

March 2<sup>nd</sup>, 2015

Ms. Phyllis Beaulieu Licensing Administrator Nunavut Water Board P.O. Box 119 Gjoa Haven, NU X0B 1J0 (867) 360-6338

# Re: Meadowbank Water License 2AM-MEA0815 Part I, Item 13 – 2014 Annual Geotechnical Inspection Report

Dear Ms. Beaulieu,

Agnico Eagle Mine Ltd. received the report "2014 Annual Geotechnical Inspection Meadowbank Gold Mine, Nunavut". An electronically and paper copy of this report will be send to your office via Xpresspost, as required by Water license 2AM-MEA0815 Part I, Item 13, as an Appendix of the 2014 Annual Report due on March 31st, 2014.

Please consider the following information as the implementation plan to address the recommendations in Section 9.0 of the report.

Regards,

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#### 1 DEWATERING DIKES

<u>Recommendation</u>: The most current versions of the Operation, Maintenance and Surveillance (OMS) Manual (AEM, 2013a), including the Emergency Preparedness Plan (EPP), and of the overall Emergency Response Plan (ERP) for the mine (AEM, 2013b) are dated September 2013. Golder considers that it is good practice to keep these documents up to date.

<u>Action</u>: AEM will continue to keep the OMS Manuel up to date. The last update of the OMS Manuel is dated January 2015.

<u>Recommendation</u>: The condition of the dewatering dikes is regularly inspected by the mine and this practice should continue.

<u>Action</u>: As stated in the OMS manual, AEM will continue to inspect and monitor all the dewatering dikes on a monthly basis.

#### 1.1 East Dike

<u>Recommendation</u>: Regular monitoring and assessment of the monitoring data (piezometric, thermal, inclinometer, and seismograph) should continue. It is recommended to flag the piezometers that recorded data below 0°C in the past and be very careful when interpreting their data as they might be broken.

<u>Action</u>: The monitoring and data interpretation of the instrumentation at East Dike is done on a regular basis and will continue.

# 1.2 South Camp Dike

<u>Recommendation</u>: It is recommended that the ultramafic waste rock dump not move closer to the dike to allow for good visual observation of the downstream toe area.

<u>Action</u>: AEM will continue to observe the situation when NPAG material placement will resume in the area in 2015-2016 to avoid having any placement next to the toe of the structure.

<u>Recommendation</u>: Instrumentation monitoring at South Camp Dike should continue on a regular basis.

<u>Action</u>: The monitoring and data analysis of the instrumentation at South Camp dike is done on a regular basis and will continue.

# 1.3 Bay-Goose Dike

<u>Recommendation</u>: The safety berms should be replaced on several areas of Bay-Goose Dike.

<u>Action</u>: The safety berms that are missing on the Bay Goose dike are on the lake side (upstream) which is not acting as an access road anymore. The access to the dike is restricted for inspection purposes only, so the berms are not necessary and will not be re-constructed.

<u>Recommendation</u>: The tension cracks observed last year on the upstream side within the thermal cap were still visible during the 2014 inspection but did not show signs of progression. The settlement within the thermal cap was observed but did not show any additional sign of movement since 2013.

<u>Action</u>: The monitoring of the entire dike will continue on a regular basis, emphasis will be put on the spring freshet.

Recommendation: Regular monitoring and assessment of the monitoring data (piezometric, flow, thermal, inclinometer, and seismograph associated with blasting and seepage) occurs and should continue. The settlement monuments have not been read in 2014. It is recommended to take regular readings of the settlement monuments.

<u>Action</u>: The monitoring of the instrumentation at Bay Goose Dike is done on a regular basis and will continue. As for the monuments, they won't be read in the future as no movements of the stations are possible since they were anchored in bedrock.

<u>Recommendation</u>: It is recommended to flag the piezometers that recorded data below 0°C in the past and be very careful when interpreting their data as they might be broken. Once a piezometer has frozen, it cannot be relied upon even if it unfroze.

<u>Action</u>: The monitoring of the instrumentation at Bay Goose Dike is done on a regular basis and will continue. A register of all the broken instruments is filed on a monthly basis in the Dewatering dikes instrumentation report.

<u>Recommendation:</u> Water ponds were observed at the downstream toe during the inspection. It is recommended to continue monitoring the elevation of these ponds and pumping out the water to allow for good visual inspection of the dike's downstream toe.

<u>Action</u>: The monitoring and pumping of the water ponds at the toe of the dike will continue on a regular basis.

Recommendation: The overall seepage is less than anticipated and is not a concern for now. The seepage downstream of Bay-Goose Dike and in Bay-Goose Pit should continue to be monitored. The seepage at the downstream toe is currently too small to require a year-round collection system, but if the condition changes such a system might be required.

<u>Action</u>: The monitoring and flow measurement of the seepages along the downstream toe will continue as a part of our regular inspection and daily routine.

Recommendation: Channel 1 and Channel 3 should be carefully monitored and inspected. Limited evidence of seepage is observed at the downstream toe of these locations and AEM considers that they are not seepage channels. The instrumentation and field observations seem to indicate that seepage is occurring at these locations but is directly reported to Bay-Goose Pit instead of the downstream toe area. The seepage being reported to Bay-Goose Pit should be included in the statistics of Bay-Goose Dike seepage.

<u>Action</u>: Water inflow from the bedrock formations in the Goose pit (not seepage) is coming from various locations around the pit and is not always associated with the Bay-Goose Dike. All the water from Goose pit is pumped into a collection sump and the flowmeter is installed on the pipe between from this sump and the

discharge. Therefore, it is impossible to differentiate the quantity of water coming from underneath the dike from the water coming from the groundwater (talik).

# 1.4 Vault Dike

<u>Recommendation</u>: The settlement and cracks observed in 2013 were still present but have not gotten worse and have started fading. The hole observed during the 2013 inspection was not observed at the time of the inspection and no new issues were discovered.

<u>Action</u>: The hole observed on the 2013 inspection was plugged before winter 2013 and no further issues were observed in 2014 in the area. The inspection and monitoring of the structure of the dike is done on a regular basis and will continue.

<u>Recommendation</u>: Regular monitoring and assessment of the thermistor data should continue.

<u>Action</u>: The monitoring and data analysis of the instrumentation at Vault Dike is done on a weekly basis and will continue.

#### 2 TAILINGS STORAGE FACILITY

<u>Recommendation</u>: The most current versions of the Operation, Maintenance and Surveillance (OMS) Manual (AEM, 2013a), including the Emergency Preparedness Plan (EPP), and of the overall Emergency Response Plan (ERP) for the mine (AEM, 2013b) are dated September 2013. Golder considers it good practice to keep these documents up to date.

<u>Action</u>: The last update of the OMS Manuel is dated January 2015. AEM will continue to keep the OMS Manuel up to date.

Recommendation: At the time of the inspection, the reclaim water in the North Cell was ponding directly against portions of Saddle Dam 1, Saddle Dam 2, Stormwater Dike and RF1. The tailings beach elevation varied and the pond elevation in the cell was at 147.1 m. AEM is closely monitoring the formation of a tailings beach against the peripheral structure and plans on protecting the saddle dams and rockfill road before winter. Golder recommends continuing deposition of tailings along all peripheral dikes of the facility to distance the water prior to winter as per the design requirement.

<u>Action</u>: The deposition sequence has been adapted to promote beaches on the rockfill structures and dikes around the TSF. Ponding against the dike liners was avoided during winter months of 2014 to prevent ice formation directly on the liners. The deposition plan was followed closely and some minor changes were done according to field observations. The deposition plan was updated as required, with the new and up-to-date values and a new plan is rerun and compared to the previous one.

Recommendation: AEM does not plan on maintaining a tailings beach against Stormwater Dike as part of their closure strategy for the North Cell. This may result in the bituminous liner being damaged and in seepage from the North Cell in the South Cell. As the South Cell will be operational by then, the consequence of such seepage is not considered an issue; however it could become an issue at closure if the tailings level is not the same in the North Cell and the South Cell. It is recommended to consider protecting the upstream face of Stormwater Dike from direct contact with the water.

<u>Action</u>: AEM do not see that as an issue since the water elevation in the North cell won't change during winter or before freshet as the pond will not be in operation.

Recommendation: It is understood that AEM will construct a permanent seepage collection and pump back system on the downstream side of all permanent dikes and dams, if necessary, due to drainage from dikes rockfill around the TSF following completion of construction activities. Saddle Dam 1 has a permanent sump with a pump back system. For Saddle Dam 2, such a system is not considered necessary as no seepage is reported, but AEM should be prepared in case of any change.

<u>Action</u>: All the material to build the collection sump is currently on site and we will evaluate the need for it in 2015.

<u>Recommendation</u>: Regular visual inspection as well as collection and regular review of instrument data should continue for all structures within the TSF.

<u>Action</u>: Inspection of the TFS structures are conducted on a monthly basis and will continue.

#### 2.1 Saddle Dam 1

Recommendation: At the time of the inspection, the tailings beach at Saddle Dam 1 was inadequate from Sta.0+140 to Sta.0+230. It is recommended to deposit tailings at these locations.

Action: At the time of the inspection the tailings beach was not adequate on a portion of the structure but it was planned to deposit tailings at that location 1 week after the inspection. This was completed to a final tailings elevation of 149.5m in front of SD-1.

Recommendation: The water collected on the downstream side of Saddle Dam 1 shows no sign of turbidity. The environment department should continue monitoring the water quality and share this information with the engineering department to assess if there is seepage through Saddle Dam 1.

<u>Action</u>: The environmental department will continue to monitor the water collected on the downstream side of Saddle Dam 1 on a monthly basis and will continue to share the results with the engineering department.

#### 2.2 Saddle Dam 2

Recommendation: An inadequate tailings beach was observed from about 20+150 to 20+210 where water is ponding directly against Saddle Dam 2. It is recommended to deposit tailings at these locations.

<u>Action</u>: At the time of the inspection the tailings beach was not adequate on a portion of the structure but it was planned to finish the North cell 2014 deposition season at that location, so proper beaching was achieved against the entire length of the structure. This was completed.

<u>Recommendation</u>: Sharp angular stones from an old access road were observed to be in direct contact with the geomembrane on the upstream face of Saddle Dam 2 around Sta.20+150. It is recommended to remove these angular stones from the geomembrane before the area is buried by tailings.

Action: These angular stones were removed following the inspection.

#### 2.3 Stormwater Dike

Recommendation: An inadequate tailings beach was observed from about 10+460 to 10+880 where water is ponding directly against Stormwater Dike. It is recommended to protect the upstream face of Stormwater Dike from direct water contact, especially if the tailings levels at closure in the North Cell and the South Cell are different.

<u>Action</u>: The only structure around the North cell perimeter that could not be protected is Stormwater dike. This will not be an issue since the water elevation in the North cell won't change during winter or before freshet.

<u>Recommendation</u>: Differential settlement was still partly visible between Sta. 10+735 and Sta. 11+045 on the upstream edge and slope. There was no sign of degradation from last year's inspection.

<u>Action</u>: The depressions are visually monitored in the monthly dike inspection.

Recommendation: A small pond of clear water was observed in the downstream toe area at Sta.10+900. No water outflow was observed at the time of the inspection.

<u>Action</u>: The toe of the dike is visually inspected on a monthly basis and a visual water quality assessment is done during the inspection.

<u>Recommendation</u>: In the past, a piping condition was observed at the downstream toe at about Sta.10+540. This condition was not observed this year. If piping is observed in the future, it is recommended to test the quality of the water in order to determine its origin.

<u>Action</u>: The toe of the dike is visually inspected on a monthly basis and a visual water quality assessment is done during the inspection.

Recommendation: It was observed that balloons filled with water had formed in the bituminous geomembrane at Sta.10+380 and Sta.10+130. It is recommended to puncture a hole in the balloons to free the water and to repair them afterward.

<u>Action</u>: AEM do not consider the balloons as a concern. Reparation will be conduct in 2015.

#### 2.4 Central Dike

<u>Recommendation</u>: Regular monitoring and assessment of the monitoring data should continue. It is recommended to install additional thermistors along the upstream slope of the dike prior to starting tailings deposition. Special attention will have to be taken to protect the instrumentation during the construction of Central Dike.

<u>Action</u>: The thermistors were installed prior to deposition in the South Cell along the upstream slope of the dike. The instrumentation data collected from the Central dike is examined on a weekly basis and will continue. An inspection of the dike is performed on a monthly basis and will continue. Daily visual inspection is performed as well.

<u>Recommendation</u>: The instrumentation data suggest that there is a direct hydraulic connection between the attenuation pond and some of the piezometers on the downstream side of the key trench.

<u>Action</u>: Daily inspection of the downstream of Central dike is performed and will continue until freshet. Regular sampling is conducted in the pond to monitor the chemical composition of the water. Elevation and piezometer data are collected every third day and analyzed.

Recommendation: It is recommended to pump the pond of water to the South Cell to keep that water pond area dry and avoid initiating an acid drainage reaction in the PAG rockfill embankment and to monitor the pumped flow with instruments.

<u>Action</u>: The pond will be pumped back to TSF South Cell at the start of the 2015 freshet.

<u>Recommendation</u>: Golder recommends closely monitoring the situation by taking water samples to assess if the water ponding downstream of Central Dike has a chemical trend similar to South Cell Attenuation Pond.

<u>Action</u>: Regular sampling is conducted in the pond to monitor the chemical composition of the water and this will continue.

# 3 AWAR

<u>Recommendation</u>: Regular inspections and maintenance of the road by AEM should continue. Consideration should be given to expanding AEM's monitoring program to include all culverts and bridges along the road to assess whether they are providing adequate capacity during the freshet and following large precipitation events.

<u>Action</u>: AWAR road crew remove ice and snow from all culverts and bridges before the freshet. Some culverts were added to prevent road washout. There is currently a monthly inspection that is conducted to inspect the bridges and AEM will add an additional inspection of the culverts.

<u>Recommendation</u>: AEM has been conducting regular and event-based inspections of the fish-bearing water crossing locations along the road and these should continue in order to confirm the hydraulic function of the crossings, adequacy of crossing locations with respect to the watercourses, and minimal impact to fish habitat.

<u>Action</u>: The environment department monitors and inspects the bridges during weekly AWAR inspections during freshet and conducts fish monitoring every two years.

Recommendation: For some culvert locations, it is recommended that AEM conduct monitoring to see if flow is actually occurring through the culvert (i.e., during the freshet). If insufficient capacity to handle the flows is observed, or water is circulating under the road, then it is recommended to clear the obstructions or repair the culverts. Particular attention should be paid to R-00A (km 2+550), the culvert at (5+700), PC-17A (8+830), PC-17 (8+850), PC-3 (km 13+865), PC-14 (km 4+260), and PC-16 (km 54+950).

<u>Action</u>: The condition of the obstructions at the culverts will be monitored and AEM will evaluate if replacement is needed.

<u>Recommendation</u>: Clear water was observed seeping under the northwestern abutment of Bridge 9, R19 at about km 83+150. The water quality of this seepage should be monitored for signs of turbidity.

Action: The environment department conducts regular monitoring for turbidity.

# 4 QUARRIES

<u>Recommendation</u>: Presence of unstable blocks and loose rocks along steep walls was observed in Quarries 3, 7, 9, and 19. These unstable blocks and loose rocks should be cleaned if operation at these quarries resumes. Workers should be cautious in these quarries and aware of the potential hazard.

<u>Action</u>: There is currently work planned in 2015 to clean all unstable blocks and loose rock. AWAR road crew will clean up unstable blocks and loose rocks should operations resume.

<u>Recommendation</u>: Slope remediation is in progress in more quarries than last year, but none of them were totally reclaimed. It is understood that AEM is developing a plan to progressively close some of the quarries along the AWPR while maintaining others to produce and store material supplies for ongoing road maintenance.

<u>Action</u>: Interim updated closure plan was completed by Golder in January, 2014 and this includes reclamation of the quarries on the AWAR.

<u>Recommendation</u>: Quarry 4 and Quarry 14 are flooded. It is understood that AEM is evaluating how best to eliminate the ponding of water within these quarries.

Action: The actions necessary to deal with the water and close these quarries will be considered as part of the final closure plan.

# 5 BULK FUEL STORAGE FACILITIES

<u>Recommendation</u>: At the Baker Lake fuel tank farm, ponded water was observed in several areas. Ongoing removal of fluids that accumulate within the secondary containment facilities should be managed appropriately.

<u>Action</u>: Each year, the accumulated water is pumped out in accordance with the Type A Water License (particularly after freshet and as needed during the open water season). Effluent must meet criteria stated in the License. After pump out each tank foundation is inspected and refilled if needed.

Recommendation: At the Baker Lake fuel tank farm, the geomembrane was folded and exposed in two areas over a 5 m length on the internal slope, north of Tanks 1 and 2. To minimize potential damage to the liner, it is recommended to cut and repair the fold and to re-cover the area with fill material. This issue was also observed during the 2012 and 2013 geotechnical inspections but has not yet been addressed.

Action: A site work order has been created to complete this work in July after the snowmelt.

<u>Recommendation:</u> For the containment cell of the twenty Jet A fuel tanks, the geomembrane remains uncovered around the tanks. The tanks lie on an approximately 0.5-m-thick granular base fill material. It is recommended to remain vigilant during the freshet and throughout the year to manage water accumulated within the bermed area.

<u>Action:</u> Please refer to final as built drawings of this facility – containment is 110% of the largest tank, which is 100,000L (actually exceeds). Water accumulation is monitored on a regular basis during freshet and pumped out in accordance with the Type A Water License.

<u>Recommendation:</u> A slide of the geosynthetic protection granular material was observed in the southern portion of the containment area of Tanks 5 and 6. It is recommended to protect the geosynthetic by replacing the granular material that slid.

Action: The observed slide of granular material slid has been replaced.

<u>Recommendation</u>: The tension cracks observed in the past on the upper bench, north of Tanks 3 and 4 and south of Tanks 5 and 6, have not progressed and are starting to disappear.

<u>Action</u>: Regular inspections (weekly) are completed at the fuel tank farm by the Site Services supervisor.

<u>Recommendation</u>: At the Meadowbank Main Camp tank farm, small channels of erosion were observed in the tank platform. It was also observed that the southern pipeline connection within the tank platform was deformed in a way that suggests settlement of the tank. This is not considered an issue but it might be a good precaution to determine if the settlement is uniform or differential.

<u>Action</u>: AEM will evaluate this issue in spring 2015 and determine if remedial action is required.

# 6 OTHER MEADOWBANK FACILITIES

# 6.1 Meadowbank Site Roads

<u>Recommendation:</u> Three culverts were installed on Vault Road. As previously observed in past annual inspections, these three culverts were partially collapsed in the middle and showed signs of erosion at the inlet. This is currently not a significant issue, but it is recommended to monitor these culverts at freshet to ensure that they provide sufficient capacity and that erosion is not occurring.

<u>Action:</u> The area was monitored in 2013 and 2014 and no issues were identified at the location in regard to water flow or sedimentation. The same inspection will be performed in 2015.

#### 6.2 Diversion Ditch and Sediment and Erosion Protection Structure

<u>Recommendation:</u> It is important that the erosion protection structure and sediment barriers be inspected during the next freshet season.

<u>Action:</u> The Diversion ditches will be inspected during the 2015 freshet season as a part of the Freshet Action Plan established in winter 2014.

# 6.3 Stormwater Management Ponds

<u>Recommendation:</u> From observations made from around the pond, no geotechnical concerns were identified regarding Stormwater Management Pond 1, or the crusher ramp located nearby. The geotechnical stability of the crusher ramp should be regularly inspected by AEM.

<u>Action:</u> Inspection and monitoring of the roads is performed on regular basis and will continue. No geotechnical issues have been identified on the crusher ramp since its commissioning.

#### 6.4 Airstrip

Recommendation: The tension cracks observed within the rolling surface in 2013 were no longer visible during the 2014 geotechnical inspection. No geotechnical concerns were identified with the airstrip.

Action: Inspection and monitoring of the airstrip is performed on daily basis and will continue. Repairs to the runway are immediately done whenever needed. The runway was entirely resurfaced in the fall of 2014.