeks in and two weeks out will mitigate this effect. | No |
| Increased traffic and industrial activity in the region may act to drive wildlife away. | BMC will implement its Traffic and Access Management Plan to minimize Project effects on regional wildlife.<br>All future projects will likely be required to implement equivalent plans. | No |
| Disruption and loss of access. | As part of the Socio-economic Participation Agreement (SEPA) BMC has agreed to pay a land use interruption supplement to mitigate the effects of the Project on the RRDC citizens who hold trapping rights under the registered group trapline, and operated trap lines within the Project area. Other projects will be expected to do the equivalent. | No |
| Creation of boom and bust cycle through relatively short Project life, particularly in small communities. | There are no mitigation measures that BMC and the owners and managers of all of the projects listed to be considered for potential cumulative effects in Table 10-2 can take to avoid creating a boom and bust cycle beyond exploring for further deposits in an attempt to extend mine life and making rational business decisions. | Yes |
| The combination of a sudden increase in income and the absence of the employed spouse/ parent during each shift rotation can have adverse effects on family health and well-being. | Projects implementing the common shift rotation of two weeks in and two weeks out will mitigate this effect according to the literature on the effects of rotation shift work in Canada. | No |
| Substantial increases in income can lead to increases in drug and alcohol abuse as these substances become relatively more affordable. | BMC will have a dry camp, will follow the industry standard and institute mandatory drug and alcohol testing for potential new employees and random testing thereafter and BMC will also support the provision of information regarding health and wellness education programmes and access to counselling services will be made available to all employees, as required.<br>It is expected that all other projects will implement the equivalent mitigation measures. | No |
| Possible reduction in traditional medicine use due to rotation shift work. | Projects implementing the common shift rotation of two weeks in and two weeks out will mitigate this effect. | No |
| The Project can potentially reduce crime through employment opportunities. But if increased incomes lead to increases in alcohol and drug abuse, then crime levels are likely to rise. | BMC will have a dry camp, will follow the industry standard and institute mandatory drug and alcohol testing for potential new employees and random testing thereafter and BMC will also support the provision of information regarding health and wellness education programmes and access to counselling services will be made available to all employees, as required.<br>It is expected that all other projects will implement the equivalent mitigation measures. | No |

## 10.4 CUMULATIVE EFFECTS SIGNIFICANCE ASSESSMENT

With the mitigation measures discussed in Table 10-4, one residual cumulative effect was identified for potential creation of boom and bust cycle in the local economy. Cumulative effect may occur if several projects proceed near-simultaneously they will quickly exceed the labour force and business capacity to supply them creating a boom or several near-simultaneous shut-downs will create a bust. The magnitude of this potential cumulative effect is considered to moderate with regional extent. The experience of other Yukon mines indicates that creating a local boom and bust cycle has a likely probability of occurrence with high degree of uncertainty; however, regional extent effect is considered to be unlikely with high degree of uncertainty. The community resilience is high in dealing with this effect. It is therefore judged to be not significant.

**Table 10-5: Cumulative Effects Significance Assessment**

| Subcomponent | Residual Cumulative Effect | Direction | Magnitude | Geographic Extent | Duration | Frequency | Reversibility | Economic and Social Context | Probability | Significance (Significant/ Not significant/ Beneficial) |
|---|---|---|---|---|---|---|---|---|---|---|
| Diverse and stable economy — discouraging boom and bust. | Creation of boom and bust cycle through relatively short Project life, particularly in small communities. | Adverse | Moderate | Regional | Long term | Once or sporadic | Reversible short term | Low | Unlikely probability of occurrence with high degree of uncertainty. | Not significant |

Note: Criteria definitions are provided in Section 13.1.3 of the Project Proposal

# 11. UNPLANNED CLOSURE

In Yukon, temporary closure at a mine site is defined as a closure that exceeds six months and is not expected to last longer than five years, and can include both planned and unplanned closure (Yukon Government, 2006). This condition assumes that the owner is still in active control of this site (i.e., not abandoned). The management of the Project in the event of a temporary closure is discussed in the Conceptual Reclamation and Closure Plan (Section 4.13 and Appendix H-1 of the Project Proposal).

BMC's approach to temporary closure is based on maintaining the Project in a state of physical and chemical stability, while also ensuring the Project is secure, safe, and in compliance with all regulatory requirements and authorization obligations. While ensuring these conditions, the Project infrastructure will be maintained in such a manner so as to facilitate the resumption of mining operations in a timely manner. Site security will be maintained in a manner comparable to the operational period with access to the site controlled by consistent presence in the gatehouse.

The potential environmental effects will be managed through the measures described in the Conceptual Reclamation and Closure Plan (Appendix H-1 of the Project Proposal). During temporary closure, the strategy from the Operational Water Management Plan will be maintained. The site will be monitored in compliance with the approved Environmental Monitoring, Surveillance, and Reporting Plan that will be approved during the Quartz Mining Licencing process. An updated plan with a reduced monitoring frequency may be developed and submitted for approval if a temporary closure period is expected to be longer than six months. With these mitigation and management plans in place, the environmental effects consequence as a result of unplanned closure is expected to be very low.

To prepare the site for temporary closure, assets not required during the temporary closure period will be secured and major contractors will be demobilized. Full-time staff will ensure a consistent site presence during temporary closure, and the camp will be prepared for a reduced staff. The staffing numbers on site at a given time are expected to range from six to ten people. The potential socio-economic effects from unplanned closure include reduced economic benefit, loss of wages and reduced business opportunities. An unplanned closure would contribute to the creation of the boom and bust cycle of local economy. In the event of an unplanned closure, BMC will give as much advance notice as practicable so that employees will know well in advance that the closure will be taking place and can start looking for new employment. As described in Chapter 4 of the Project Proposal, during operations of the Project, BMC will implement a health and well-being program for all mine employees. This program in part will include training programs (e.g., trades, apprenticeships, management) to promote progression in employee careers but also to promote transferable skills to enable employees to be more employable, which will facilitate any transitions from working on the Project to another mine or even a different industry. Also, as part of the health and well-being program, all BMC employees will have the opportunity to take financial management training, which will teach employees about the importance of saving as well as debt avoidance. In additional, in the event that an unplanned closure is required, BMC will help all employees prepare resumes, practise interviews and facilitate in the job search, with the intent that employees would transition quickly to new employment. However, even with these programs and measures in place, the socio-economic effects consequence as a result of unplanned closure is expected to be medium as the effects are expected to be felt in the local communities and extend beyond the Project area.

The likelihood of the temporary closure is rated as unlikely (based on the conservative assumptions in the financial assessment of the Prefeasibility Study for the Project).

In summary, the likelihood of temporary closure is considered to be unlikely with a consequence of very low for environment effects and of medium for socio-economic effects, resulting in a risk ratings of low and moderate, respectively for environmental and socio-economic effects. The potential

environmental effects are considered not significant given the risk rating of low. The local communities have high resilience to boom and bust economies (Section 15.5.3 of the Project Proposal). The socio-economic effects are not considered significant due to low magnitude of Project's effects on economic growth while in operation (Section 15.10.1.3 of the Project Proposal) and mitigation measures identified above.

In the event that a commercial decision is made by BMC not to reopen the mine, the final Reclamation and Closure Plan will be executed to permanently close the site (with all the necessary regulatory approvals in place). The environmental effects consequence as a result of early permanent closure is expected to be very low. Early permanent closure will reduce the beneficial socio-economic effects (described in Chapter 15 of the Project Proposal) as a result of the Project's shorter Project life, resulting in consequence of medium. Similarly, as noted above for temporary closure, the potential risk ratings of low and moderate are identified, respectively for environmental and socio-economic effects. Therefore, the potential environmental effects are considered not significant. The socio-economic effects are not considered significant due to low magnitude of Project's effects on economic growth while in operation (Section 15.10.1.3 of the Project Proposal) and mitigation measures identified above to minimize effects from closure.

### 11.1 SUMMARY

The summary of the assessment (it's likelihood and consequence and resulting risk rating) is provided in Table 11-1.

**Table 11-1: Unplanned Closure Assessment Summary**

| Assessment Scenarios | Likelihood | Consequence | Risk Rating |
|---|---|---|---|
| ***UNPLANNED CLOSURE*** | | | |
| Temporary closure/ Early permanent closure | Unlikely | Environmental: Very low | Environmental: Low |
| | | Socio-economic: Medium | Socio-economic: Moderate |

Since the unplanned closure risk ratings were low and moderate, they are not considered to have a significant effect.

## 12. ADDITIONAL MITIGATION RELATED TO PLANNED/UNPLANNED CLOSURE

### 12.1 INFORMATION REQUEST REPORT #1

The following presents the Information Requests from Information Request Report #1 (YESAB, 2017a) and BMC's responses, as they relate to additional mitigation measures for planned or unplanned closure of KZK.

### R262

Identify situations or scenarios where the project might operate on a reduced scale (including temporary or unplanned closure). This should include detail about assumptions made in the financial assessment of the prefeasibility study (referred to in Section 17.4 of the proposal). Characterize the potential effects of these scenario's and proposed mitigation.

### BMC RESPONSE

As the Kudz Ze Kayah Project is a private sector economic venture based on revenues exceeding expenses, an unforeseen significant decrease in revenues or increase in expenses could temporarily upset the economic balance of the Project. In the worst case scenario, production could potentially be temporarily halted to allow commodity prices to increase, and/or to retool any aspects of production costs that would result in a resumption of production.

The financial analysis of the Kudz Ze Kayah Project, which includes third party review of the Prefeasibility Study by internationally recognized accounting firm Ernst & Young, sets out the case for a robust economic performance of the Project which can withstand minor to moderate upsets in either revenue or expense forecasts. Economic modelling for the Project has a high degree of confidence.

A catastrophic weather, seismic or other event either naturally occurring or caused by human error could potentially result in a temporary cessation of operations until the situation was rectified. The Kudz Ze Kayah Project will be staffed by experienced mining tradespeople and professionals, who are experienced in rapid response to exigencies and will be well prepared to deal with any emergency situation promptly and adroitly. The protection of human health and safety is of paramount concern for BMC, and as such the inculcation of a 'worksite safe' culture, supplemented by continual safety training will be hallmark of the Project.

### R275

Provide additional information on the risks of temporary or permanent unscheduled closure of the Project focusing on socio-economic effects to employees, contractors, and businesses, and others who have been impacted economically. Include details and description on how adverse socio-economic effects will be mitigated and financed, particularly if an unscheduled closure occurs (i.e., how will BMC be able to finance the costs associated with mitigation measures).

### BMC RESPONSE

**1. Risk of Closure:**

Any unplanned or temporary closure of the project is most likely to occur through some unanticipated technical or financial occurrence that renders the mine either uneconomic or otherwise unfeasible to operate.

Prior to submitting and in preparation of the Project Proposal to YESAB, BMC has carried out feasibility studies that include likely technical and economic project elements. These studies have been carried out by experienced industry professionals both in house and through world renowned specialist mining consultancies that have a demonstrated track record of developing mining projects worldwide. At all stages of the investigations to date, BMC has been conscious of the technical and economic risks that can beset a mining project and has ensured that there is an appropriate level of conservatism in the assumptions and the technical and economic assessments. For example, BMC does not use short term metal price and exchange rate data in our project assessments but rather uses long term consensus forecasts provided by industry specialists in such diverse fields as commercial and merchant banking, metals and commodity traders, government economic groups, central banks, and mining industry bodies. In addition to adopting a longer term view, BMC has carried out its own internal stress testing of project economics under a range of scenarios including unplanned unfavourable short and long term movements in metals prices and exchange rates outside expected norms. The work completed to date has helped us to form our view regarding the financial metrics for the Project. Final financing decisions with respect to Project development will incorporate provision of various scenarios in relation to product pricing and technical risk to ensure that BMC is able to finance costs related to any temporary closure.

**2. Mitigation of outcomes from an unplanned closure:**

**a) The effects on employees of an unplanned or temporary closure;**

As outlined in the Socio-Economic report, the local region around the project and the Yukon generally has a relatively low level of mining employment and an overall high rate of youth and other unemployment. There are also a high number of working age people who have never had the opportunity to hold a full time or steady job due to the lack of availability of an opportunity. The proposed Project offers local community members the possibility to gain employment and improves their potential for future employment should this employment end after a period of time. Once workers have a demonstrated record of employment and transferable work skills, future employment is more likely.

Furthermore, BMC has certain programs already in place that promote education and on the job training. The most public of these is the current three year BMC-Kaska Scholarship program. This program is designed to run until June 2019 at which time it is expected that it will be superseded by the final mining related program. The current program:

- Supports and encourages Kaska secondary students to complete their final year of school;
- Encourages and supports completion of trade certificates and apprenticeships through Yukon College;
- Encourages and supports completion of certain technical studies that will result in achievement of diplomas, certificates and other recognisable qualifications through Yukon College; and
- Supports degree level technical studies in both mining related and other fields of study through any recognised university in Canada. Scholarship holders for mining related degrees

studies are further supported by a guarantee of vocational employment to gain work experience.

In 2016, the above program provided direct support to 27 Kaska members and it is expected that the 2017 and 2018 programs will provide benefits to similar or greater numbers. By the time the proposed mine is in operation, it is likely that over 100 local Kaska members will have enhanced their education due to the BMC-Kaska Scholarship program.

During the operation of the proposed mine, the company intends to continue a similar program to the above but will supplement this program by:

- Various on the job training programs; and
- Employment of apprentices and trainees.

The above programs will result in an overall upskilling of the workforce over the life of the project which is independent of the time that the project is open. Unplanned closure or interruption of operations either for a short period or longer period will not detract from this outcome. It should also be noted that the skills and experience gained through the projects life will be transferrable across different mine sites and across different industries. This upskilling will result in project employees being seen as valuable additions to any workforce in the Yukon or Canadian as well as the international mining industry or in any non-mining employment scenario that they choose to go into. As a result of the increased experience, the upskilling of the workforce and the mobility of that experience and skills gained, it is expected that any temporary closure of the project should not result in undue financial hardship for employees unless they choose to not take up work with other employers.

**b) The effects on local contractors of an unplanned or temporary closure**

The above explanation a) is no different for local contractors who will all gain through experience, contracting history and upskilling of their workforce. This will lead to an increase in their ability and capacity to compete for contracting opportunities both within the Yukon mining industry and in outside industries.

BMC has a policy of supporting local businesses with an established track record. In 2016, the BMC awarded over 70% of its major contracts at the Kudz Ze Kayah project to local First Nation and other Yukon companies. In the event of a planned or unplanned temporary closure of the project the company anticipates maintaining support for local businesses through BMC policy and practise.

**c) Funding mitigation measures around an unplanned or temporary closure event**

The Company is an international mining company with significant funds and funding commitments established. In order to develop the project, the company will generate additional funding through a combination of equity and debt. This funding level will be calculated to take into consideration working capital requirements and the risk of temporary cessation of revenue from project activities. Where there exists a risk from metal price and foreign exchange the company may put in place certain

hedging arrangements or other financial measures should the Directors in consultation with the Company's bankers and other advisors deem that it is prudent to do so.

In addition to this, the extensive studies that have been carried out on behalf of the company to date have demonstrated that the project is economically viable under a broad range of economic and technical conditions. The company expects to make a profit from the project and intends to adopt prudent and well tested cash management policies in order to ensure that it retains sufficient cash reserves on hand to adequately deal with any unforeseen revenue interruption over the project life.

Finally, it is normal practise for regulators to impose environmental bonding obligations on mine developers prior to issuing licences and permits to construct and operate. These bond requirements are normally calculated by the regulator to ensure that sufficient funds are available for an orderly closure of the mining project at any stage of its life. The company expects that this project will be no different in that regard and has included allowances within its financial models for this to occur.

## 12.2 INFORMATION REQUEST REPORT #2

The following presents the Information Requests from Information Request Report #2 (YESAB, 2017b) and BMC's responses (as they relate to additional mitigation measures for planned or unplanned closure of KZK).

### R2-116

Identify situations or scenarios where the project might operate on a reduced scale (including temporary or unplanned closure). This should include detail about assumptions made in the financial assessment of the prefeasibility study (referred to in Section 17.4 of the proposal). Characterize the potential effects of these scenario's and proposed mitigation.

### BMC RESPONSE

In certain circumstances it may be necessary to operate the mine on a reduced scale from that considered in the Project Proposal. As noted in BMC's response to R262, this could include a catastrophic weather, seismic or other event either naturally occurring or caused by human error, or alternatively a sustained period of reduced metal prices that threatened the ongoing economic viability of the Project.

With regard to the first mentioned natural or human error induced conditions, BMC anticipates that such events would be short lived and dealt with by experienced mining personnel trained and experienced in rapid response to any emergency situation in a prompt and efficient manner. The protection of human health and safety is of paramount concern for BMC, and as such the inculcation of a 'worksite safe' culture, supplemented by continual safety training will be a hallmark of the Project.

With regard to the second item of a sustained period of reduced metal prices; in preparing the prefeasibility economic assessment of the Project, BMC utilized financial analyst consensus long term

metal prices of US$1.07/lb zinc, US$0.94/lb lead, US$2.95/lb copper, US$1,292/oz gold and US$19.31/oz silver. As of the date of preparing this response (November 13, 2017) current metal prices are in general notably higher than that used in the prefeasibility study; namely US$1.49/lb zinc, US$1.15/lb lead, US$3.08/lb copper, US$1,278/oz gold and US$16.92/oz silver, indicating a degree of flexibility from that used for the economic assessment (prices were obtained from the following source: http://www.indexmundi.com/commodities/).

In the event that metal prices fell below that adopted for prefeasibility study economic analysis, a considerable margin exists before the operating viability of the Project would be called into question. Annual operating costs are projected to be in the order of US$120 million per year. Metal prices would need to fall by an average of 50% from that considered in the prefeasibility study before the average annual operating costs would no longer be covered by revenue generated from concentrate sales. This equates to metal prices of US$0.54/lb zinc, US$0.47/lb lead, US$1.48/lb copper, US$646/oz gold and US$9.65/oz silver. A comparison to historical metal prices over the last ten years as shown in Figure 12-1 to Figure 12-5, demonstrates that metal prices would need to fall significantly below their long term averages before the average annual operating costs could no longer be covered by regular operations and hence the long term economic viability of the Project could possibly be placed in doubt.

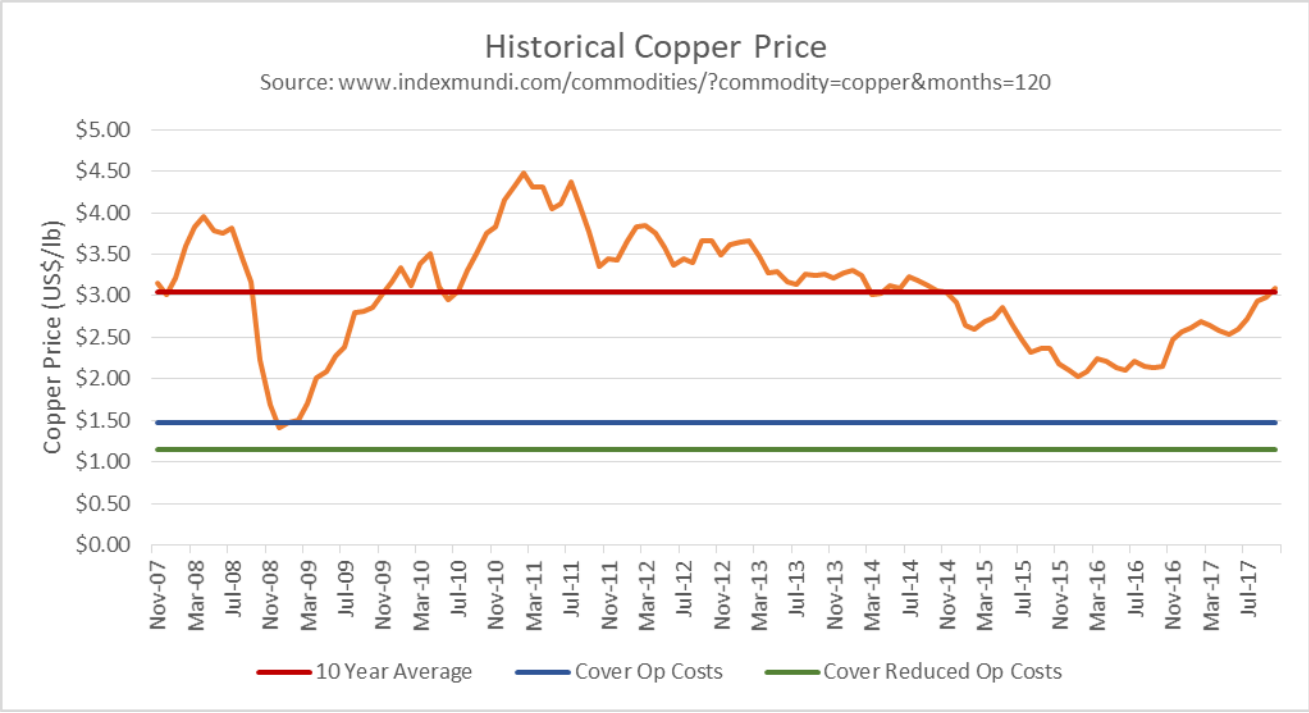


**Figure 12-1: Historical Copper Price Compared to Operating Costs and Reduced Operating Costs**

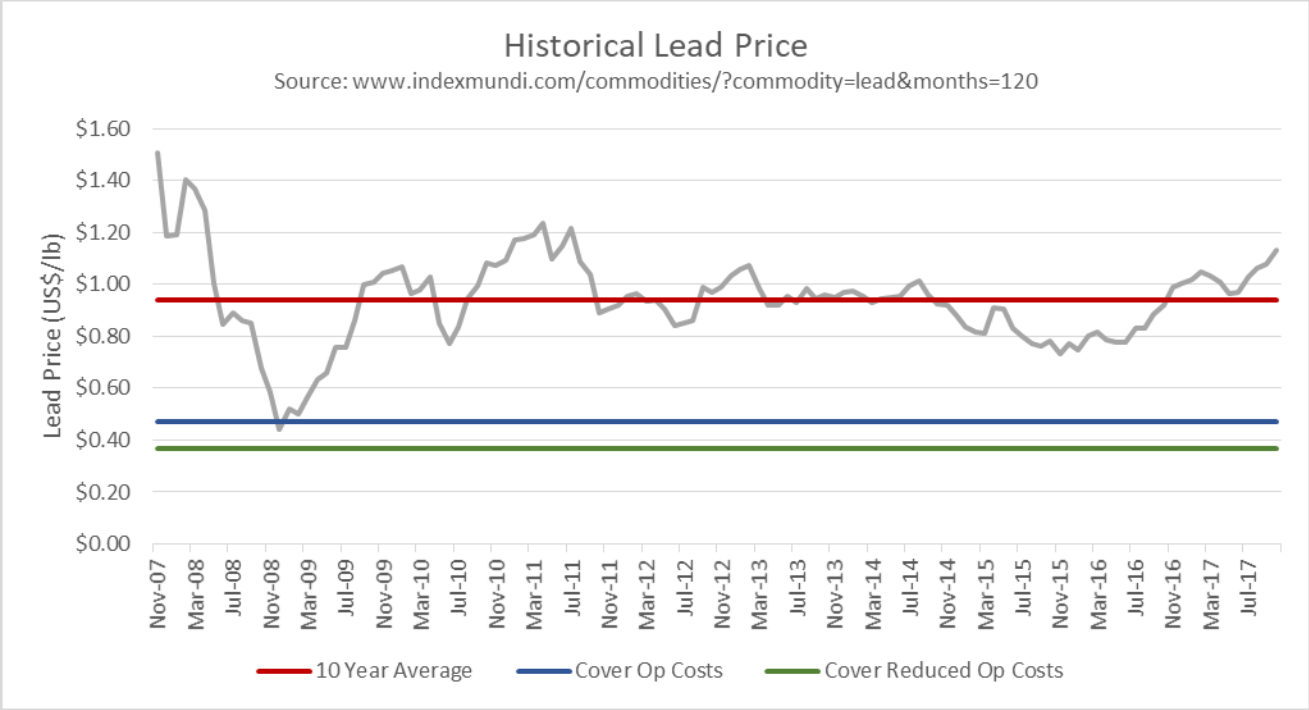


**Figure 12-2: Historical Lead Price Compared to Operating Costs and Reduced Operating Costs**

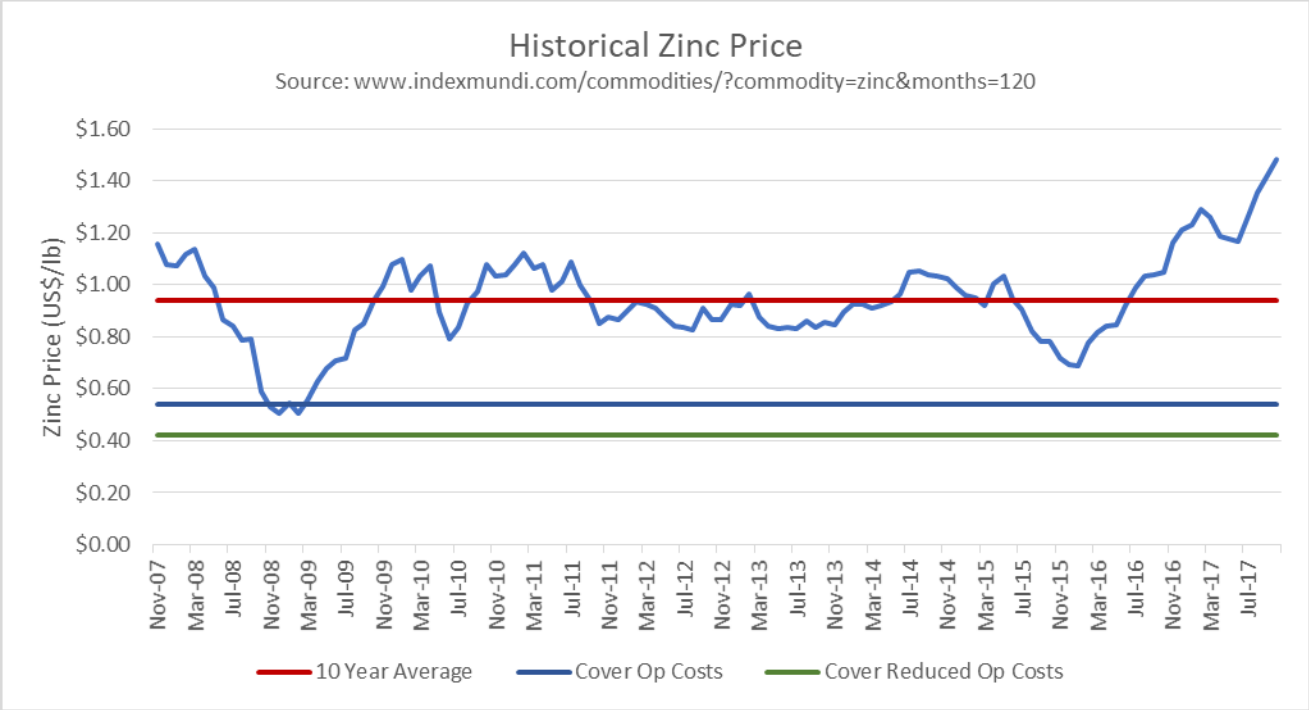


**Figure 12-3: Historical Zinc Price Compared to Operating Costs and Reduced Operating Costs**

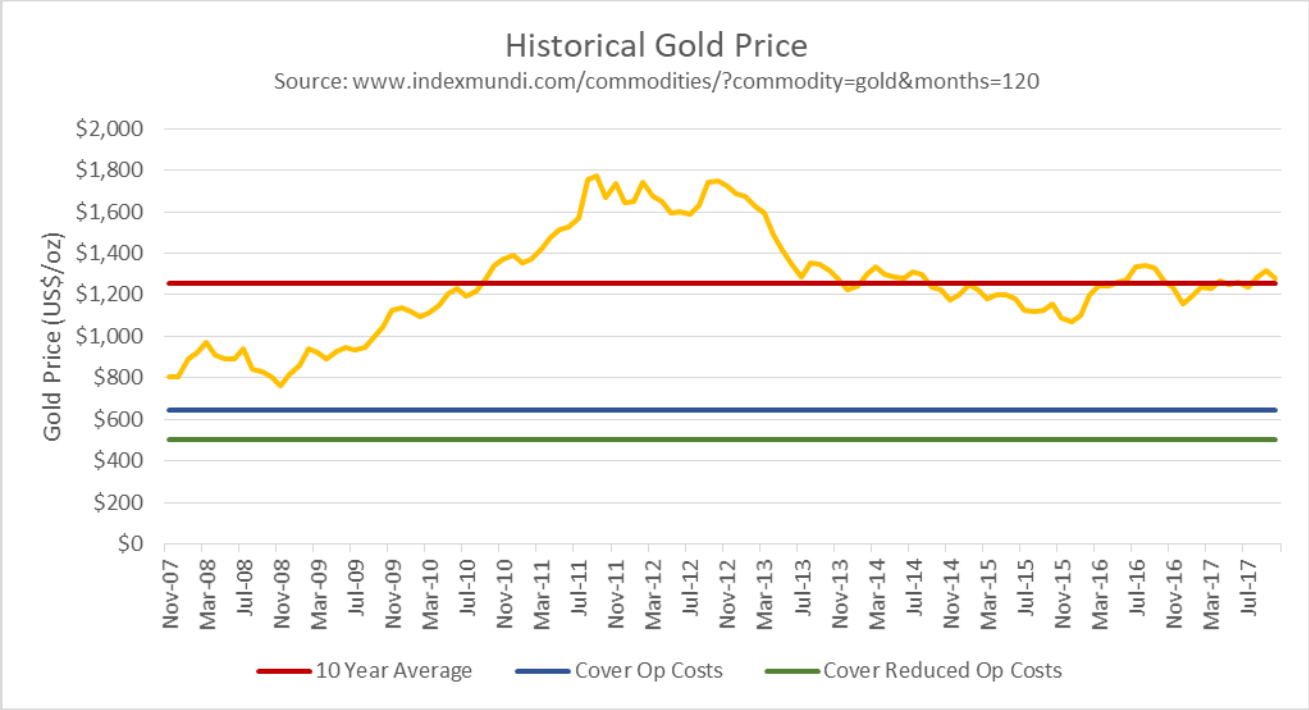


**Figure 12-4: Historical Gold Price Compared to Operating Costs and Reduced Operating Costs**

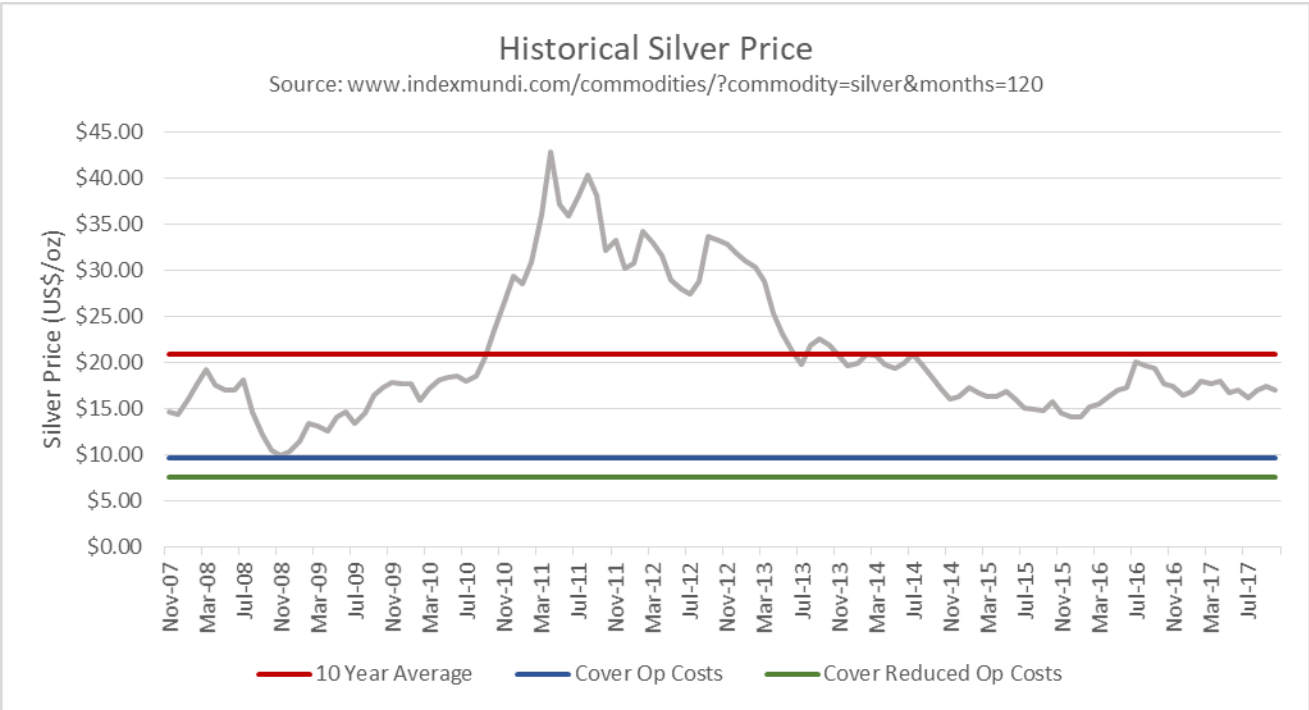


**Figure 12-5: Historical Silver Price Compared to Operating Costs and Reduced Operating Costs**

In addition to the financial strength of the Project noted above, should a sustained period of low metal prices be experienced, BMC would review its operating expenditures and make appropriate short term reductions to defer the need to place the operation in a temporary closure phase. This could include cessation or reduction of open pit waste stripping to focus on mining of previously exposed ore and ore that has a lower waste to ore stripping ratio. Typically, the open pit mine would have between one and six months supply of ore exposed within the open pit available for blasting and haulage to the processing plant. This ensures that a reliable supply of ore can be maintained to the processing plant and that blending and scheduling requirements can be adequately managed. However, should it be necessary to temporarily cease mining of open pit waste, operating costs would be reduced by approximately 45% of that of regular operations, allowing metal prices to reduce to US$0.42/lb zinc, US$0.37/lb lead, US$1.15/lb copper, US$505/oz gold and US$7.50/oz silver before operating costs could no longer be covered by day to day operations. These metal prices are also detailed in Figure 12-1 to Figure 12-5. Clearly, as a polymetallic mining project the mix of metals, by their very nature, provide a natural hedging effect. It would be unlikely that all metals would be reduced or at a cyclical low at the same time and so while the above metal prices are theoretically possible at the same time there is no sensible scenario that makes them likely.

Should low metal prices persist, the company will also have stockpiled ore on the Run of Mine Pad to draw from to continue to feed the processing plant, without the need of incurring additional mining costs. Stockpile levels vary by month according to the mine plan, but are typically in the order of three to four months of processing plant requirements.

In summary, the Kudz Ze Kayah Project has been demonstrated to be a robust economic Project, able to withstand a significant reduction (50%) in metal prices before operating costs would no longer be covered and the ongoing viability of the operation could be called into question. In the unlikely event that this were to occur, the company has additional operating strategies to reduce ongoing operating costs to ensure that the operation can continue as a going concern until metal prices recover to long term historical fundamentals. This is common practice in the international mining industry.

### R2-126

Provide additional information on the risks of temporary or permanent unscheduled closure of the Project focusing on socio-economic effects to employees, contractors, and businesses, and others who have been impacted economically. Include details and description of adverse effects; on how these effects will be mitigated and how they will be financed.

### BMC RESPONSE

BMC believes that the likelihood or risk of temporary or permanent unscheduled closure occurring has been well described in its previous response to R275. With regards to the matter of effects of temporary or unscheduled closure the Company offers the following additional comments:

In the case of a temporary closure or reduction in activity, the activity on site does not diminish immediately. A relevant local example of this can be seen at Capstones' Minto Mine in north-east Yukon. Due to a sustained reduction in copper prices the company announced that it was considering

its options in relation to operations at the mine (2014). In 2015, it announced that it was putting in place certain cost reduction measures including the treatment of existing low-grade stockpiles, reduction in waste stripping and deferral of certain other capital expenditures. It was several months after the initial statements before there were any significant reductions in site personnel numbers and during this period ore that had already been stripped of waste continued to be mined. As part of its plan it maintained an orderly reduction in activities for all of its contractors and ensured that the contractors were able to manage the reduction in revenues from the Project. In 2017, Capstone announced resumption of normal site activities and those same contractors (and the company) were well placed to ramp up site operations. The Minto mine example is reasonably typical of a well managed temporary closure or reduction of activity on a mining project.

In the case of Kudz Ze Kayah, BMC notes that the Project intends to operate with ore stockpiles equivalent to 1 to 4 months of processing plant feed (between 150,000t and 600,000t). The intrinsic value of those stockpiles will vary with grade however as the Project is predominantly open pit with low operating costs and robust operating margins and the cost of treating stockpiles is approximately half the costs if mining is required, these stockpiles will generate substantial revenues should there be a temporary cessation or reduction of mining activity. In addition to those stockpiles, at any discrete point in time there will be certain ore in the pit (or underground) where capital waste movement has been completed and that ore can be mined at low incremental cost. The combination of available exposed ore and existing ore stockpiles means that in any unexpected closure, the Company will have multiple options available to it and will be able to reduce site mining and processing activity over a controlled and extended period whilst maintaining strong cashflows to protect creditors and employee entitlements. During this period, employees and contractors will be able to similarly make decisions and put in place mitigation measures of their own in a controlled manner over a reasonable timeframe.

In the case of an unexpected total closure of the mine it should be noted that closure of a mine does not correlate to cessation of all activity. In the case of Kudz Ze Kayah, a full closure would still require treatment of all ore stockpiles (taking 2 to 4 months) and then subsequent treatment of any accumulated low- grade stockpiles (the level of which will vary throughout the Project life). Treatment of these stockpiles would generate substantial cashflow which would provide funding for an orderly closure of the processing plant associated infrastructure. The period of time from a decision to close to cessation of activity to only Care & Maintenance would be no less than six (6) months and could be as high as 18 months under some circumstances. Given that activity during this period would be fully funded by the extraction of value from the stockpiles this is considered adequate mitigation.

In addition to the above, it is expected that as a condition of permitting the Project, the regulator will require the lodgement of an appropriate level of environmental bonds (either cash, bank guarantees or some other form of funding acceptable to the Yukon Government). It is normal practise for the bond amount lodged to be regularly reviewed and adjusted to ensure that it is appropriate to cover the full remediation of the Project. In the absolute worst-case scenario, these funds would therefore be available to the government to fund remediation activity independent of the financial health of the company. In the case of an unexpected and sudden full closure of the Project then the focus of the mining fleet and personnel and significant numbers of other staff would change from mining to

reclamation. The period of active reclamation is expected to take at least 3 years. This period is more than enough to allow mining, maintenance and related employees and contractors an orderly departure from the site.

The above deals primarily with the financial implications of unexpected temporary or permanent closure. It should be noted that the company accepts that there is a clear link between financial stress and emotional well-being and personal health. Provision of a controlled closure will provide some protection for employee on this front but it cannot be the only tool. BMC reiterates its comments made in response to question R275 regarding the provision of an Employee Assistance Program (EAP). These programs are very flexible and will be made available to employees and contractors working on site and their immediate families. In the case of a temporary or unplanned closure, the EAP will still be in place and will be funded by the company (and in certain circumstances by the company's insurer). This program will provide additional emotional and mental health support for those that are in need of it. This program will be supplemented by the provision of externally managed outplacement services for all personnel employed by the company at the Project. Typically, these programs run from between 1 month to 1 year from the cessation of employment (but can run longer if required) and are designed to help employees to either obtain other employment in the same field or to prepare for and subsequently obtain employment if a different field if that is their wish. The employment upskilling identified in R275 will combine with the above to provide significant mitigation in the event of full unplanned closure.

## 12.3 INFORMATION REQUEST REPORT #3

The following presents the Information Requests from Information Request Report #3 (YESAB, 2018) and BMC's responses (as they relate to additional mitigation measures for planned or unplanned closure of KZK).

### YESAB ISSUE

While ongoing exploration activities by the Proponent and other companies may delay the decline of mining activities in the area, an eventual decrease in the level of mining activity is inevitable. If this is not replaced by other sources of income/employment for the local area and Yukon at large, this may result in some of the adverse effects associated with a boom and bust cycle.

### BMC RESPONSE

YESAB has stated that "the eventual decrease in the level of mining activity is inevitable". BMC notes that on a worldwide basis, mining activity is increasing as demands for metals such as copper, lead and zinc has increased (on average) by approximately 1-3% per annum for the last 100 years. In the case of zinc (the dominant metal at the project) this equates to approximately 140,000 – 420,000 tonnes of new metal supply being required every year. Broadly speaking, this means that a new mine the size of Kudz Ze Kayah is required to be opened every 2-6 months somewhere in the world over the next generation. There is no doubt that mining is a cyclical industry where mining exploration activity is linked to world economic conditions however the phrase "boom and bust cycle" is a populist

phrase that has been coined by non-industry persons and it does not properly describe the reality of either the growing world wide need for the metals being mined from KZK or a modern operating mine that has undergone rigorous feasibility, environmental and socio-economic analysis.

### R3-16

Describe measures to mitigate potentially significant adverse effects associated with the loss of employment at the end of the mine's operational life.

### BMC RESPONSE

BMC notes that the Project life cycle is expected to be as set out below. The Project life cycle will broadly match the equivalent working life of an adult. That is, the Project will be expected to provide employment and career opportunities for a generation.

1. BMC exploration/drillout and feasibility: 2.5 years
2. Permitting: 2.5 years
3. Construction: 2 years
4. Operation (approximate): 10 years
5. Active Closure: 3 years
6. Transition Closure (estimated): 13 years
7. Passive Closure Period (estimated): 10 years
8. Total project life cycle: 43 years

The period of maximum employment at the Project will be from commencement of Construction through to the end of the Transitional Closure. This is a period of approximately 28 years. The YESAB question therefore relates to the company's planned actions approximately 13 -28 years from today. Any answer to this must take into account the context of the timeframe and the uncertainty that this introduces.

There are a number of tried and successfully executed methods for the orderly closure of mining projects. The following outlines one that is common and that the proponents have utilised before. The key to successful mine closure is for clarity, and communication with, the workforce so that the Project phases are well understood as early as possible. In this way the company and its current and potential employees can and will make decisions on employment in full knowledge of both the risks and consequences.

During the last one to two years of the operational phase of the Project, mining activity will reduce steadily as follows;

- In the underground mine, mine development will reduce and then cease and only production stoping will continue. During this period, a number of personnel will naturally cease working for the company of their own accord and take up positions elsewhere. This is typical in the

last year or two of both mining and non-mining industries. The company will regularly assess its employment needs and as underground mine development reduces, mine development personnel will be redeployed into the mine production crews (where their skills are readily transferrable) to fill ongoing vacancies. During this period, the company shall commence removal of fixed equipment from mined out areas and this will be undertaken by former development personnel. The company acknowledges that at times it will be slightly over or understaffed and has accommodated this in its schedules and financial calculations.

- In the open pit, as the pit gets deeper and work areas become restricted, the mining (drill/blast/excavate) sequence will be modified, waste to ore strip ratios will be reduced and activity in the pit will gradually reduce. At the same time, reclamation activity on the mining waste rock storage areas will be increased and when mining activity is low in the open pit, personnel will be redeployed to carrying out the reclamation earthworks. In this way it is expected that overall activity for mining personnel will be kept relatively constant.

- At the end of the open pit mining period, specialist drill and blast personnel will be offered employment termination packages (see below). Most other mine earthmoving personnel will move to fulltime roles in reclamation. This work shall continue for 1-2 years.

- From a mineral processing perspective, the company will continue at full processing production until late in the final year of operations at which point the company will most likely transition to an operating cycle that fits with the remnant production capacity of the mine. In the company's experience, it is likely that personnel will commence to find other permanent roles from approximately 12 months prior to this period. The company will therefore need to adopt a strategy to deal with a steadily reducing workforce during this period. The company may need to modify its processing activity slightly earlier than expected if employee numbers dictate. In any event, this will not appreciably impact the company's financial models and will be easily accommodated.

- Once the Project has processed all the available ore stockpiles, the processing team will commence closure operations which will ensure employment continuity for the majority of the operators. The remainder will be offered termination packages (see below).

- At some point during the Active Closure period the company will offer voluntary redundancy packages to general employees. Employees with critical skills that are required for the Active, Transitional and Passive closure periods will not be offered termination packages. In this way the company expects to reduce employees on site to those number required for the next stage (i.e. Transitional or Passive) of closure.

- Given that the Transitional and Passive closure period runs for 23 years past this point (i.e. starting in approximately 13-14 years from now) any prediction past that point will have limited accuracy. In addition, the company estimates that the natural attrition of employees leaving employment during that time will largely balance the declining need for personnel hence whilst at some point a number of redundancy packages may be offered it is likely these will be limited.

- Throughout the steps above, the company will take into account the unique circumstances of every employee and will give retention preference to locally based employees. This will not preclude locally based employees from requesting a termination package if they wish to take advantage of another employment opportunity elsewhere.

- Redundancy packages typically include the following elements:

    - Relocation/transfers into other roles within the company (for example into exploration or environmental monitoring roles).

    - Retention bonus so that employees finish their employment at a time that suits the company's operational needs.

    - Retraining allowances to help the employees upskill to fit their future desired roles;

    - Employment outsourcing support, where the company pays for third party support for new employment roles. The degree of this support will vary depending upon the level of employment activity that is prevalent in the Yukon and Canada at the time but typically these packages are provided for 3-12 months. Outsourcing support typically includes assistance with preparing resumes, letters of application, career counselling and advice, sourcing of opportunities and coaching for interviews. It can be as comprehensive as the employee needs;

    - References will be provided for all employees;

    - Termination redundancy payments will vary depending upon circumstances but typically these payments will vary from 1-6 months of the average annual wage of the employee; and

    - Employee Assistance Programs (EAP) to provide counselling and emotional support on an as required basis for both employees and their immediate family members for a period of 3-6 months after closure of the Project.

### R3-17

How will employees and contractors be meaningfully supported through the transition from operations to closure and closure to post-closure?

### BMC RESPONSE

Please see BMC's response to R3-16.

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