

25 November 2014

AMEC File: VM00623

VIA EMAIL

Goldcorp Inc.
C/O Equity Silver Mine
P.O. Box 1450
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Attention: Mike Aziz

Dear Mike,

**Reference: Independent Third Party Review of Dam Safety Inspection for the
Golden Bear Mine Tailings Facility, near Dease Lake, BC**

1.0 INTRODUCTION

AMEC Environment & Infrastructure, a division of AMEC America's Limited (AMEC) was retained by North American Metals Corp (NAMC), a subsidiary of Goldcorp Inc. (Goldcorp) to perform an independent third party review of the 2014 Dam Safety Inspection (DSI) of the Tailings Storage Facility (TSF) at the closed Golden Bear Mine near Dease Lake, BC.

On August 18, 2014, the Chief Inspectors office of the BC Ministry of Energy and Mines (MEM) issued orders mandating that the 2014 DSI of all tailings dams be completed, with the report reviewed by an independent third party Professional Engineer, and submitted by December 1, 2014. The order also stipulated that the review should include a review of the dam consequence classification. This letter is intended to satisfy that order.

The review of the 2014 Golden Bear TSF DSI, documented herein, was performed by Mr. Andrew Witte, M.Eng., P.Eng who has had no prior involvement with the Golden Bear Mine site. A site visit was not performed as part of this review and the scope is limited to the tailings storage facility only; the heap leach areas were not included.

2.0 TERMS OF REFERENCE

The following documents were provided to AMEC by NAMC for review:

- i. North American Metals Corp. Golden Bear Mine, Tailings Storage Facility and Heap Leach Facilities, Report on 2014 Dam Safety Inspection. Report prepared by Knight Piesold Consulting, KP Project VA101-65/7-1, Rev. 0 dated October 20, 2014.
- ii. North American Metals Corp. Golden Bear Mine, Tailings Storage Facility and Heap Leach Facilities, Report on 2009 Dam Safety Inspection. Report prepared by Knight Piesold Consulting, KP Project VA101-65/6-1, Rev. 0 dated November 30, 2009.
- iii. North American Metals Corp. Golden Bear Mine, Tailings Storage Facility and Heap Leach Facilities, Closure Design Report. Report prepared by Knight Piesold Consulting, KP Project VA101-65/2-1, Rev. 0 dated July 11, 2003.

This review was performed with reference to the following applicable guidelines, codes and standards:

- Canadian Dam Association (CDA) 1999 Dam Safety Guidelines.
- Canadian Dam Association (CDA) 2007 Dam Safety Guidelines, Revised in 2013.
- Canadian Dam Association (CDA) Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams, dated October 4, 2014.
- British Columbia Ministry of Energy and Mines (MEM). Health, Safety and Reclamation Code for Mines in British Columbia, dated 2008.
- British Columbia Ministry of Energy and Mines (MEM). Guidelines for Annual Dam Safety Inspection Reports, dated August 2013.

3.0 REVIEW OF DAM SAFETY INSPECTION REPORT

The Golden Bear Mine is a closed underground and open pit gold mine located approximately 100 km west of the community of Dease Lake, in northeastern BC. It is important to note that as the mine is closed, the TSF falls under the Closure – Passive Care Phase of a mining dam as outlined in the 2014 CDA Mining Dams Bulletin. Furthermore, the closed TSF more closely resembles a dry stack than an impoundment as, under normal conditions, it does not contain a free water pond on top of the facility. This sets the context for the expectations of the DSI Report as some items typical to an operating mine or mine in the Transition or Active Care Phases of Closure may no longer be applicable. The 2014 DSI states that:

“the dam is considered to be in a stable state condition and sufficient experience has been gained with the structure and sufficient monitoring completed to demonstrate no further intervention is required. The dam is in a passive state and does not have operating personnel on site or regular surveillance”.

In this context the 2014 DSI report prepared by the Engineer-of-Record (Knight Piesold) is generally complete and satisfies the requirements of the MEM Guidelines for Annual Dam

Safety Inspections although it does not explicitly address all of the topics provided in the Guidelines. Two areas that have been identified for improvement are as follows:

1. Reference should be made to the classification of the TSF under the BC MEM's - Health, Safety and Reclamation Code. The configuration of the TSF presented in the drawings provided with the DSI suggests that it may meet the classification of a *major impoundment* and/or *major dam* as defined in Part 10 of the Code. The dam appears to be up to 14 m in height with a crest length in excess of 500 m. This should be clarified in the DSI as designation as a major impoundment and/or dam could necessitate additional reporting requirements such as an OMS Manual however this may ultimately be negated by the passive conditions of the facility.
2. Review of climate data since the last inspection should be provided as it relates to dam safety. This could be in the form of a regional hydrometric data review from available stations to inform field observations and assess the performance of the facility with respect to wet/dry years and observed storm events since the last DSI. This is of particular interest as the DSIs are being performed only every 5 years.

4.0 COMMENT ON DAM CONSEQUENCE CLASSIFICATION

As stated in the 2014 DSI, the TSF was assigned a “low” consequence classification rating under the 1999 CDA Guidelines. The DSI indicates that the rationale for this rating is that “*the potential for loss of life, and the environmental and socio-economic impacts following a failure of the tailings dam are low*”. The DSI goes on to state that, as there have been no physical changes that would necessitate a revision to the rating, the TSF was reassessed under the revised 2013 CDA Guidelines as a “low” consequence structure. It is important to note that 1999 guidelines included a 4-tier failure consequence classification system: very low, low, high and very high. In 2007, the CDA Guidelines were rewritten and the consequence classification system changed to 5 tiers: low, significant, high, very high and extreme. As such, the rating for the TSF was essentially decreased from 2-out-of-4 to 1-out-of-5 by maintaining the “low” classification. Due to the remoteness of the site, the potential for loss of life is likely quite low however it is unclear how the interpretation of environmental impacts was reduced from “moderate damages” under the 1999 Guidelines to “minimal short term loss” under the 2013 Guidelines. Thus, neither the 2009 nor 2014 DSI provide sufficient discussion on the reassessment under the revised 2013 CDA Guidelines to substantiate this reduction.

The 2003 Closure Design Report notes that the TSF is located in an accreting braided alluvial floodplain of Bearskin Creek upstream of Bearskin Lake (also known as Muddy Lake) in the Taku River drainage basin. The size of Bearskin Lake (roughly 135 ha and 10 times the surface area of the TSF) appears to provide substantial buffering capacity for a hypothetical breach of the TSF however insufficient information is available on the geochemical properties and potential environmental and cultural impacts associated with the release of presumably fine gold tailings. Nonetheless, the selected design criteria for closure of the TSF (Inflow Design Flood =

Probable Maximum Flood and Maximum Design Earthquake = 1,000 year return period with $PGA = 0.1g$) might render this a moot issue. These design criteria would also satisfy the requirements of the “significant” consequence classification under the 2013 CDA guidelines. However, such an increase would necessitate performance of a formal Dam Safety Review (DSR) on a 10 year frequency and potentially impact the current inspection requirements which the reviewer agrees may be excessive given the documented success of the reclamation and closure prescriptions to date.

5.0 CLOSING REMARKS AND LIMITATIONS

As outlined above, the 2014 DSI of the Golden Bear Mine TSF satisfies the requirements of the MEM Guidelines for Annual Dam Safety Inspections although additional information on the facility definitions under the Code and review of climate data should be provided for completeness. There is insufficient information provided to confirm the low consequence classification assigned to the facility however the applied design criteria would also satisfy the requirements of a significant consequence classification.

Recommendations presented herein are based on a desktop review of the documents provided, a site visit was not performed. This report has been prepared for the exclusive use of North American Metals Corp, a subsidiary of Goldcorp Inc. for specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. It has been prepared in accordance with generally accepted dam safety engineering practices. No other warranty, expressed or implied, is made.

Respectfully submitted,

**AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited**

Reviewed by:

Original copies signed and sealed by
Andrew D. Witte, M.Eng., P.Eng.

Original copies signed by
Steve Rice, P.Eng.

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AW:SR/bf