January 05, 2010

Mr. Dennis Gourde, P.Eng.
General Manager
Agnico – Eagle Meadowbank Division
Baker Lake Office

Email: denis.gourde@agnico-eagle.com

Dear Mr. Gourde,

Report No 5
Meadowbank Mine Dike Review Board
Meeting December 17-18, 2009

1.0 INTRODUCTION

The dike review meeting was held, as planned, in the Burnaby B.C. offices of Golder Associates Limited (GAL), to receive an up-date on the mine site construction activities, to learn of responses to past reports from the Board, to review the design of various water and tailings retention structures, and to assess the way forward. Particular emphasis was placed on:

- Performance of East Dike
- Design & construction Bay-Goose
- Design & Construction of TSF Structures

The sequence of presentations and discussions followed the agenda as presented in Attachment A.

All three Board members participated in the meetings. A list of the persons participating in the discussions is presented in Attachment B.

Prior to and during the meeting, information packages were sent out in electronic format. The presentations were made available in hard copy during the meeting and a compilation of the presentations was produced at the close.
A list of the documents made available is included in Attachment C.

In the report which follows, the Board's recommendations are underlined.

2.0 PROJECT STATUS

The representatives of Agnico Eagle Mines (AEM) gave a summary of the status of mine site construction, the business plan with respect to gold production, and the water quality management Final gold will be produced Q1/2010.

The site work is on schedule to permit drawdown of the Portage Pit pond to el. 116 m in March 2010 which will permit mining to begin. The first phase of the Tailings Storage Facilities (TSF), namely the Stormwater Dike (SWD) and the Saddle Dam No. 1 (SD1)

have also advanced to the intended crest elevations, 140 m and 141 m respectively, to accept tailings from the mill start-up. There has been a continuation from 2008 into 2009 for the principal players such as the main contractor, sub-contractor and much of the personnel which has obviously contributed to minimising any learning curve for the 2009 season. The adoption of two shifts for key work components is also part of the reason that the goals have been met.

Excellent progress has been made with respect to the management of suspended solids. Silt curtains were deployed according to best reasonable practice and measurements of Total Suspended Solids (TSS) indicated compliance. Even the disturbance of the water body by high winds during a September storm was of short duration with TSS values at the monitoring stations quickly returning to normal. AEM has been transparent and it is hoped that this good working relationship with the regulators will continue.

In order to further improve the control of sediments for the 2010 season, it is planned to advance a causeway during the winter along the alignment of the upstream shell of the southern sector to better confine the sediment generating activities in the open water summer season. This constitutes a good pro-active approach to the work.

3.0 RESPONSES TO RECOMMENDATIONS FROM REPORT NO 4

Written responses were made to the comments and recommendations from the Board's previous report. These were all satisfactory and either complete, would be covered by subsequent discussion, or will be considered in due course during the on-going work.

4.0 EAST DIKE

4.1 East Dike Instrumentation

GAL and AEM presented recent data on the dike performance including measurements from the vibrating wire piezometers, thermistors & inclinometers. However, it was noted that the inclinometers provide only horizontal movement data and vertical control is currently missing. Settlement monuments have been installed on the dike crest but, for a variety of logistical or staffing reasons, even the baseline survey has yet to be completed. Measurement of settlements and heave (frost) is an important component of the monitoring programme and this situation should be rectified as soon as reasonably possible even if the work is somewhat laborious due to interrupted lines of sight.

Deformation monitoring could be enhanced by the installation of shallow settlement gauges which would detect any tendency for separation at the cut-off wall/frozen dike cap interface.

The instrumentation is comprehensive in scale and is functioning reliably. The monitoring indicates that, in general, the East dike is performing as anticipated. The exception to this is the situation interpreted from the readings of the string of thermistor beads TH 485. This instrument was installed in a casing located in the slurry wall and on dike centerline. The evolution of the temperature, when compared to that of a string placed in the lake, indicates a strong correlation with little time lag, which provides evidence of a communication and potentially severe leak. The Board recommends additional thermistors in the vicinity of TH 485 to validate the findings, and to determine the possible extent of any high permeability zone. If this check confirms the interpretation of a leak then the following is needed:

i) Estimate permeabilities and calculate flux/m of wall and compare with current leakage

ii) Evaluate determining the possibility and the extent of other local anomalies by monitoring with additional thermistor installations which could also be installed in the grout tubes to avoid damage to the cut-off by new drilling.

4.2 CPT Investigation

Subsequent to the incident in May 2009, where high inflows through the dike interrupted the dewatering progress, and the occurrence of a sink hole immediately upstream of the cut-off in July 2009, an investigation programme consisting of Cone Penetration Tests (CPT) was initiated. Holes were pre-drilled through the cap of frozen coarse crushed material at the crest at intervals of approximately 1.5 m from Stn. 60+458 to Stn. 60+510. The probe was then pushed through the soil bentonite cut-off with continuous readings of tip resistance and sleeve friction as well as instantaneous pore pressure measurements. Several pore pressure dissipation tests were carried out by interrupting the probe advance for a period of time. The programme was well executed.
The primary aim of the exercise was to determine whether the integrity of the wall was compromised in the sinkhole area by comparing the measurements with those outside the area. The findings can be summarized as follows:

- A high degree of variability with the low values falling below what had been anticipated;
- Values obtained in the sinkhole area are not markedly different from outside this area except in the 3-4 m depth interval where more frequent spikes were noted;
- Refusal met on several occasions above the base of the Soil-Bentonite (SB) cut-off, which is interpreted as possible inclusion of cobbles in the mix;
- The CPT tests also indicated the presence of stiffer material (presumably natural in-situ till) between the base of the cut-off and the bedrock.

One of the conclusions drawn by GAL from this investigation was that a large proportion of the results could be classified in a region of low tip resistance and high friction ratio that was not consistent with the expected values for a well graded material such as the SB mix. The low tip resistance was interpreted as being indicative of low stresses, possibly the result of arching (silo effect) within the confines of the slurry trench.

The Board is sceptical with respect to the arching conclusion/silo effect but, if further analysis leads in this direction, suggests that Flat Dilatometer (DMT) tests be conducted to measure directly the lateral stresses within the SB slurry wall.

The Board is also not convinced about conclusions with respect to uniformly variable point resistance and wishes to emphasize the possible hypothesis that high tip resistance (qt) zones are indicative of granular and relatively free draining materials related to foreign intrusions and recommends that the CPTs be interrogated from this perspective. For example, the spikes in the traces of tip resistance at the locations shown in the following table are coincident with a nul reaction in the dissipation tests.

CPT test number	Depth (m)
10	7.43
14	4.16
17	7.08
26	4.72
31	6.07
36	9.69

The flat pore pressure trace could be showing material that is neither dilative nor contractive or, more likely, material with a higher permeability. It should be noted that the probe deviation may have caused the test in CPT 36 to be outside the SB trench and the high permeability at this location is therefore not necessarily associated with an inclusion. The Board would like the unfiltered data with respect to the permeability assessments to be made available.

The Board agrees that additional CPTs may be warranted in relation to the leakage study mentioned above and in other areas along the dike where discrepancies between the bottom of the cut-off and the bedrock level were noted.

4.3 Dike Investigations, Geophysical and Drilling

Further investigation of the sinkhole was carried out in October/November 2009. The work consisted of a series of Ground Penetrating Radar (GPR) profiles parallel to the dike axis and 3 diamond drill holes.

The geophysics program revealed no obvious expression of near surface void formations similar to that which led to the sinkhole formation.

The drillholes (one vertical and two inclined) were located in the area where some discrepancy had been noted between the rock elevation and the base of the cut-off. The vertical hole was carried out immediately upstream of the cut-off and the inclined holes downstream of the same. As the holes were drilled outside the cut-off, no verification of the nature of the contact zone could be made. The core recovered below the rock surface was more useful and there was evidence of gravel material, other than parent rock, below the interpreted rock surface.

The water pressure tests indicated zones of relatively high permeability and the reaction of certain instruments to the drilling operations confirmed the potential for communication within the rock between the upstream and the downstream sides of the cut-off. (It should be noted that curtain grouting programs are often not 100% efficient in closing all joints and fissures.)

The Board wishes to recognize the diligent manner in which this investigation work has been carried out. Certain questions remain, namely whether the current self-sealing plug with existing grouting constitutes an acceptable status (plus contingency plan); or is additional grouting at chosen targets justified?

Maintaining a grout plant on site, as AEM has committed to, is a good idea. The Board is of the view that bolstering the grouting is appropriate and justified. The investigation demonstrates that further grouting of the rock in this vicinity may be beneficial but the program needs to be well planned and executed with care. The grouting would be performed from the upstream side of the SB trench. Based on the detailed analysis of the earlier grouting records, and on possible additional CPT tests, an extension to the remedial grouting may be considered for other areas.

5.0 BAY-GOOSE CONSTRUCTION REVIEW

The construction of the Bay-Goose Dike (BGD) generally followed the design and the procedures developed in 2008 on the East Dike. Rockfill for the BGD was obtained from the required excavations for the mine development. Crushed materials for the coarse filter and the core zone complied with the specifications. Good quality till was available from the shore and bed of 2nd Portage Lake. This provided well graded material from which to produce the SB backfill.

No incidents of embankment instability were noted despite dumping of fill on the lakebed sediments and with the upstream sloping foundation. Either the sediments are sufficiently competent to support the embankment or the material is displaced by the advancing fill. Sediment was encountered in the excavation of the central trench, though the origin, natural sediments or fines from the embankment fill, has not been confirmed. Gradation tests on this material indicates 85% to 90% passing the 0.08 mm sieve size. The 0-19 mm core backfill has a D_{15} size of 0.7 mm or less when sampled above the water line. Samples recovered from below the water line (possibly washed) have a D_{15} of up to 2.5 mm. Therefore, the importance of minimizing segregation during the placement of the core material, such that it can be relied upon as a filter, is amply demonstrated. A concerted effort was made to ensure that the cut-off trench excavation reached bedrock.

The Large Penetration Test (LPT) was well conducted and worthwhile. Although testing on a "before" and "after" basis could not be performed due to the non-availability of the equipment, the results indicated that the dynamic compaction was efficient down to a depth of 6-8 m. The Board does not expect significantly deeper densification with this method and the vibro-densification technique may be required for areas of deeper fill.

With the double shift operation the Contractor was able to complete the cut-off wall on September 26th, ahead of the onset of cold weather. This was a considerable achievement given the late start (end July) of the dike construction.

One modification to the planned construction method was the abandonment of tremie pipe placing for the Cement-Soil-Bentonite (CSB) in order to facilitate construction. Instead, continuous inclined placement was permitted. The Board has concerns related to placement of stiff CSB over ductile/settling SB and the potential development of a gap/crack at the interface and recommends that the project team evaluates alternative remediation schemes (now and in the future if this method is adopted for the 2010 work). The low slump value for the material placed is also noted. This may have led to irregular surface profiles for the CSB material in the trench.

A minor adjustment of the dike axis was made at the Goose Island abutment and an end joint was also constructed of CSB to ensure trench backfill stability when the work is resumed in 2010.

As far as concerns the grouting for the Bay-Goose Dike, valuable lessons have been learned at the East Dike and will be implemented at the BGD. Fortunately the current schedule is not tight and the work can be started after the winter.

There is some concern over the use of Odex drilling with air in the CSB and the risk of cracking. The Board does not consider that a successful drilling test under controlled conditions with inspection by a televiewer will be a guarantee of problem free production work. Any blockage of the annular space may lead to a rapid build-up of pressures when using compressed air.

There is a need to evaluate the grouting methodology particularly with respect to:

- the hole washing strategy to ensure adequate removal of erodable joint infilling materials;
- phased contact grouting with sequential perforation to create, insofar as possible, a reticulate grout filament structure.

The Board looks forward to a review and discussion of this issue at the next meeting or conference call.

At the last meeting, there was some limited discussion on the issue of freeze thaw within the SB cut-off. A preliminary testing program has been put together but more details need defining before implementation. This subject also will be treated at a future occasion. However, the Board suggests that samples be taken from the East Dike to show the current incidence of ice lenses vs the measured temperature gradient. Current rates of frost heave should be assessed by direct measurement and related to current temperature gradients.

6.0 BAY-GOOSE PLANS

The Board is generally content with the planning for design and construction activities in 2010. The 2009 site investigation program added to the knowledge of the BGD foundations in both sectors and additional work is planned from the ice during the 2010 winter period. There is a high expectation for good results from the sonic drilling for various site applications. The Board concurs with this approach to obtaining samples of the lakebed sediments and underlying till. Complete samples, even if disturbed, are essential for the evaluation of the various cut-off options in the South sector.

The design of the cut-off for the South sector must be carried out in parallel with investigations, as an iterative process, to ensure that any necessary adjustments to the investigation program are made in a timely manner. Preliminary results from the exercise are expected in April and a discussion with the Board in a teleconference is proposed.

7.0 DIKE SEEPAGE MANAGEMENT PLAN

The Board is content with the formulation of the plan, but notes a need for a push in the design of the seepage collection system, pump station location, protection against freezing and the avoidance of ice accumulation. The planning will be reviewed again as it evolves along with increasing geotechnical quantifications.
Note that the TH 485 leakage scenario may indicate the value of more proactive measures in the plan.

8.0 TAILINGS STORAGE FACILITY 2009 CONSTRUCTION REVIEW

8.1 Stormwater Dike

A number of expedient decisions were made to facilitate construction given the presence of soft lakebed materials and the water table. The softer sediments were removed progressively with the advancing fill platform in the upstream area below the future liner but left in place on the downstream side. As a result this will be a higher risk structure but the short life is recognized and consequences of seepage are deemed to be manageable. The Board understands the project acceptance of higher risk for this structure. It is noted that underlying gravel/sand channels were discovered in some of the excavations and construction completion details, instrumentation installations, and monitoring during operation should take these into account.
The SWD was constructed by AEM to plans prepared by GAL. The Board seeks clarification with respect to the final construction report roles and responsibilities. The Engineer of Record will need to sign off on the As-Built report.

8.2 Saddle dams

In contrast to the SWD, the Saddle Dams (and the Central Dike) are permanent structures and this is reflected in the design. The dike cross-section for Saddle Dam

No. 1 (SD1), which was constructed in 2009, includes details such as a filter beneath the upstream shell to guard against piping and thus ensure longer life functionality.

However, the Board notes that the cut-off trench was backfilled with till so as to raise the location of the geomembrane liner key which now has a minimum seepage path length of only 2 to 3 m. Consequently, the Board recommends that an extra till berm be added above the liner to make a more robust tie-in to the foundation.

The topography of the site is such that a small drainage basin exists between the main site access road and the dike. Moreover, the stripped foundation elevation lies below the level of a lake situated on the opposite side of the access road. Therefore, the Board has concern that the downstream toe will be flooded by runoff and that water will enter the rockfill of the dam with the potential to degrade the ice rich foundation. The question that has to be addressed is whether this is significant and if so, can it be prevented?

8.3 General comments on geomembrane covers

A short discussion was held on the advantages and disadvantages of covers on the impervious geomembrane liners. Covers are placed on liners with a view to providing protection against:

- Ultra-violet radiation;
- Temperature fluctuations (expansion and contraction);
- Ice thrust and drag;
- Impact of boulders and other material from successive construction stages;
- Passage of equipment or animals over the surface.

The composition of modern liner materials is such as to resist the degradation from ultra-violet radiation, and a liner type with lower coefficient of thermal expansion can be selected. Ice impact and abrasion can be resisted by rub sheets of smooth membranes such as HDPE. By careful design and execution, the construction of subsequent dike raises can be carried out with limited risk of material falling or rolling onto the liner (berms and zones of finer material at the outside of the fill). Smooth surfaces will discourage the passage of animals.

The construction activity necessary to place a cover could, by and of itself, constitute a potential risk for perforation and tearing of the liner. An additional aspect to consider is that the cover materials, from the finer protective layer to the outer rip-rap, are pervious materials and, even when covered eventually by tailings, can constitute a seepage collector which can feed to any anomaly. GAL is to evaluate the pros and cons of a cover zone on the geomembrane liners in the TSF and further discussions will ensue.

9.0 TAILINGS STORAGE FACILITY 2010 INVESTIGATION PLAN

The Central Dike, Saddle Dikes 2, 3, 4, 5 and 6, and the Rockfill Road 2 will be constructed, as and when required, to complete the Tailings Storage Facility. An investigation program has been prepared for implementation in 2010. It consists of percussion drilled holes to confirm the bedrock elevation and to obtain disturbed samples, as well as several diamond drill holes. The Board considers the program to be well conceived and should provide the required information to advance the detailed design of these structures. The interaction between the design and the investigation work, including any adjustments to the latter as the work progresses, should consider the following aspects:

- In future, it would be advantageous to provide detailed information on “Issued for Construction” level drawings to define anchor trench geometry and sequences of dewatering/construction. There is a need to evaluate how to work as much as possible in-the-dry to ensure good quality execution.
- There is also a need to understand potential glacial fluvial deposits in the basin and their influence on the design, construction and performance. There is a particular need to understand the site geology for cut-off design.

The Board understands that the project team will re-evaluate the liner alternatives (Coletanche vs LLDPE) for all failure modes and adopt the appropriate design details.

The Board recommends a re-assessment of the length of the upstream geomembrane seal to control seepage gradients and minimize the potential for piping.

10.0 NEXT MEETINGS

The following meetings are to be planned/confirmed:

- Teleconference call in April concerning the preliminary results of the Bay-Goose investigations and the design of the cut-off for the Southern sector;
- Site visit for July 26 to 29.

11.0 ACKNOWLEDGEMENTS

The Board once again wishes to thank the personnel of AEM and GAL for their participation in the meetings, and for the excellent documentation and presentations made by AEM and GAL which contributed to the efficiency and effectiveness of the proceedings.

Signed:

Norbert R. Morgenstern, P.Eng

D. Anthony Rattue, P.Eng.

Andrew M. Robertson, P. Eng.

ATTACHMENT A

AGENDA FOR BOARD MEETING NO. 5

December 17-18, 2009

AGNICO-EAGLE MINES - MEADOWBANK DIVISION
MEADOWBANK DIKE REVIEW BOARD

Meeting #5 - 17-18 DECEMBER 2009

5th Floor Main Boardroom, Golder Associates Office
500-4260 Still Creek Drive, Burnaby

AGENDA

Day 1 - Thursday December 17

8:30 **Welcome** (Coffee and pastries)
8:45 **Agenda Review and Approval**
8:50 **MDRB Report no.4 Review**
10:00 Coffee Break
10:15 **East Dike**

- Review of latest monitoring results
- CPT investigation results
- East dike investigation results
- East Dike mitigation plan

12:00 Lunch

13:00 **Bay-Goose - 2009 Construction Review**

- Summary of construction works
- Details on placement of SB-CSB
- LPT testing program carried out
- Lessons learned from 2009 construction season

15:00 Coffee Break
15:15 **Bay-Goose - 2010 Investigation and Construction Planning**

- South Portion Alignment
- Intent of the investigation
- Design decisions that remain to be done over the winter

17:00 End of Day 1
18:00 Dinner

Day 2 - Friday December 18

8:30 Coffee and pastries
8:45 **TSF 2009 Construction Review**

- SWD – Stage 1 Construction Works
- SD1 – Stage 1 Construction Works

10:00 Coffee Break
10:15 **TSF - 2010 Investigation and Construction Planning**

- 2010 Geotechnical Investigation
- 2010 Construction work planning

12:00 Lunch

13:00 **Deliberation by the Board Members**
15:30 Coffee Break
15:45 **Preliminary Report by the Board Members**
16:45 Closure

ATTACHMENT B

ATTENDANCE AT DECEMBER 2009 MEETING
Held at the Golder Associates office Burnaby, B.C.

Attendance		
Gaston Blanchette	AEM	Dike Superintendant
Eric Lamontagne	AEM	Mine manager
Stephane Robert	AEM	Environment Manager
Yohan Jalbert	AEM	
Michel Julien	Golder Associates	Project Manager
Annie Beaulieu	Golder Associates	
Paul Bedell	Golder Associates	
Grant Bonin	Golder Associates	Grouting Specialist
John Cunning	Golder Associates	
Trevor Carter	Golder Associates	
Karine Doucet	Golder Associates	
Fiona Esford	Golder Associates	
Rick Fillotte	Golder Associates	
Lynn Wilson	Golder Associates	
Norbert Morgenstern	Self	Dike Review Board
Anthony Rattue	SNC Lavalin	Dike Review Board
Andrew Robertson	Robertson Geoconsultants	Dike Review Board

ATTACHMENT C

LIST OF FURNISHED DOCUMENTS

Golder Associates, 2009(a), “TSF dike construction, technical specifications”, October 2009.

Golder Associates, 2009(b), “Bay-Goose and South Camp Dikes, 2009 spring geotechnical investigation, November 2009.

Golder Associates, 2009(c), Technical memorandum, Additional details for work carried out between Stns 60+452 and 60+500 at the East Dike, Meadowbank Gold Project”, November 2009.

Golder Associates, 2009(d), “Response to report no. 4, Meadowbank Dike Review Board, dated August 19,2009”, December 2009.

Golder Associates, 2009(e), “2009 geotechnical investigation, Tailings Storage Facility, Meadowbank Gold Project”, December 2009.

Golder Associates, 2009(f), “East Dike CPT investigation, Meadowbank Gold Project, Nunavut”, December 2009.

Golder Associates, 2009(g), “East Dike construction as-built report, Meadowbank Gold Project, Nunavut”, December 2009.

Golder Associates, 2009(h), “West Channel Dike construction as-built report, Meadowbank Gold Project, Nunavut”, December 2009.

Golder Associates, 2009(i), “Technical memorandum, Drilling and LPT investigation program, Bay-Goose Dike, Meadowbank Gold Project, Nunavut”, December 2009.

Golder Associates, 2009(j), “Binder and CD of PowerPoint presentations made on December 17 and 18”