



A TETRA TECH COMPANY

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Government of Yukon  
Department of Energy Mines and Resources  
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**Attention:** Ms. Josée Perron, P.Eng.  
Senior Project Manager, Assessment and Abandoned Mines

**Subject:** June 2013 Geotechnical Inspection of Earth Structures  
Mount Nansen Site, YT.

## 1.0 INTRODUCTION

As requested, EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA) has completed a geotechnical inspection of the earth structures located at the abandoned Mount Nansen mine site west of Carmacks, YT. The intent of the inspection was to provide a geotechnical engineering report on the stability of the tailings, water-retaining, and water diversion structures as part of the on-going care and maintenance program recommended in the Canadian Dam Association's (CDA) Dam Safety Guidelines (2007). Similar inspections have been completed by EBA in the past. The scope of work for this study was to include two site inspections in 2013 (one in June, one in September), with the existing instrumentation being read by EBA during the June trip. This letter presents an interim report based on the June inspection, which will be combined with the September inspection to prepare the Annual Geotechnical Inspection Report.

## 2.0 OBSERVATIONS AND RECOMMENDATIONS

Mr. Richard Trimble, P.Eng. and Kathleen Jarvis, EIT of EBA's Whitehorse Office completed a one-day inspection on June 21, 2013. The structures examined were:

- North Interceptor Ditch/Dome Creek Diversion Ditch/Emergency Spillway
- Tailings Dam
- Seepage Collection Dam

Using YG-AAM's instrumentation readout equipment, water pressure data from the working piezometers and ground temperature data from the working thermistor cables was also obtained.

Specific observations and recommendations are presented in the following sections of this letter, including selected photos. Other photos taken are available for review in EBA's files. Prior to the site visit, a site specific Health and Safety Plan was prepared and submitted to YG-AAM, followed by the completion of a Safe Work Form before starting the site work.

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## 2.1 NORTH INTERCEPTOR DITCH/DOME CREEK DIVERSION/EMERGENCY SPILLWAY

The ditches above and around the tailings pond, connecting to the emergency spillway were in similar conditions to previous years. The effects of ice excavation and cleanout to keep the ditch flowing over the previous winter were evident – this included some oversteep sideslopes near Dome Creek, some areas of slower flow, and general siltation/sanding of the ditch bottom up to about the bridge. See Photos below.



Photo 1: Oversteep ditch slope on Dome Creek Diversion (June 21/13)



Photo 2: Oversteep ditch slope upstream of Dome Creek intersection (June 21/13)

Erosion gullies from water entering the interceptor ditch were in the same condition as previous years, and should continue to be monitored. These small erosion gullies are probably significant contributors to sand and silt deposits in the diversion ditch. See Photo 3.



Photo 3: Sand deposits in channel bottom upstream of Dome Creek intersection (June 21/13)

The primary concern with these ditches is the effects of erosion on the toes of the banks – this will have to be monitored and corrective actions taken (regular repair – flattening to 1.5:1, possible riprap placement) if over-steepening occurs.

One item requiring immediate attention is a small erosion scar on the north side of the emergency spillway. It appears as though ice-damming this past winter caused the channel to deflect into the north bank, overtopping the riprap and geotextile, and eroding the sand. This area must be repaired before next winter, using the following suggested procedure:

1. Expose the ends of the geotextile adjacent to the erosion scar, and fold them back
2. Remove all riprap down to the water line
3. Smooth out the edges of the scour area by excavating the sand
4. Reconstruct the channel bank by using compacted sand and/or gravel, in maximum 300 mm lifts
5. Add new geotextile, overlapping at least 1.0 m on all three sides
6. Replace the riprap to match adjacent area (EBA took samples of the riprap on site, and it is presently being tested for suitability, prior to placement).

Photo 4 shows the erosion scour on June 21/13.

During re-construction, photos should be taken at all stages of the work, for future reference purposes.





Photo 4: View of Erosion Scour on north side of spillway that must be repaired (June 21/13)

## 2.2 TAILINGS DAM

The water level in the tailings pond was below the maximum operating level elevation, but higher than it has been in previous years. However, the dam itself is considered to be in a stable condition (see Photo 5). No evidence of previously noted instabilities or seepage on the north abutment was observed, and there were no signs of significant erosion or permafrost thaw features that could affect stability. Minor surface thaw depressions previously observed on the south crest have not changed over the past several years.



Photo 5: View to the south along crest of tailings dam (June 21/13)

The water in the pond was above the height of the installed staff gauges, and was read at 1.11 (actually 2.11 as there are two staff gauges on top of each other) using binoculars interpreting hand-written marks on an adjacent PVC pipe. Using last year's data (reading of 1.72=1095.93 m) the water level on June 21/13 was at 1096.32 m which is about 0.39 m higher than August 2012 and about 1.5 m below the design "pond operating level" of 1097.8 m. A re-survey by YG-AAM personnel early on July 17/13 indicated that a reading of 1.91 on the staff gauge now corresponds to an elevation of 1095.97 m.

### 2.3 SEEPAGE COLLECTION DAM

As previously arranged by YG-AAM, the water in the seepage collection pond had been "drawn down" as low as practically possible in the days before the inspection – see Photo 6.



Photo 6: View of Seepage Collection Pond – water level pumped down (June 21/13).

This facilitated a better observation of several seepage zones that had been observed over the years – primarily from the toe of the tailings dam, and also from the north abutment. Based on these new observations, they are still not considered to significantly affect dam stability.

Photo 7 shows one of these seepage zones from the base of the sand terrace on the north side of the pond. The water was observed to be clear, and the small alluvial fan visible in the photo is the result of erosion of the natural sand surface by moving water, not by subsurface piping.

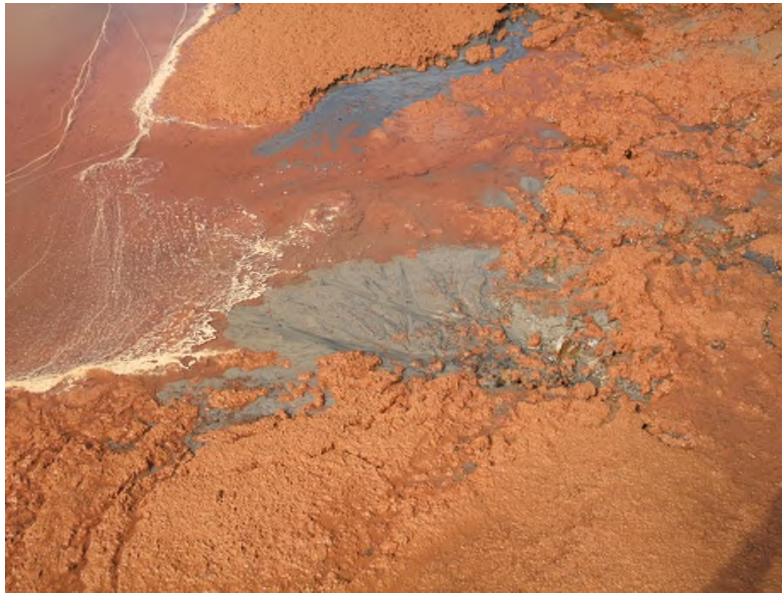


Photo 7: Seepage observed from base of sand terrace at north side of seepage collection pond (June 21/13).

No stability concerns are noted as a result of this inspection during lower water levels in the pond.

### 3.0 SUMMARY OF RECOMMENDATIONS

The following Table has been prepared to summarize the recommendations from the annual geotechnical inspection. This table will be updated annually, with items noted as “completed” being removed from subsequent versions of the Table, and the others carried forward if still applicable.

**Table 1: Summary and Status of Maintenance Items from 2012 and June 2013 Annual Geotechnical Inspections**

Item Description	Recommended Maintenance	Status
<b><u>From 2012 Report</u></b>		
North Interceptor, Diversion Ditch and Emergency Spillway	Monitor the condition of bank sideslopes on a regular basis, and if undercut/over-steepened by erosion, then either repair or provide armour consisting of non-woven geotextile and suitably sized riprap.	Continue Monitoring
Tailings Dam	Continue to visually monitor permafrost thaw settlement on the downstream face near the south abutment.	Continue Monitoring
	Monitor and possibly test seepage from toe of tailings dam immediately above seepage collection pond, to determine its origin.	Discussed/ not necessary
Seepage Collection Dam	Monitor seepage quantity and clarity of water from base of sand terrace to north of seepage collection pond,	Continue Monitoring
	Monitor seepage zones on downstream face of dam	Continue Monitoring
	Continue to collect pumping data, with periodic calibration checks using the “time to fill a 20 L pail method”.	Continue Monitoring



Item Description	Recommended Maintenance	Status
<b><u>June 2013 Recommendations</u></b>		
North Interceptor, Diversion Ditch and Emergency Spillway	Continue to monitor steep sideslopes and sand/silt buildup. Flatten sideslopes as required, clean out sand in base of ditch as required.	On-going
	Repair erosion damage on north side of spillway	To be completed in Summer 2013
Tailings Dam	Continue to monitor minor permafrost thaw settlements. Don't let water in tailings pond get too much higher than the June 21/13 water level. This is about 1.5 m below the design operating level, which provides a good buffer for any unanticipated weather events.	On-going
Seepage Collection Dam	Monitor seepage zones from toe of tailings dam and from base of north terrace. If water becomes silty, notify a geotechnical engineer immediately.	On-going
	Continue to record pumping rates from seepage collection pond, and notify a geotechnical engineer if the rates significantly increase to maintain a constant water pond elevation.	On-going

## 4.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Government of Yukon, Energy Mines and Resources and their agents. EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Government of Yukon, Energy Mines and Resources or for any Project other than the site described herein. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in the attached General Conditions.



## 5.0 CLOSURE

We trust this report meets your present requirements. The inspections reported herein are specifically related to geotechnical observations completed by the author regarding the north interceptor ditch/Dome Creek diversion/emergency spillway, tailings pond, and seepage collection pond at the time of the inspections. Should geotechnical stability issues be noted by site personnel during other routine inspections, EBA should be notified as these observations may affect the conclusions presented in this report. Should you have any questions or comments, please contact the undersigned.

Sincerely,  
EBA, A Tetra Tech Company



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