Appendix B2

Report: *Meadowbank Dike Review Board Reports #14*

September 23rd, 2013

Mr. Jean Béliveau
General Manager
Agnico–Eagle Mines, Meadowbank Division
Baker Lake Office

Email: jean.beliveau@agnico-eagle.com

Dear Mr. Béliveau,

Report No 14
Meadowbank Mine Dike Review Board
Meeting September 9-11, 2013

1.0 INTRODUCTION

The meeting of the Dike Review Board was held on site as planned from September 9th to 11th. The Board is now comprised of three members, Mr. D. W. Hayley, Dr. N. R. Morgenstern and Mr. D. A. Rattue. All three members were in attendance.

The objectives were to review the progress of the works, the dike behaviour, and make acquaintance with future plans for the mine development.
The activities covered those outlined in the agenda which is included as Attachment A. The list of attendees at the meeting is given in Attachment B.

Digital copies of several documents were transmitted prior to the meeting, a list of which is included in Appendix C. Paper copies of the various PowerPoint presentations were provided by Agnico-Eagle Mines (AEM) and Golder and Associates (GAL) during the meeting. A selection of photographs taken during the visits is to be found in Appendix D.

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

2.0 OPERATIONS UPDATE

AEM provided an update on the mine status for information.

The currently projected life of mine is to the third quarter of 2017, with the current reserve being 1.6 $x10^6$ oz.

There has been no stage 3 capital expenditure on the Central dike this year. However, the dike footprint was enlarged to accommodate future raises and rockfill has been added to the body of the dike since the previous visit.

The Board notes that it is timely for a variety of reasons to review the mine closure plan. The closure plan is currently under revision by GAL and subsequent to submission of the plan to AEM, a teleconference call will be scheduled.

3.0 RESPONSE TO REPORT NOS 12 AND 13

The Board is content that all items have been or are being addressed and hence no significant items are outstanding.

4.0 FIELD INSPECTIONS

4.1 September 9th

On the first day, a visit was paid to the following sites:
Saddle dams #1 and #2, Stormwater dike, Central dike and the Waste Rock Storage Facility.

The visits made during the second day were to:
Bay-Goose Pit and Dike, East Dike, and Vault Dike and Pit.

The Board did not identify any issues unknown to the Project staff.

5.0 CENTRAL DIKE

5.1 Construction progress review

The foundation area of the dike has been enlarged on the downstream side and at the abutments such as to provide a footprint capable of accommodating the maximum planned height of the dike with a crest at el. 150 m. Overall planning may require construction only to el. 136.1 m as the minimum necessary to provide 2 m of freeboard relative to Third Portage Lake.

Filter materials and run-of-mine rockfill have been placed to el. 120 m, but no work was undertaken on the upstream liner in 2013 the crest of which thus remains at el.112 m.

Piezometers and thermistors have been added in the dike foundation as recommended by the Board in 2012.

The Board was satisfied with the construction management and quality control.

5.2 Design modifications

The studies carried out by GAL in the preceding months have focused on the filter blanket requirements and optimisation of the rockfill.

On the abutments, the cut-off trench will occupy a position at the upstream toe rather than along the centreline, as was the case in the bottom of the valley. As till material will form the foundation beneath the shell in most areas, the Board concurs with the need to provide a filter blanket immediately downstream of the cut-off trench and agrees with the current planned dimensions.

The upper part of the central dike rockfill will be constructed of non-acid generating (NPAG) material. A proposal has been made to incorporate a layer of Potentially Acid Generating (PAG)

rockfill sandwiched between NPAG material in order to optimize the use of the latter and to provide stronger material. As much of the NPAG material is soapstone that is subject to physical breakdown when handled, and particularly grinding when in trafficked areas, the more durable PAG rock was viewed with favour. However, the Board sees potential issues with placing PAG rock above the lake level and suggests that the permitting and closure aspects may outweigh any perceived structural advantage. Selection of better quality NPAG material will be required for the outer slopes.

5.3 Instrumentation review

The piezometers and thermistors that were installed in the foundation and fill of the central dike seem to be responding and temperatures are reasonable. The thermistors give readings that are 0.5 to 1°C warmer but the only areas with definite freezing conditions are shown at the locations 650P3 and 465P3 at or downstream of the dike toe.

Several piezometers register unexplained high values of suction with apparent piezometric levels below the bottom of the Portage pit which have no credence. Unfortunately, it seems that readings were not taken prior to grouting up the boreholes (fully grouted installations) or at least the results were not made available. It would be interesting to examine such values if they can be located.

The project staff has not noticed any significant flows into the neighbouring Portage pit so conditions are judged to be acceptable. The readings will be re-visited at the next meeting.

6.0 STORMWATER DIKE FINAL RAISE

Construction in the 2103 season brought the crest to the planned final elevation of 150 m. The liner installation was completed shortly before the visit.

The Board did not identify any issues and all evidence points to well managed construction. The rock exposed at the left abutment was not treated but the grain size curve for the till seal indicates a well graded material that should resist erosion. However, the Board does have some concerns with the perimeter of the Tailings Storage Facility beyond this area as is discussed in section 8.0.

7.0 INTEGRATED TAILINGS DEPOSITION PLAN

Issues with the actual behaviour of the tailings deposit, such as the underwater slopes and the effect on the reclaim pump barge have required intervention such as rock groins and temporary pump installations and have also motivated additional studies on the deposition patterns.

The project has adopted MUCK 3-D as a tailings deposition planning tool and the results of a series of simulations were presented. An empirically driven ice modelling exercise has been conducted within this framework.

The simulations have been carried out to develop a tailings deposition plan to November 2015, at which time the surface elevation would be close to final. The simulations honour the current business plan respecting the anticipated water inventory and its future management, the observed beach slope angles, and the observed densities. They also take into account the

need for a minimum depth of clear water to operate the reclaim barge. The Board complements AEM on developing these tools.

MUCK 3-D is the right tool and it has been exploited effectively. The exercise is a good example of the benefits of developing increased capabilities in-house for the tailings and water management, as it not only improves the understanding of the process but also allows, for example, bench testing of alternative discharge points and thus aids with day to day operations.

With regard to enhanced calibration of the model, the Board recommends:

1. To do sediment sampling to confirm the accuracy of the Sonar surveys. This should be done in summer and in winter.
2. To recognize and take account of the real delta front migration which is not at a fixed slope but arises from distinct episodes of slumping with extended flow slides due to tailings mobility.

The Board notes the following:

- There is a need to integrate the tailings deposition plan with the TSF closure plan, for example the site a of a future spillway;
- Areas of liner in the North Cell may be exposed to ice loads;
- The tailings deposition study illustrates that substantial potential savings for the project can be made if the capacity of the North Cell is maximized to the point that the South Cell is no longer needed for tailings storage;
- Such a plan would also imply the possible exposure of the Central Dike liner to ice loads if there is no tailings beach.

Furthermore, the Board observes that temporary water storage as needed by the tailings management plan in 2014/2015 appears to be available in a worked out part of the Portage Pit without affecting the mine plan.

Given these options, the Board recommends that a concentrated effort be made to evaluate the appropriate strategy for exploiting the North and South Cells, and to determine whether the suggested upstream raise of the North Cell by up to 8 m is indeed feasible.

The Board wishes to emphasize that there are only six months to study these options and prepare for their execution. Significant engineering effort will be needed to support the upstream raise design and this should be factored into the schedule.

For information regarding the protection of exposed liner, the Board suggests that Razek Abdelnour of Geniglace in Ottawa be consulted.

8.0 ROCK STORAGE SEEPAGE

The Board was informed of the situation regarding seepage from the TSF through the Rock Storage Facility (RSF). A good summary of the sequence of observations and of the water chemistry was provided. The diagnostic studies are ongoing. The Board accepts the view that there has been a tailings water communication which, with other contaminants from the rock pile, has reached the perimeter of pond NP-2 situated to the north of the RSF. In the pre-mine natural conditions, pond RP-2 drained to Second Portage Lake through what is now the TSF. The outlet to the lake is at around elevation 141 m and with the TSF pond now at elevation 143 m, a hydraulic gradient in the reverse direction has now been created. As part of the plan

to minimize run-off towards the TSF, a series of ditches have been excavated from the high end of the catchment area to the north, leading water away from the TSF to the west and to the east of the latter. One such series of ditches passes through RP-2 and connects with ponds which ultimately drain to the Second Portage Lake at a point to the south of the Portage Pit. These works thus have the consequence of directing any seepage water that enters RP-2 to the outside of the Lease Boundary. This potential flow path was identified and mentioned in a Technical Memorandum from GAL dated March 24, 2011. It was hypothesized that the tailings beach and long term ingress of freezing would minimize the amount of water reporting to the RSF. The current situation has arisen in part due to the lack of a beach on the eastern shore of the TSF as shown in photograph #3.

The Board does not agree that this is an adequate approach and wishes to draw attention to the possibility of tailings piping through the coarse run-of-mine rock that comprises both the Rockfill Roads RF-1 and RF-2, as well as the RSF. Such a loss of tailings could release water from the decant pond towards RP-2 and overwhelm a seepage collection facility. The Board recommends proper evaluation made of cut-off alternatives, one of which could be a freeze wall created by a row of passive thermosyphons which would function very efficiently in a location such as Meadowbank.

9.0 DEWATERING DIKES

The Board was given a summary of the performance of the dewatering dikes as determined from the instrument monitoring and visual inspections. No new issues have been identified. The Board is content with the management of the dikes and the pertinent observations such as the accumulation of water during freshet between the Bay-Goose Dike (Channel #1) and the pit wall (see photo #5). Measures will be taken to avoid a recurrence in subsequent years as water ponding above the pit wall is undesirable.

While it is clear that other maintenance items are being addressed, the results may leave something to be desired. During the site tour, the Board observed the capping that had been placed on the Bay-Goose Dike during the preceding winter. This rockfill capping enhances thermal protection of the core but as it was placed during winter, ice and snow were incorporated in the fill. Moreover, no compaction was carried out. As a result, the surface is irregular and several cracks were noted (photos #6 and #7). This hampers the identification of any settlement or cracking related to the performance of the body of the dike. Compaction and grading of the surface is recommended.

Seepage emanating from the toe of East Dike appears to have stabilized or even diminished. However, seepage in the foundation bedrock may be reporting directly to the Portage Pit.

The Board requests that, in future, improved presentation of the instrument data be made. As the quantity of data is voluminous some was transmitted ahead of the meetings. However, the volume of information requires that better graphics be developed to facilitate comprehension. This would be of value not only for presentations to the Board but also for internal reporting. More specific examples are as follows:

1. Provide instrument locations both in plan and in section;
2. Illustrate the latest piezometric pressures by water columns at each piezometer on the appropriate cross-section;
3. Include global cross-sections which relate pore pressures under a dike with the lake levels upstream and bottom of pit elevation downstream to provide context;

4. Provide only a selection of results that clearly indicate trends, such as values for the same month each year. Temporal evolution can also be shown on a graph of value vs date which enables a visual appreciation of the annual cycle. A graph with, say, a temperature vs depth profile for too many reading dates creates confusion;
5. Avoid exaggerated scales which are not appropriate for the precision of the instrument;
6. Avoid horizontal time scales with labels such as "12:00:00 AM 04/12/2012" and replace with uniformly distributed labels such as Dec 2012, Jan 2013 etc. unless the event being displayed is of very short duration;
7. On certain piezometer plots, pressure spikes have been noted at times of blasting. If blasting in the proximity of a dike is anticipated, it is recommended to increase the reading frequency for the duration of the blast;
8. For inclinometer plots, the incremental displacement is a good diagnostic tool for irregular readings but the cumulative displacement is of more interest to indicate trends in structure deformation.

10.0 VAULT PROJECT

The Board was given presentations on the construction of the Vault Dike, the instrumentation incorporated and on the results of the dewatering. The construction was carried out in three months during the winter. Quality control appears to have been to a high standard. The AEM team identified issues with the liner that had been purchased for this work and made timely and appropriate modifications, including a change to another product that was available on site, to ensure satisfactory performance.

No issues were brought to light during the dewatering. It was noted during the site visit that the lakebed downstream of the dike is covered with a thick layer of ice jacked and broken rock which does not facilitate the observation of any seepage (Photo #10). However, this low head structure is founded on permafrost which provides an impervious barrier. Thermistors have been installed to permit detection of any change in this situation.

GAL made a presentation on the structural geology which will control the pit wall design for the Vault Pit. As at the Portage and Bay-Goose pits, careful analysis of the structures is leading to optimal high wall inclinations and bench widths so as to minimize the need for rock reinforcement while ensuring safe mining conditions. The presentation also mentioned how readings of the thermistors that have been installed in the pit walls at Bay-Goose have corroborated the hypotheses of the permafrost zone which influences the design of that pit. Similar information will be part of the ongoing design work for the Vault Pit and indeed some thermal modelling has already been carried out to predict the presence or absence of pore pressures. This approach is appropriate but requires a full understanding of the issues by the pit operation staff and adequate communication with the designer. Geotechnical hazard identification mapping is to form part of the pit management.

11.0 OTHER DOCUMENTS

Several documents were transmitted ahead of the meetings. These were principally As-Built reports of various structures and copies of the Operation, Maintenance and Surveillance (OMS) manuals. In general the Board is satisfied with the contents and presentation thereof. One or two comments are offered.

In the section on surveillance it would be useful to include directives concerning the cataloguing of observed features. In the field, markers at each feature and systematic station markers along the crest would facilitate location of and verification of any phenomenon by different inspectors.

The section on Emergency Preparedness provides communication charts together with the coordinates of personnel. However, in the event of a high risk situation developing, it is not clear how the decision making process would play out. Who would be responsible for initiating an evacuation? Who would decide on mitigative measures? Etc. It is recommended that Table-Top practice sessions be carried out to identify any weaknesses in the system.

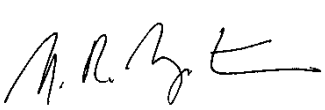
12.0 NEXT MEETING

A telephone conference call was suggested for discussion of the revised Tailings Deposition Plan when this becomes available. However, the Board believes that it would be more constructive to hold a face to face meeting possibly in Toronto in 6 months time to cover in detail the overall water management, tailings management and mine closure development.
The next site visit is set tentatively for September 2014 with exact dates to be determined.

13.0 ACKNOWLEDGMENTS

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. Don W. Hayley, P.Eng D. Anthony Rattue, P.Eng.

ATTACHMENT A

AGENDA FOR BOARD MEETING NO. 14

September 9th-11th, 2013

Agnico Eagle Mines-Meadowbank Division

Meadowbank Dike Review Board

Meeting # 14 – September 9 to 11th, 2013

Meadowbank Mine Site, Nunavut

AGENDA

Monday, September 9th

Arrival with Nolinor flight, approx. 12h30

12h30	Check in, room assignments and site H&S orientation, lunch *(arrival time can vary; depending on charter route)*
13h30	**Welcome, Review of the Agenda and Highlights of the Meeting** [AEM]
14h00	**Meadowbank Mine Operations and Management Update** [AEM]
14h15	**Review of Answers to MDRB Report #12-13 – Discussion with Board Members** [AEM]
14h30	**Central Dike Stage 2 - Construction Progress Review** [AEM]
15h30	TSF Field Visit (Including Central Dike)
17h30	**Central Dike - Design Modifications and Instrumentation Review** [AEM]
18h30	Dinner (site cafeteria)

Tuesday, September 10th

7h30 **Tailing Storage Facilities Review [AEM]**

- Stormwater Dike 2013 Final Raise
- North Tailing Cell - Review of Tailings Management in North Cell
- South Tailing Cell Strategy

9h30 Coffee Break

10h00 **Dewatering Dikes – BayGoose, South Camp and East Dike Review [AEM]**

- Update on Monitoring Program and Data Review of Dewatering Dikes, Comments on Dikes Performance

11h00 **Bay Goose (cont'd) [AEM]**

- Downstream Bay Goose Instrumentation Plan and Progress

11h30 Lunch (site cafeteria)

13h00 Site Visit – Bay Goose, East Dike and Vault area

15h30 **Vault project [AEM]**

- Vault Dike Construction and Instrumentation Review
- Vault Lake Dewatering
- Vault Pit – Geomechanics Campaign and Results [Golder]

18h00 Comments from the Dike Review Board Related to Issued Documents and Reports
(OMS and ERP Manuals, As-built Reports, Instruments Data)

18h30 Dinner (site cafeteria)

Wednesday, September 11th

7h30	Deliberation by the Board Members
10h00	Preliminary Report by the Board Members
11h00	Closure
12h30	Approximate Time of Departure

ATTACHMENT B

ATTENDANCE AT SEPTEMBER 2013 MEETING
Held at the Meadowbank Mine site, Nunavut

Attendance		
Jean Béliveau	AEM	Mine manager
Kevin Buck	AEM	
Rebecca Cameron	AEM	
Stephane Frechette	AEM	
Patrice Gagnon	AEM	
Louise Grondin	AEM	
Alain Hamel	AEM	
Michel Julien	AEM	
Thomas Lepine	AEM	
Pierre McMullen	AEM	
Erica Voyer	AEM	
Yves Boulianne	Golder Associates	
Cameron Clayton	Golder Associates	
Don Hayley		Dike Review Board
Norbert Morgenstern		Dike Review Board
Anthony Rattue	SNC Lavalin	Dike Review Board

ATTACHMENT C

Documentation provided in advance of the meeting

Bay-Goose Final As-Built Report
North Cell Diversion Ditches As-Built Report
Tailings Storage Facilities As-Built Report
Vault Dike As-Built Report
Dewatering Dikes OMS manual
Tailings Storage Facilities OMS Manual
Emergency Response Plan Report
Bay-Goose Dike Instrumentation Monitoring 2013
East Dike Instrumentation Monitoring 2013

Documents provided at the meeting

Operation update
Central Dike Stage 2 Construction Progress
Central Dike Design Modification and Instrument Review
Stormwater Dike Final Raise
Tailings Storage Facilities Review
Dewatering Dikes
Vault Dike Construction and Instrumentation
Vault Lake Dewatering
Vault Geomechanics Campaign

ATTACHMENT D

PHOTOGRAPHS

Photo #1 Saddle Dam No. 1 Note single large diameter tailings outfall

Photo #2 Central Dike, as viewed from Stormwater Dike. South Cell used for water storage only

Photo #3 Toe of waste rock storage facility and Rockfill Road RF-1 to east of the TSF

Photo #4 Site of seepage observations at waste rock pile. Pond RP-2

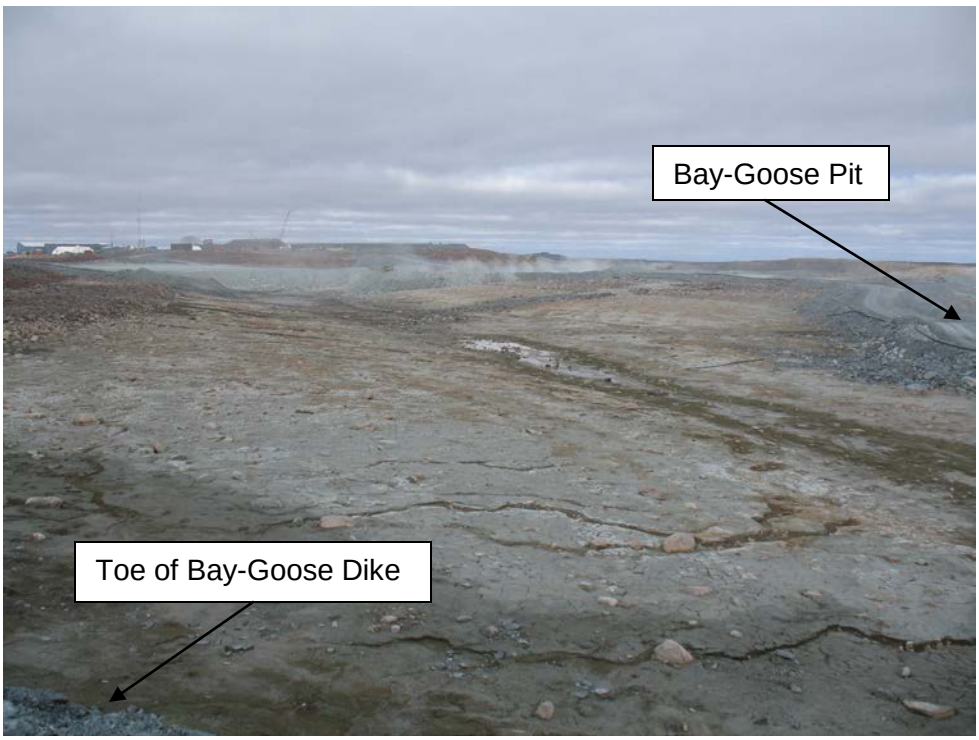


Photo #5 Bay–Goose in-field area downstream of Channel 1. Water ponded here during freshet

Photo #6 Crest of Bay-Goose Dike, view along cut-off axis

Photo #7 Crest of Bay-Goose Dike, upstream shell

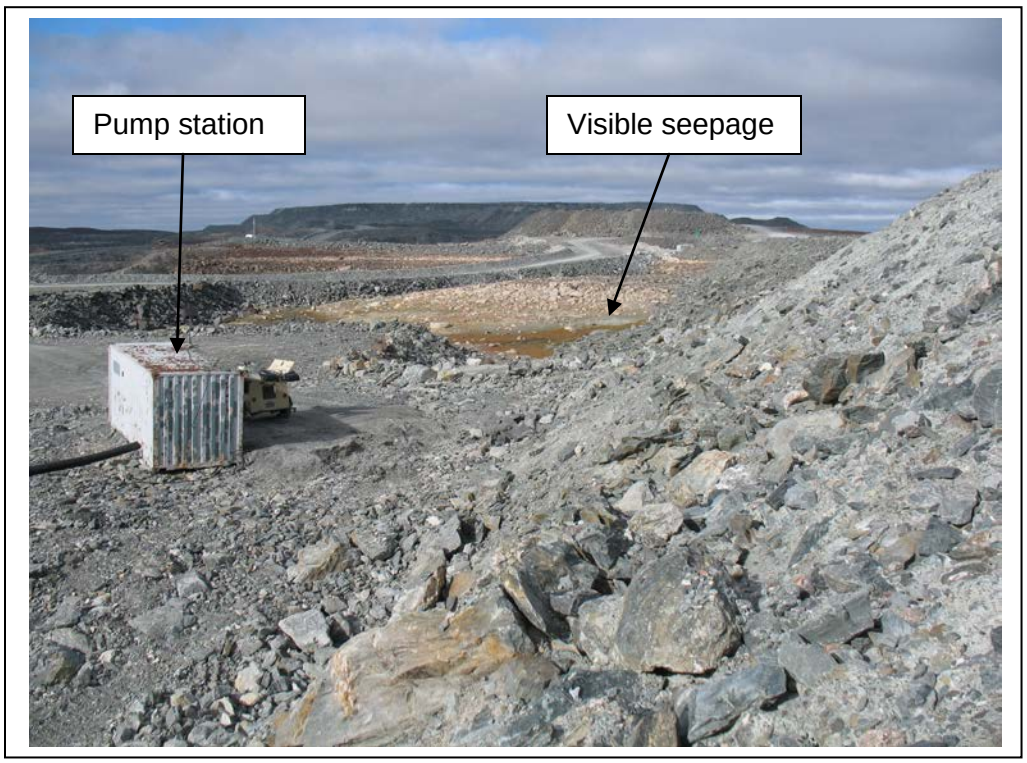


Photo #8 Toe of East Dike

Photo #9 Vault Dike

Photo #10 Lakebed downstream of Vault Dike

Photo #11 Bay-Goose Pit, east wall