July 20, 2010

Project No. 09-1428-5007
Doc. No. 1065 Ver. 0

Dr. Eric Lamontagne
Agnico-Eagle Mines Limited Meadowbank Division
P.O. Box 540
Baker Lake, Nunavut
X0C 0A0

RESPONSE TO REPORT NO. 6 MEADOWBANK MINE DIKE REVIEW BOARD, DATED MAY 28, 2010
SUBJECT: REVIEW COMMENTS

Dear Dr. Lamontagne,

On April 30, 2009, the sixth meeting was held between Meadowbank Dike Review Board (MDRB), Agnico-Eagle Mines Limited (AEM), and Golder Associates Ltd. (Golder). The meeting was held in the Golder Burnaby, BC office. The objectives of the meeting were to present an update on the geotechnical investigation and design for the southern portion of the Bay-Goose Dike.

On May 28, 2010, the MDRB provided a letter with their comments from this meeting. The following provides Golder's response to the MDRB questions and comments raised in their letter.

1.0 BAY-GOOSE DIKE SOUTH PORTION

1.1 Geotechnical Investigations

Comment: *Three depressions in the dike profile have been identified as Channels 1 to 3 from the NW to the SE of this portion. The Board notes that the low point in the rock profile in Channel 3 has not been adequately defined but this can be resolved by air-track soundings from the construction platform.*

Response: The Board's comment is correct. AEM is planning to perform additional air track drilling to provide better definition of the bedrock profile in Channel 3 from the dike platform once constructed.

Comment: *It is also noted that no inclined holes, that may have better characterized the fault zone in this same depression, were included in this years programme. However, it is anticipated that adjustments can be made, if necessary, to the grout pattern during construction to deal with any higher permeability.*

Response: Consideration to inclined holes will be given based on conditions encountered in the field, the results of the grouting program and the equipment available on site. The grouting program is planned and is being executed using vertical holes; to date, satisfactory grouting results have been achieved.

1.2 Design

1.2.1 Design modifications proposed

Comment: *Though no incidents of instability have been reported during the [causeway] construction, the deeper deposits of lakebed sediments (up to 6 m) as compared to the east dike and the adverse bed slope justify an evaluation of the potential risk to truck traffic.*

Response: A stability analysis for construction of the causeway has been completed and will be provided to the Board. The analysis was used as a guideline and was supplemented by experience gained during causeway construction. AEM will use their experience gained from causeway construction along with observations made during the further construction for widening of the causeway to complete construction of the rockfill platform. An update on the causeway stability and rockfill platform construction will be provided during the site meetings in July.

Comment: *The Board suggests that a review of the [dike] set-back design be carried out. As the dike is of generous width, the set-back could be evaluated from the toe of a hypothetical minimum safe section.*

Response: Discussions are in progress to complete this investigation / review of the setback.

1.2.2 Cross-sections

Comment: *Four typical sections have been proposed with improved cut-off details. The first is applicable to areas where the bedrock is at less than 5 m below the lake level, and the second for depths from 5 m to 6 m. Both will adopt a Soil-Bentonite cut-off. The third, for depths exceeding 6 m, employs a Cement-Soil Bentonite cut-off taken to rock. A fourth option where depths exceed the reach of the available equipment includes a cutoff, again of CSB, which will be anchored in firm till. The base width of the contact of the central zone of crushed rock on the till foundation increases progressively from the first to the fourth typical section. As was the case for the sections used in the northern portion of the Bay-Goose dike, no coarse filter is placed in contact with the foundation. Given the results of the investigations (no samples with less than 10% fines), the Board accepts the principle of the partial cut-off and concurs with the application the above mentioned typical sections.*

Response: It is noted that in zones designated for cutoff wall construction with CSB, CSB is to be used up to an elevation of at least 128 m. Above this elevation SB or CSB may be used. In areas where a partial cutoff is constructed, soil left in place will be treated by jet grouting. Jet grouted columns of about 1 m will be constructed between the base of the cutoff wall and bedrock with some treatment (jet grouting) of the overlaps.

Comment: *The Board notes that a large extended reach Komatsu PC 1250 excavator will be available to maximize the depth of cut-off construction to the degree practicable. The Board is pleased with this initiative as a positive cut-off can be relied upon to a much greater extent than a grouted zone.*

Response: No response is required.

Comment: *The embedment of the cut-off in the till foundation will depend on a minimum excavation depth in till for the initial trench through sediments or the central crushed rock core zone and the maximum depth achievable for the cut-off. Consequently, the Board seeks clarification of the intended specifications for the control of these depths and of the approval process.*

Response: Based on results of the 2010 geotechnical investigation program, a target surface for the initial trench excavation in the partial cutoff areas has been developed which represents the anticipated depth at which competent till exists. It is noted that variation in the actual depth of competent till is likely and therefore the QA representative will be responsible for approving the actual depth of excavation prior to the trench being backfilled. The QA representative will base this decision on the reaction of the excavator as it digs and on samples obtained from the base of the excavation. The excavator is instrumented with a GPS system which will be used to obtain a second reading of the depth of excavation in addition to that obtained from the bathymetric survey. The results obtained from this system will be reviewed and compared with those from the bathymetric survey.

The cutoff trench in the partial cutoff areas is required to be extended at least 1 m into competent till beyond the elevation of the initial trench. A combination of the manual soundings and GPS system on the excavator will be used to track the depth of the cutoff trench. The QA representative will also monitor the excavation to obtain information on the competency of the material being excavated through, and is to approve the depth of the cutoff trench.

Comment: *The Board notes that the optimization of the densification methodology (vibro-densification and dynamic compaction) will be the responsibility of the sub-contractor and concurs with this approach.*

Response: No response is required.

Comment: *The Board also agrees with the proposal to determine the lateral extent of CSB and SB and to avoid the placing of CSB on SB.*

Response: No response is required.

1.2.3 Grouting

Comment: *To date, the overburden treatment has been performed using a perforated pipe rather than true "Tube-à-Manchette" (TAM) methods. The Board notes that final control is now to be based on TAM and recommends that a three line treatment be carried out unless the cut-off embedment reduces the till window depth to less than 2 m.*

Response: Since the last Board meeting, the design for the Bay-Goose Dike southern portion has been modified. Jet grouting rather than TAM grouting methods will be performed between the base of the cutoff wall and bedrock in the partial cutoff zones. Below the base of the jet grouting, bedrock grouting will be performed, as is currently being performed in the north portion of the dike. The remainder of the dike, where the cutoff wall is extended to bedrock, bedrock and contact grouting will be performed using the current methodology.

Comment: *The Board recommends that jet grouting in the till and upper rock section be assessed as an alternative solution. The Board suggests that an analysis of the various methods be conducted to make a recommendation to AEM prior to the planned May 31st teleconference.*

Response: An evaluation of jet grouting versus TAM has been completed. An update was provided to the Board via teleconference on June 21st (10h:30 Eastern Daylight Time). AEM has selected jet grouting as the preferred method for treating the soils left in place beneath the cutoff wall, and has Hayward-Baker to complete the work.

Comment: *The Board recommends that the "special washing" proposed prior to grouting in overburden be eliminated as it is an unproven method.*

Response: Special washing is only being implemented in limited areas of the bedrock.

Comment: *As some concern has been expressed previously related to the use of air flush drilling techniques, the Board seeks clarification of the drilling methods that will be employed for the grouting works.*

Response: Through the SB-only portion of the cutoff wall, a 4.5-inch OD steel casing is advanced to bedrock by pushing the casing into the ground with up to a maximum 3500 psi of downwards force. While advancing the casing, the bit is rotated via a hydraulic drive head. If necessary, the hammer is actuated to advance through / push aside any cobbles/boulders that are encountered and create space so that the casing can be pushed again. Only the hammer itself is air-actuated.

Through the CSB-only portions, a 4.5-inch diameter borehole is pre-drilled with a rotary tricone water flush bit. The 4.5-inch OD steel casing is then pushed into the open hole in the same manner as is used for SB-only.

Through the CSB overlying SB portions, a 4.5-inch diameter borehole is pre-drilled to the top of the SB with the same rotary tricone water flush bit. The casing is advanced through the CSB to the top of the SB as described above for the CSB-only portion of the wall, and then through the SB as described for the SB-only portion.

Through the SB overlying CSB portions, a 4.5-inch OD casing is first advanced to the SB/CSB contact as described for the SB-only portion. A 3.5-inch hole is then triconed through the CSB and the casing is subsequently reamed through to bedrock. It is possible that the diameter of the 3.5-inch triconed hole is actually a bit larger than 3.5-inches because the CSB borehole wall is widened slightly with the rotary tricone bit.

The air-actuated DTH concentric bit is used to advance the casing 0.5m into bedrock. The bit and central rods are then extracted, leaving the steel casing in place.

Bedrock drilling is carried out through the steel casing by top-hammer, air-rotary drill rig with water flush only. The head of the top hammer is fitted with a special head which is capable of drilling with water flush, and using air to lift the cuttings and return water out of the grout hole. The use of air is limited to the end of the hole.

1.2.4 Mitigation

Comment: *The Board accepts the role of expanded instrumentation for the partial cut-off sections, but cautions that instruments, while able to assist with the location of problem areas, may not give forewarning of an incipient piping condition; such as was the case at the East dike.*

Response: As jet grouting has been selected as the method of treating the soils left in place beneath the cutoff wall, less instrumentation will be installed than would otherwise have been if the soils were not treated by this technique. A preliminary instrumentation plan is being prepared and will be provided to the Board during the next meeting.

2.0 OTHER ISSUES

2.1 CPT studies

Comment: *No further action is needed, but the Board anticipates presentation, at the July meeting, of a review of the [East] dike performance.*

Response: An update regarding the performance of the East Dike will be presented during the July site meetings.

2.2 Groundwater flow modelling

Comment: *Groundwater flow modelling has been carried out to assist with the design of the south portion of the Bay-Goose dike in channels 1 and 2. Relief wells were included as one option to control uplift pressures. However, the Board wishes to note that local hydraulic gradients may increase with such an installation and may not provide the intended protection against piping.*

Response: As jet grouting has been selected as the method of treating the soil left in place beneath the cutoff wall, it is anticipated that the risk of piping will be significantly reduced in comparison to not treating the soils with this technique. As a result, there is a lower probability that other mitigation methods will be necessary, including the use of relief wells. The potential for greater localized gradients with relief wells is recognized.

2.3 Frost heave studies

Comment: *The Board suggests that the "Segregation Potential" of the [East Dike] SB [core sampled] material be determined and that further sampling be made in locations where the frozen/unfrozen boundary is fairly stable.*

Response: Particle size analysis of the samples obtained from the East Dike is underway and will be used to assess the segregation potential of the material.

Comment: *Copies of a preliminary report on Seepage/Thermal modelling were distributed but time did not permit a presentation to be made on this subject. As the studies are ongoing, it is anticipated that the topic will be re-visited in July at the site meeting.*

Response: These topics will be re-visited during the July site meetings.

3.0 NEXT MEETINGS

Comment: *The following meetings are proposed subject to confirmation by AEM:*

- *Teleconference call on May 31st (19h:30 Eastern Daylight Time) concerning the grouting design for the Bay-Goose dike;*
- *Site visit for July 26 to 29, 2010.*

Response: The teleconference concerning the grouting design for the partial cutoff areas of the Bay-Goose Dike was held with the Board on June 21st (10h:30 Eastern Daylight Time). The dates for the site visit are confirmed for July 26 to 29; details to follow at a later date.

4.0 CLOSURE

We hope the above information provides the required clarification. If additional information is required, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Fiona Esford, P.Eng. (BC, Yukon, NWT/NU)
Geotechnical Engineer

ORIGINAL SIGNED

Karine Doucet, P.Eng. (BC)
Geotechnical Engineer

ORIGINAL SIGNED

Grant Bonin, M.Eng., P.Eng., (BC)
Associate, Geotechnical Engineer

ORIGINAL SIGNED

Dan Walker, Ph.D., P.Eng., (BC, NWT/NU)
Associate, Project Manager

ORIGINAL SIGNED

Michel Julien, Ph.D., P.Eng., (QC)
Principal, Project Director

FE/KD/GB/AB/DRW/MRJ/lw/ja

\\bur1-s-filesrv2\final\2009\1428\09-1428-5007\doc 1065 let 0720_10 ver 0\doc 1065 0720_10 let response to report no 6 meadowbank dike review board -ver 0.doc