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November 28, 2014
Project No.: 1460-001

Mr. Gordon Frost
Copper Mountain Mining (BC) Ltd.
Copper Mountain Mine
Box 1400
Princeton, BC, V0X 1W0

Dear Mr. Frost,

**Re: 2014 Independent Review/Audit of Tailings Dam Safety Inspection and
Consequence Classification: Copper Mountain Mine, BC**

1.0 INTRODUCTION

1.1. Background

BGC Engineering Inc. (BGC) was retained by Copper Mountain Mining (BC) Ltd. (CMML) to conduct an independent third party review/audit of the 2014 Dam Safety Inspection (DSI) report for the tailings dams at the Copper Mountain Mine including a review of the failure consequence classification for the associated dams. The Copper Mountain Mine is located approximately 15 km south west of Princeton, British Columbia (BC).

This work was carried out in general accordance with our proposal, dated November 4, 2014, and CCML's authorization to proceed on November 4, 2014. This work is subsequent to the BC Chief Inspector of Mines order, dated August 18, 2014, requiring an independent review of 2014 DSI's prior to December 1, 2014.

Production at the Copper Mountain Mine and use of the tailings management facility (TMF) commenced in 1972 and continued through to 1996, when mine operations were suspended. The TMF was reactivated in May 2011, during commissioning of the mill facility. East Dam construction did not begin until 2012, with the West Dam construction beginning in 2013. A detailed site investigation and dam safety review were performed in 2011 (AMEC, 2011) as part of the TMF reactivation design.

The TMF incorporates two tailings dams located at the east and west ends of a small west-east trending valley situated between the Similkameen River and Wolfe Creek valleys. The dams are constructed of cycloned tailings sand, using a combination of centerline and upstream construction methods. Based on the drawings provided in 2014 DSI Report (AMEC 2014), the tailings dams are approximately 130 m high.

1.2. Scope of Work

The scope of work for this audit was limited to:

- Document Review: review of AMEC 2014 DSI report for the Copper Mountain Tailings Storage Facility, dated November 7, 2014
- DSI Independent Audit: comparison of the 2014 DSI report to the BC Ministry of Energy & Mines (MEM) Guidelines for Annual Dam Safety Inspection Reports (BC 2013), including a review of the information provided as it relates to the hazard classification
- Reporting: Preparation of letter report for the DSI Independent Review Audit of the Copper Mountain Mine TMF.

1.3. Limitations

This audit report addresses whether the 2014 DSI report was in conformance or deficient to the guidelines presented in BC (2013). The report does not address the safety of the structures, as this was beyond the scope and intent of our work.

As this audit work was a desktop study, no site visit was conducted by BGC. Further from this, BGC relied on the site observations and thorough review of data on site by other third parties for completeness, without any independent first-hand or on site verification directly by BGC. These limitations are important and should be acknowledged. As such, BGC's review herein does not relieve the professional engineer conducting the DSI or engineer of record (EOR) work and/or the owner of their relevant responsibilities.

2.0 AUDIT REVIEW

2.1. Consequence Classification

Both dams are assigned a "Very High" consequence category based on the CDA (2007) Guidelines. Section 2.3 of the DSI report states that the "Very High" consequence is based on the assessment in the 2011 TMF reactivation design (AMEC, 2011), based on the perceived "Significant" environmental damages and "Very High" potential economic losses associated with a hypothetical dam failure. This was reported to be in accordance with the results in the subsequent revised Dam Breach Inundation Study (AMEC, 2013a). BGC did not review AMEC (2011) or AMEC (2013a).

Additionally, Section 2.3 in the DSI report states that the criteria used for seismic and IDF design are the CDA (2007) guideline suggested target values for dams with "Extreme" consequence classifications. Thus though the dams have been given a "Very High" consequence classification, they are designed by AMEC for a higher consequence classification.

A detailed explanation was not available of the deemed potential consequences to: Loss of Life, Environmental and Cultural Values, and Infrastructure and Economics in accordance with the CDA Guidelines. However, given that the design utilizes criteria for dams with "Extreme"

consequences as described above, a detailed description of specific consequences would have no appreciable impact on the design.

2.2. DSI Report Review

The 2014 DSI for the Copper Mountain Mine TMF was conducted on September 4, 2014, by Andrew Witte, P.Eng. of AMEC. As part of our audit of the DSI, we compared AMEC (2014) to BC (2013), which defines the requirements for a DSI report. Our comparison is provided in Table 1 below.

Table 1. DSI Report Audit Compared to BC 2013 Requirements.

Requirement No.	BC 2013 Requirements	Discussion Included in Report	Comments
1a	Classification of the dam(s) in terms of Consequence of Failure in accordance with Table 2-1 of the CDA Dam Safety Guidelines (2007).	Yes	The East and West Tailings Dams are both classified as “Very High” Consequence. Section 2.3 of the DSI report did discuss the justification for this rating, as described in Section 2.1 above. The dam is designed based on a higher (“Extreme”) consequence classification for seismic and IDF criteria.
1b	Significant changes in instrumentation and/or visual monitoring records.	Yes	<p>Instrumentation and Monitoring are discussed in Section 6 of the DSI report. There were no reported significant changes in instrumentation or visual monitoring records for 2014. No new instruments were installed in 2014.</p> <p>The DSI report provides maximum and minimum water elevations measured in each of the piezometers at the site, and compares them to the threshold values determined from the most recent design. All water levels were reported as being below the minimum (“Green Light”) threshold value.</p> <p>The DSI report provides results of all (four) slope inclinometers since installation in 2013, two for each dam. The movements were compared to the threshold movement rates, and it was reported that the measured rates were below the minimum (“Green Light”) threshold rate.</p>
1c	Significant changes to dam stability and/or surface water control.	Yes	<p>The DSI report indicates no changes to dam stability.</p> <p>Section 2.2.2 and 2.3 of the DSI report also discusses the potential implications of the new CDA (2014) guidance on factor of safety during construction, and indicates that going forward the design may steward towards a minimum static factor of safety > 1.5 for short-term, construction conditions.</p> <p>No changes to surface water control were reported.</p>

Requirement No.	BC 2013 Requirements	Discussion Included in Report	Comments
1d	For major impoundments, as defined in Part 10 of the Code, a current Operation, Maintenance and Surveillance (OMS) Manual is required. The annual report shall indicate the latest revision date of the OMS manual.	Yes	The most recent version of the OMS Manual is Revision 1, dated 8 October, 2013 (AMEC, 2013b). The DSI report also provides a PowerPoint slide pack (Appendix D) that has been prepared and presented to select site staff as additional training for OMS and EPP familiarization in 2014.
1e	For tailings dams classified as High, Very High, or Extreme Consequence, an Emergency Preparedness Plan (EPP) is required. The annual report shall indicate the latest revision date of the EPP document.	Yes	The EPP was updated in concert with the OMS Manual in October 2013, to be consistent with the results of the 2013 Dam Breach Inundation Study (AMEC (2013a). The EPP is contained in the OMS Manual.
1f	Scheduled date for the next formal Dam Safety Review in accordance with Table 5-1 of the CDA Dam Safety Guidelines (2007). Formal Dam Safety Reviews are required every 5 to 10 years (depending on consequence classification) and differ from annual dam safety inspections. The requirements for Dam Safety Reviews are included in Section 5 of the CDA Dam Safety Guidelines. Dam Safety Reviews may be conducted by the Engineer of Record with third party review, or by an independent third party with involvement of the Engineer of Record.	Yes	A Dam Safety Review is reported to have been conducted as part of the reactivation of the TMF in 2011 (AMEC, 2011). Based on the current Consequence Classification of "Very High", AMEC recommends the next DSR to be conducted in 2016 by an independent third party in consultation with the EOR.

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2	Summary of past years' construction (if any) with a description of any problems and stabilization.	Yes	<p>Section 4 of the DSI report discusses activities since the 2013 annual inspection.</p> <p>Crest raising of the East Dam to El. 930 m using cycloned sand began in March 2014, and was scheduled to end in November 2014, after the DSI inspection in September 2014.</p> <p>Crest raising of the West Dam to El. 930 m using cycloned sand occurred throughout the winter of 2013/2014, and was scheduled to end in November 2014, after the DSI inspection in September 2014.</p> <p>Beach construction occurred in conjunction with cycloning of sand for dam construction via cyclone overflow and spigotting of total tailings off the tailings header pipes, between the cyclones.</p> <p>It was reported that there were no problems.</p>
3	Plan and representative cross sections.	Yes	Plan and representative cross section drawings were provided in the Drawings Section of the DSI report. Section drawings included locations and measured heads in the piezometers.
4	Site photographs.	Yes	Appendix A of the DSI report included 42 photographs taken during the DSI.
5	Review of climate data.	Yes	Section 5.1 of the DSI report reviews the climate data for the year and compares it to historical averages. Total precipitation for 2014 was lower than average, though snow fall in February and March was 150% to 250% higher than average.
6	Water balance review.	Yes	Section 5.3 of the DSI report discusses water storage volumes, and Figure 5.3 shows pond water volume over the 2013-2014 time frame. Two pond soundings in 2014 gave pond water volumes of 1.8 Mm ³ and 1.3 Mm ³ . In 2013, volumes ranged between 0.8 and 1.6 Mm ³ . For calculation of freeboard and IDF storage associated with dam raises, a conservative value for pond storage volume of 2.0 Mm ³ has been used (i.e. the pond volume is not to exceed 2.0 Mm ³).

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7	Freeboard and storage availability (in excess of the design flood).	Yes	<p>The DSI report indicates that the design minimum freeboard is 2 m above the IDF pond level. During the inspection, the freeboard was 8.9 m. A record of freeboard throughout the year was not provided.</p> <p>The IDF volume is stated to be 2.5 Mm³ based on the 2011 Design Report (AMEC, 2011). The DSI report states that the design water balance could accommodate up to 2.0 Mm³ of pond water plus the IDF. As noted above, the pond soundings gave a water volume of 1.8 and 1.3 Mm³ on two occasions in 2014, below the maximum design volume of 2.0 Mm³.</p> <p>A plot of maximum operating level and pond level versus time would allow more accurate reporting and monitoring by the operator.</p>
8	Water discharge system, volumes, and quality.	Yes	<p>Water is removed via the reclaim water pumping system, with a maximum capacity of approximately 3,200 m³/hr. There are no spillways associated with the TMF and the system relies on evaporation, seepage and pumping to maintain the design freeboard.</p>
9	Seepage occurrence and water quality.	Yes	<p>The dams have internal drains to collect seepage with the seepage collection pipes exiting at the dam toes. Seepage is collected in a pond and collection ditches at the dam toes and pumped back into the pond.</p> <p>Flows from the East Dam toe drain outlets were reported to appear to be higher than in 2013, but no flow measurements are available to corroborate this observation on the inspection. Pump back records indicate similar rates for 2013 and 2014. Vegetative growth around the drains was removed in November to promote visual inspection. The rock crest drain outlet pipe was partially buried, but no flow was observed. The pipe was subsequently exposed to allow for drainage, should any occur.</p> <p>The West Dam drain outlets were covered in saturated sand during the inspection, and were subsequently exhumed and a channel</p>

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			<p>was dug to direct seepage to the pond. Flows from the rock crest drain had increased in 2014 from measured flows in 2013.</p> <p>Seepage in the recovery system appeared clear and free of suspended solids.</p> <p>No other seepage emanating from the dams were reported.</p> <p>Reportedly the seepage pump back pipelines that currently run up the dam face, are damaged in several locations, and are over pressurized at the bottom. A breakage had reportedly occurred on the pipeline near the toe of the East Dam, resulting in some erosion. We understand the seepage pump back system on both dams has been shut down until assessment and remediation is completed.</p>
10	Surface water control and surface erosion.	Yes	<p>Minor erosion was reported at the south abutment of the West Dam resulting from runoff from the access road on the face of the dam.</p> <p>Minor erosion on the downstream slope of the West Dam was noted, resulting from cyclone overflow that ran down the face of the slope.</p> <p>No other surface water control issues were reported to have occurred.</p>
11a	Instrumentation review including: Phreatic surfaces and piezometric data.	Yes	As noted above in 1b reportedly all water levels were below alert levels. The system is reported to have two phreatic surfaces (shown on the cross sections and based on piezometric data), one within the tailings and dam, and a deeper one in the foundation, resulting in downward gradients.
11b	Instrumentation review including: Settlement.	No	Based on the information provided in the report, there is no settlement monitoring of the structures.
11c	Instrumentation review including: Lateral movement.	Yes	The results of the four slope inclinometers (two in each dam) are discussed in 1b above.

Requirement No.	BC 2013 Requirements	Discussion Included in Report	Comments
	The report shall be submitted by a qualified geotechnical engineer registered as a Professional Engineer (P.Eng.) in British Columbia. The professional engineer will be deemed the Engineer of Record for the facility unless another engineer is identified within the Dam Safety Inspection report as having this responsibility.	Yes	Andrew Witte, the individual who signed and sealed the report, as noted on the APEGBC website, is registered as a Professional Civil Engineer in British Columbia. He is also reported as the Engineer of Record for the facility (Section 2.2.1 of the AMEC 2014 report)

3.0 SUMMARY

In general, the AMEC (2014) report addresses the requirements as outlined in BC (2013) to be discussed in a DSI report, and provided recommendations consistent with their observations.

The 2014 DSI report states that the consequence classification for the dam is "Very High". The DSI report does not provide a detailed breakdown of the specific consequences used to obtain this classification, however BGC noted that a more severe classification of "Extreme" has been used for design. As the classification of "Extreme" is the most severe failure consequence classification for dams in British Columbia, BGC concludes that this classification is considered suitable as a basis for design.

BGC is in agreement with the recommendations made by AMEC to address the seepage recycle system shut down.

Furthermore, BGC recommends that:

- Subsequent DSI reports would benefit from a plot of maximum operating level and pond level versus time.
- Minor surface erosion described in item 10 in Table 1 should be investigated to target the cause of this erosion. Minor surface erosion that does occur should continue to be repaired in conjunction with the EOR.

4.0 DOCUMENT NOTES

BGC Engineering Inc. ("BGC") prepared this document (the "Report") for the account of Copper Mountain Mine (BC) Ltd (the "Client"). The material in the Report reflects the judgment of BGC staff based upon the information made available to BGC at the time of preparation of the Report, including that information provided to it by the Client. Any use which a third party makes of this Report or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility whatsoever for damages, loss, expenses, loss of profit or revenues, if any, suffered by any third party as a result of decisions made or actions based on this Report.

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Note the conclusions provided herein will change as the recommended mitigation measures are undertaken.

5.0 CLOSURE

We trust this meets your requirements, and thank you for the opportunity to work with you on this project.

Yours sincerely,

BGC ENGINEERING INC.

per:



Kevin Biggar, Ph.D., P.Eng. (AB, BC, NT)
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KB/RDP/bb/st

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