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December 1, 2014
Project No.: 0954-005-04

Ms. Janis Cardiff
Barkerville Gold Mines Ltd.
15th Floor – 675 West Hastings St.
Vancouver, BC, V6B 1N2

Dear Ms. Cardiff,

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

1.0 INTRODUCTION

1.1. Background

BGC Engineering Inc. (BGC) was retained by Barkerville Gold Mines Ltd. (BGM) to conduct an independent third party review/audit of the 2014 Dam Safety Inspection (DSI) report for the tailings dams at BGM's QR Mine, as well as a review of the failure consequence classification for the associated dams. The QR Mine is located about 60 km southeast of Quesnel, British Columbia (BC).

This work was carried out in general accordance with our proposal, dated October 22, 2014, and BGM's authorization to proceed on October 27, 2014. This work is subsequent to the BC Chief Inspector of Mines' Order ("the Order"), dated August 18, 2014, requiring an independent review of 2014 DSI's prior to December 1, 2014 (BCMEM 2014).

Construction of the QR Mine tailings storage facility (TSF) commenced in 1994 and is comprised of two cross valley embankments for tailings containment, the Tailings Dam to the north and the Cross Dyke to the south. Since initial construction, the Tailings Dam and Cross Dyke have been raised in a number of stages and methods over the years. As reported in the 2014 Klohn Crippen Berger Ltd.'s (KCB) DSI, the most recent dam raise of the Tailings Dam and Cross Dyke, as well construction of the closure spillway, was on-going during KCB's 2014 site inspection. Based on the drawings provided in KCB 2014, the Tailings Dam is approximately 28 m high, whereas the Cross Dyke is approximately 17 m high. Note that in KCB 2014, the Tailings Dam is referred to as both the North Dam and Tailings Dam.

BGC understands that tailings are no longer being placed in the TSF but rather the flooded Main Zone Pit at the QR Mine (KCB, 2014).

1.2. Scope of Work

BGC's scope of work for this audit, as noted in our proposal of October 22, 2014, was limited to the following:

- Document Review: review of KCB 2014 DSI (Rev. 1) report for the QR Tailings Storage Facility, dated November 24, 2014, and table of contents of BGM's Operation, Maintenance and Surveillance Manual, dated May 2014 Revision 2014-2 and the current Environmental Emergency Response Plan, Fourth Revision dated November 22, 2012.
- DSI Independent Audit: comparison of the 2014 DSI report to the BC Ministry of Energy & Mines Guidelines for Annual Dam Safety Inspection Reports (BCMEM 2013) and review of hazard classification.
- Reporting: Preparation of a letter report for the DSI Independent Review/Audit of the QR Mine TSF.

Note this work was also to include a review of the hazard classification of the structures, as determined by others. However, insufficient background information on the dam failure consequences was available at the time of completing this report to complete a review of the classification.

1.3. Limitations

Our report addresses whether the 2014 DSI report was in conformance or deficient to the guidelines presented in BCMEM 2013. This audit 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 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

Based on the data provided, and referenced in this report, it appears a preliminary classification of the dams was conducted in 2003 by Klohn Crippen Consultants Ltd. (KCB, 2009) for the previous owner of the QR Mine. At that time, the QR Mine TSF Dam classifications were considered to be "Low" based on the Socioeconomic, Financial and Environmental Consequence as outlined in the Canadian Dam Association (CDA) 1999 Guidelines.

Subsequent to this initial classification KCB 2009, also conducted for a previous owner of the mine, adopted the hazard classification as "Significant" for the dams, according to criteria in

CDA 2007 without the benefit of a dam break analyses. This classification was also adopted in the KCB 2014 DSI report for the current owner BGM.

In the course of conducting the Dam Safety Review of the QR Mine TSF dams in 2012, BGC was not asked to re-assess the hazard classification of the dams. Rather, BGC's scope was based on the previously adopted classification and to assess if the dams were designed and constructed in accordance to this adopted classification.

Therefore, as limited background information and rationale were available to assess the hazard classification of the dams, BGC could not comment on the current failure consequence classification of these structures. *Further, as it appears there has not been a rigorous evaluation of the hazard classification of the dams between the current owner BGM and the EOR, KCB, BGC recommends this work be conducted.*

2.2. DSI Report

The 2014 DSI for the QR Mine TSF was conducted by Mr. Lowell Constable, P.Eng. of KCB on June 29, 2014. It was reported, at the time of the inspection, the weather was sunny with some clouds and no precipitation.

As part of our audit of the DSI, BGC compared the KCB 2014 document to the BCMEM 2013 guidelines, which defines the requirements for a DSI report. Our comparison is provided in Table 1, with associated commentary including factual information in regular font (KCB 2014) and BGC's interpretation in *italics*.

Table 1. DSI Report Audit Compared to BCMEM 2013 Requirements

Requirement No.	BCMEM 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	Both the Tailings Dam and Cross Dyke were classified as Significant. *However, as it appears there has not been a rigorous evaluation of the hazard classification of the dams between BGM and the EOR, BGC recommends this work be conducted.*
1b	Significant changes in instrumentation and/or visual monitoring records.	Yes	KCB 2014 reported all water levels were below alert levels. *However, based on the readings provided, it appears that DH2002-01 has recently exceeded its piezometric alert level and that the listed maximum historical readings dates do not correspond to the readings provided. It should also be noted approximately 40% of the piezometers have either equalled or exceeded their piezometric alert levels in the past (based on rounding off of significant digits) and that the OMS does not provide piezometric alert levels for the piezometers.* *BGC recommends the piezometric alert levels be reviewed and that the OMS be updated with the appropriate piezometric alert levels.* KCB 2014 reported that no slope monitoring instruments are in place and that this should be reviewed. *BGC concurs.*

Requirement No.	BCMEM 2013 Requirements	Discussion Included in Report	Comments
1c	Significant changes to dam stability and/or surface water control.	Yes	KCB 2014 reported there had been no indication of dam instability and that recent designs followed the CDA 2007 requirements for stability. KCB 2014 recommended the steeper than designed downstream slope of the north Tailings Dam (Reference Photos I-10 and I-20) should be assessed. BGC *concurs*. *In Photo I-6, portions of the upstream slope along the Cross Dyke also appeared to be steeper than design and should also be assessed.*
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 is BGM 2014, Revision 2014-2. *Refer to additional discussion in Section 2.3.*
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 most recent version of the Environmental Emergency Response Plan (EERP) Rev. 4, dated November 2012. *The OMS also references that document but does not provide the revision number. Refer to additional discussion in Section 2.4*

Requirement No.	BCMEM 2013 Requirements	Discussion Included in Report	Comments
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	The most recent Dam Safety Review (DSR) was conducted by BGC in 2012 and also indicates that the next DSR should be completed prior to 2022. *Should the hazard classification of the dams be modified, it may also be necessary to alter the timing for the next DSR.*
2	Summary of past years' construction (if any) with a description of any problems and stabilization.	Yes	KCB 2014 reported the 2013 construction was halted due to weather and this work was to be completed in 2014. Construction was continuing at the time of KCB's site visit. *All 2014 construction activities should be confirmed by the EOR that they met required design criteria or note any variances and rationale from those.*
3	Plan and representative cross sections.	Yes	KCB 2014 provided Interim Status Drawings in Appendix II of their report.
4	Site photographs.	Yes	KCB 2014 provided photos in Appendix I of their report.
5	Review of climate data.	Yes	KCB 2014 reported the precipitation has been wetter than historic averages.

Requirement No.	BCMEM 2013 Requirements	Discussion Included in Report	Comments
6	Water balance review.	Yes	KCB 2014 reported this was done in 2012 and again updated to August 2014 and that no water or tailings are currently being discharged into the facility. They further recommended the water balance be updated to reflect future conditions. *BGC Concurs.*
7	Freeboard and storage availability (in excess of the design flood).	Yes	KCB 2014 indicated a freeboard of 4 m and that pond levels were recorded weekly. KCB 2014 also noted; as the dams have been raised, and the closure spillway was designed and constructed to pass the Probable Maximum Flood, that the risk of overtopping is negligible. *Based on the provided drawing and pond level reported, BGC would have estimated the overall freeboard to be 3.5 m (1031-1027.5). The freeboard amount should be confirmed by KCB.*
8	Water discharge system, volumes, and quality.	Yes and No	Closure spillway construction was completed after the KCB 2014 site inspection. It was noted outflow from the impoundment is predominantly pond evaporation. *All 2014 construction activities should be confirmed by the EOR that they met required design criteria or note any variances and rationale from those*. *No explicit summary text on discharge volumes and related water quality were provided in DSI report.*

Requirement No.	BCMEM 2013 Requirements	Discussion Included in Report	Comments
9	Seepage occurrence and water quality.	Yes and No	KCB 2014 reported seepage was noted at both the toes of the Tailings Dam and Cross Dyke (10 L/s and 2 L/s, respectively). At the Tailings Dam, the seepage is collected and pumped back to the TSF. In the case of the Cross Dyke, the seepage is routed to the Main Zone Pit. The return line on the Tailings Dam was noted to be leaking. *Consideration should be given to re-routing the return seepage line over the abutment rather than the dam. Reference Photo I-15 in KCB 2014.* *No explicit water quality data on seepage was provided in DSI report.* It was further noted a trial grouting program is planned to assess the benefit of grouting to reduce seepage losses. *BGC recommends the reasoning for observed seepage partway down the slope along the Cross Dyke should be assessed (Reference KCB 2014 Photo I-7).*
10	Surface water control and surface erosion.	Yes	KCB 2014 reported diversion channels have been maintained along both sides of the impoundment. No signs of significant erosion were noted in the report. *BGC recommends clearing of the diversion ditches should be documented in the report and conducted, as necessary. Reference Photo I-21 in KCB 2014*.

Requirement No.	BCMEM 2013 Requirements	Discussion Included in Report	Comments
11a	Instrumentation review including: Phreatic surfaces and piezometric data.	Yes	As noted above in 1b, KCB 2014 reported all water levels were below alert levels. *However, based on the readings provided, it appears that DH2002-01 has recently exceeded its piezometric alert level and that the listed maximum historical readings dates do not correspond to the readings provided. It should also be noted approximately 40% of the piezometers have either equalled or exceeded their piezometric alert levels in the past (based on rounding off of significant digits) and that the OMS does not provide piezometric alert levels for the piezometers.* *BGC recommends the piezometric alert levels be reviewed and that the OMS be updated with the appropriate piezometric alert levels.*
11b	Instrumentation review including: Settlement.	No	No instrumentation reported to be installed for this type of monitoring.
11c	Instrumentation review including: Lateral movement.	No	No instrumentation reported to be installed for this type of monitoring.

Requirement No.	BCMEM 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	Lowell Constable, as noted on the APEGBC website, is registered as a Professional Engineer in British Columbia. *His qualifications as a tailings or geotechnical engineer was not however judged.* *Note on the version of the report we were provided, another person signed for Mr. Constable. The final document should be signed and stamped by the P.Eng. who authored the report.*

2.3. OMS Manual

The most recent version of the OMS is BGM 2014, Revision 2014-2. This document was not reviewed in detail.

In general, the table of contents indicates the OMS followed the general Mining Association of Canada guidelines for OMS documents (MAC 2011).

Some review comments, based on our cursory review of the document, were that the piezometric alert levels should be reviewed and the OMS be updated with the appropriate piezometric alert levels and it appears there could be a mix-up between revision numbers in text versus the title page, this should be corrected.

2.4. Emergency Response Plan

The most current Environmental Emergency Response Plan for the QR Mine is the Fourth Revision, dated November 22, 2012. This document is referenced in the current OMS under Section 9.0 EMERGENCY PLANNING AND RESPONSE.

A few notes, based on out cursory review of the document, were that the discussion on potential dam failure modes and actions was very general and no drawings were provided indicating the extent of the site and/or evacuation points.

3.0 SUMMARY

In general, the KCB 2014 report addressed the majority of the requirements to be discussed in a DSI report, as outlined in BCMEM 2013, and provided recommendations consistent with their observations, which BGC concurs with.

However, BGC recommends, based on our review/audit of the report, the following should be further addressed:

- *As it appears there has not been a rigorous evaluation of the hazard classification of the dams between BGM and the EOR, we recommend this work be conducted.*
- *We recommend the alert levels be reviewed and that the OMS be updated with the appropriate piezometric alert levels.*
- *The OMS and EERP should be updated for the noted deficiencies.*
- *The steeper than designed downstream slope of the north Tailings Dam (Reference Photos I-10 and I-20) should be assessed as KCB 2014 recommended. Also in Photo I-6, portions of the upstream slope along the Cross Dyke also appeared to be steeper than design and should also be assessed.*
- *All 2014 construction activities should be confirmed by the EOR that they met required design criteria or note any variances and rationale from those.*
- *The existing freeboard should be confirmed by KCB.*
- *Discharge volumes and quality should be explicitly stated.*

- *Consideration should be given to re-routing the return seepage line over the abutment rather than the dam. Reference Photo I-15 in KCB 2014.*
- *Seepage related water quality should be explicitly stated.*
- *The reasoning for observed seepage partway down the slope along the Cross Dyke should be assessed (Reference KCB 2014 Photo I-7).*
- *Clearing of the diversion ditches should be documented in the report and conducted, as necessary. Reference Photo I-21 in KCB 2014.*
- *The final DSI document should be signed and stamped by the P.Eng. who authored the report.*

4.0 DOCUMENT NOTES

BGC Engineering Inc. ("BGC") prepared this document (the "Report") for the account of Barkerville Gold Mines 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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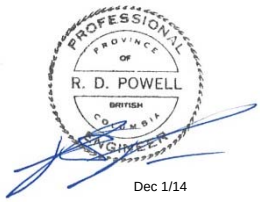
Note the conclusions provided herein will change as the recommended mitigation measures are undertaken.

5.0 CLOSURE

Yours sincerely,

BGC ENGINEERING INC.
per:



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Reviewed by:

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RDP/JWC/cr/lw

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