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October 14th, 2014

M. Karén Kharatyan
Technical Advisor
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU
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Re: NWB 2AM MEA0815: Response to NWB completeness reviews of the Type A water license renewal application.

Dear M. Kharatyan,

The following information is provided in response to the NWB completeness reviews made by the Kivalliq Inuit Association and their consultants, Aboriginal Affairs and Northern Development Canada, Environment Canada, and Fisheries and Oceans Canada, regarding the Meadowbank Gold Project Type A water license renewal application. AEM has provided responses to all completeness review related comments made by the NWB interveners. Many of the comments provided by KIA and DFO were technical in nature; AEM has provided responded to many of these recommendations and where noted, will address others during the technical meetings.

Should you have any questions or require further information, please contact Stephane Robert, Ryan Vanengen or Marie-Pier Marcil at marie-pier.marcil@agnicoeagle.com.

Regards,

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1 Environment Canada (EC) Comments and Recommendations

1.1 *Recommendation #1 – Vault Pit Expansion Concern*

- **EC has concerns about the review of this application, given the Proponent's expected intention to submit an amendment application in the near future regarding the Vault Pit Expansion and dewatering of Phaser Lake at the Meadowbank project site. EC encourages the Proponent to consider steps to consolidate applications wherever possible, thereby facilitating the review process.**

  This concern was also brought up by DFO. Unfortunately, this may not be possible until NIRB has completed their review of the Vault Expansion into Phaser Lake. AEM has submitted an application for a straight renewal with administrative updates; this will ensure that the renewal of the License is completed within the appropriate timelines. If the timing permits, AEM would prefer to include it and have discussed the possibility of merging the Vault Pit Expansion into Phaser Lake as part of the Type A Water License renewal.

1.2 *Recommendation #2 – Management Plan Concern*

- **EC found the following specific management plans to be poorly-labelled or missing:**

  - **Environmental Protection Plan**
  - **Shipping Management Plan**
  - **Fuel Management Plan**
  - **Oil Pollution Emergency Response Plan**
  - **Emergency Communications Plan**
  - **Accident and malfunction scenarios in the Spill Contingency Plan**

  While the above-mentioned management plans may be integrated into more general text, clear labelling of these management plans would significantly facilitate the review process.

  AEM has included all of the updated and applicable management plans requested by the Water License into the renewal application. The Environmental Protection Plan, Shipping Management Plan, Fuel Management Plan and Oil Pollution Emergency Response Plan that EC has referred to are required as part of the NIRB Environmental Impact Statement process, are the mandate of another regulatory authority (i.e. OPEP is under Transport Canada) and were therefore not included in the application as not requested by the Water License. The Emergency Communications Plan can be found into License renewal application document Appendix B7 - Emergency Response Plan in Section 3 and Section 4.10 of the Appendix B9- Spill Contingency Plan. Accident and Malfunction scenarios can be found into the Appendix B7 - Emergency Response Plan in Section 4, Appendix B9- Spill Contingency Plan in Section 7, Appendix B19 - Dewatering Dike: Operation, Maintenance and Surveillance Manuel in Section 12 and Appendix B20 – Tailings Storage Facility: Operation, Maintenance and Surveillance Manuel in Section 8. This will be explained further during the technical hearings.

2 Fisheries and Ocean Canada (DFO) Comments and Recommendations

2.1 *Appendix B3: Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (WQMMPDCD), Version 4, April 2010*

2.1.1 Section 5.2: Lake Level monitoring during Dewatering Activities

"*Third Portage Lake and Second Potage Lake water levels will be surveyed at a location of sufficient distance from the outlets to limit potential lake level drawdown effects. Lake water levels will be monitored weekly during the freshet and ice-free period, and weekly during the ice-up period, dependent of the ice conditions and worker safety*."

- **DFO requests that Agnico-Eagle clarify whether a similar schedule and plan will be used during re-watering (re-flooding). If not, DFO request that the schedule and plans be provided. What are the specific threshold criteria that will be used to determine unacceptable low water lake levels?**

  As specified, currently AEM monitors both Third and Second Portage Lake on a weekly basis during freshet and ice-free period, and weekly during the ice-up period, dependent of the ice conditions and worker safety. This schedule and monitoring location will be maintained throughout the life of mine, post-production, during the re-flooding operation and concluded once pit re-flooding is completed. This also applies for Wally Lake in the Vault Pit area. During the technical meeting of the Type A Water License Freshwater Use Amendment, NWB requested that AEM establish a trigger and threshold value for Third Portage Lake drawdown to ensure no risks to the littoral area. See the attached AEM response letter (Appendix A) with accepted triggers and thresholds for monitoring lake levels.

2.2 *Appendix B14: Interim Closure and Reclamation Plan (IRCP), Version 2 (January 2014)*

2.2.1 Section 1.1 Interim Closure and Reclamation Plan Objectives

"*This ICRP document is an update to the closure and reclamation plan for the development phase of the Project (AEM 2008). … This document does not include detailed engineering closure designs, or specific post-closure monitoring programs as these will be developed in the future.*"

- **DFO requests that Agnico-Eagle provide a date for the final Closure and Reclamation Plan with detailed engineering closure designs, prior to the first re-flooding event beginning in 2015.**

  As per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016). As discussed with AANDC on October 6th, 2014, in addition to submitting the ICRP, for internal purposes, AEM is presently working with consultants on scoping, prefeasibility and closure execution studies, to determine detailed engineering closure designs. The detailed planning for reflooding of Goose Pit has started and details will be presented in the technical meetings.

Re-flooding of the Main Mining and Vault Areas constitutes habitat gains for offsetting, under the No Net Loss Plan (2012), yet the executive summary of the IRCP does not mention obligations to adhere to Fisheries Act Authorizations 03-HCAA-CA7-00191.3 and 03-HCAA-CA7-00191.4, with

respect to the lakes providing the source waters for re-watering (re-flooding) activities (Third Portage Lake, Wally Lake). (Specifically: Impacts to fish and fish habitat other than that specifically identified within those Authorizations are not permitted.).

- **DFO request that these obligations be added to the list beneath the "purpose of the ICRP".**

  AEM will add reference to the Fisheries Act Authorizations 03-HCAA-CA7-00191.3 and 03-HCAA-CA7-00191.4 in the next vision of the IRCP.

- **DFO also notes that the draft No Net Loss Plan (NNLP) Implementation Cost Estimate and Construction Schedule (May 2013) has been replaced by Version 2, November 2013. Please revise this reference.**

  AEM will change the reference of the Draft No Net Loss Plan, Implementation Cost Estimate and Construction Schedule May 2013 by the Final No Net Loss Plan, Implementation Cost Estimate and Construction Version 2, November 2013 in the next version of the IRCP.

2.2.2 Section 2.3 Permits and Authorizations

- **DFO notes that the Letter (Avoid and Mitigate) for NU-10-0049 is not an Authorization. Please correct this reference.**

  AEM understands that the Letter for NU-10-0049 is not an HADD authorization and will correct this reference in the next version of the IRCP.

- **DFO would also like to note that Environment Canada is now the Responsible Authority for MMER Schedule 2 TIA, which falls under Fisheries Act Subsections 36 (3 to 6), according to a Designation Order issued February 28, 2014. DFO requests that Agnico-Eagle note this in the table.**

  AEM will add this in the next version of the IRCP.

2.2.3 Section 2.4.2.5 Permafrost

"*Rock and soil-related terrain instability is a minor concern … The exception is the wetlands occupying lowlands adjacent to lakes and ponds where excess ground ice is present and thaw instability is foreseeable. These impacts can be mitigated using currently accepted permafrost engineering practices as part of dike construction, drawdown and re-watering of lakes…*"

- **DFO request that Agnico-Eagle provide details regarding engineering practices to be used to mitigate permafrost-related terrain instability during re-watering of lakes, with respect to the stability of shorelines (and avoidance or mitigation of associated erosion and slumping).**

  As per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months (targeted date of Q3 2016) prior to the expected end of mining (Q3 2017). As discussed with AANDC on October 6th, 2014, in addition to submitting the ICRP, for internal purposes, AEM is presently working with consultants on scoping, prefeasibility and closure execution studies, to determine detailed engineering closure designs and costs. The planning for reflooding of Goose Pit has already begun and details of this approach to ensure the stability and integrity of the shorelines is maintained; information on this will be presented in the technical meetings.

2.2.4 Section 2.5.7 Water Management Facilities

"*Pit flooding has been scheduled assuming the annual water volume withdrawn from Third Portage and Wally lakes for re-flooding purposes will be lower than the spring freshet volumes, resulting in no reduction to the lake water level (SNC 2013). The rate of transfer from source lakes will be controlled through pumps or engineered structures. Where possible, the water for flooding will be taken from deep areas of the source lakes to avoid the removal of oxygenated surface waters. Water intakes will be properly screened.*"

- **DFO requests that Agnico-Eagle clarify the data, modeling or other factors they have used to determine that the lake water levels will not be affected. DFO also notes that SNC 2013 (Meadowbank Gold Project Water Management Plan 2012) is cited in several locations in the IRCP with respect to re-flooding. Please append this document to the ICRP for ease of reference, or provide the relevant information supporting, in the context of avoiding or mitigating serious harm to fish in source lakes during re-watering. Appendix B17 (2013 Water Management Report and Plan, Version 1, March 2014), which DFO understands to be an update to SNC 2013, does not include sufficient detail as described below.**

  To ensure water levels in Third Portage Lake and Wally Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of the source lakes (Wally and Third Portage Lakes) has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original licensing hearings. The current water balance presented in the latest 2013 Water Management Plan shows rates reduced from the initial study conducted by AMEC as depicted in the table below.

Water Body	AMEC (2003) ($x10^6$ m^3)	AEM (2013) ($x10^6$ m^3)
Third Portage Lake	5.30	4.88
Wally Lake	4.20	4.18

2.2.5 Section 3.3.3.3 All-Weather Private Access Road (AWPAR) Planned Reclamation Approach and Activities

"*Decommissioning of the AWPAR will involve restoring, to the extent possible, the pre-development drainage patterns along the route. Natural drainage courses will be restored by removing the culverts and bridge … and removing in-stream works down to the original channel bed … Where affected watercourses are fish-bearing, channel beds will be re-constructed similar to baseline conditions. Work at these sites will consider appropriate timing for in-stream works and will be completed in accordance with DFO operational statements. Details on the channel bed reclamation will be included in the detailed engineering for closure.*"

- **DFO request the detailed plans for channel bed reclamation.**

  As per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016). This will include detailed decommissioning of the AWPAR to ensure the drainage patterns are restored. This will be discussed in the technical meetings.

2.2.6 Section 3.3.4.3 Dikes and Saddle Dams Planned Reclamation Approach and Activities

"*The location of breaching on the Bay-Goose Dike will be selected based on a desired attenuation period in which surface water runoff will mix with the pit lake water before discharge to Third Portage Lake. Currently, it is estimated that a total of about 200 m of the dike will be breached in two sections. The dike will be breached to 3 m below the average water level in Third Portage Lake (134.1 m elevation) to provide all-season aquatic access across the dike. Sides of the breached sections will be pulled back for long-term stability. Erosion control measures will be considered before breaching the dike…*"

- **DFO request that Agnico-Eagle clarify how fish passage needs have been taken into account when considering possible locations for dike breaches, given that fish habitat use and therefore location within the lake will vary seasonally.**

  As per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016). This will include detailed decommissioning to ensure the dike breach provides long term stability and that erosion is controlled.

2.2.7 Section 3.3.4.4 Uncertainties and Assessing Information Gaps

"*Although detailed design of the dike breaches is not currently available, this will be completed during the later stages of operations prior to closure.*"

- **DFO request the detailed designs of the dike breaches.**

  As per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016). This will include detailed decommissioning to ensure the dike breach provides long term stability and that erosion is controlled.

2.2.8 Section 3.3.5.3 Open Pits Planned Reclamation Approach and Activities

"*To minimize impacts to aquatic habitat in the surrounding lakes, it is anticipated that transfers from Third Portage and Wally lakes will be done during periods of higher water in the spring and summer months. Maximum fill rates will depend on acceptable draw down levels in each source lake.*"

- **DFO request that Agnico-Eagle clarify what the acceptable draw down levels in each source lake are, and how they were determined.**

  As previously stated, to ensure water levels in Third Portage Lake and Wally Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of the source lakes (Wally and Third Portage Lakes) has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original license hearings.

2.3 *Appendix B17: 2013 Water Management Report and Plan (March 2014)*

2.3.1 Section 3.3 Pit Reflooding Operation

- **Regarding this entire section and the associated Appendix A, DFO requests that Agnico-Eagle clarify how they selected their withdrawal volumes from Third Portage Lake (2016-2024) and Wally Lake (2018-2024) for the purposes of pit re-flooding. DFO request that Agnico-Eagle focus their answer specifically on how they determined that these selected volumes would not affect lake levels and littoral habitat. Lower lake levels would lead to the risk of exposure for littoral fish habitat that would normally be submerged due to spring freshet.**

  As previously stated, to ensure water levels in Third Portage Lake and Wally Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of the source lakes (Wally and Third Portage Lakes) has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original license hearings.

  Furthermore, AEM developed monitoring trigger and threshold levels that AEM proposes to be followed during pit reflooding. As per Meadowbank's Type A Water License conditions, AEM monitors water levels in Third Portage Lake on a monthly basis. As an example, AEM is proposing two trigger values, below which measures will be taken to prevent impacts to Third Portage Lake. The trigger values presented to the NWB for the freshwater use amendment were derived based on the maximum permissible winter water withdrawal volume of 10%, according to the DFO "Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut", June 21, 2010.

  For Third Portage Lake, if the water volume is decreased by 5%, or there is a water level decrease of 0.68m (133.0 masl), AEM will increase the water level monitoring from monthly to weekly. If the water volume in Third Portage Lake decreases by 10%, or there is a water level decrease of 1.35m (132.33 masl), AEM will initiate a review the mine site water balance, evaluate the natural contributing factors (e.g. precipitation) and engage in consultation with the NWB and DFO to determine measures to protect the aquatic ecosystem (i.e. decrease the rate of pit reflooding).

"*In 2016, additional reflooding efforts [for Goose Pit] will be added for the summer period to accelerate the flooding operation via the utilization of pumps or siphons from 2PL.*"

- **DFO request that Agnico-Eagle clarify whether Second Portage Lake is the intended source of water, as Second Portage Lake (2PL) is cited here for both Goose and Portage Pit, but Appendix A – Water Balance (sections concerning years 2016-2025) mention Third Portage Lake.**

  AEM would like to clarify that no water will be pumped from Second Portage Lake to reflood the pits. All water used for re-flooding operations in Goose and Portage Pits will originate from Third Portage Lake. An error was made within the text specified above.

"*The Vault area will follow a similar reflooding process, with an incoming flow rate from Wally Lake, equivalent to that of the spring freshet (4,182,604m^3) through pump stations or syphons.*"

- **DFO request that Agnico-Eagle clarify how this volume was calculated (i.e., from what data, and how were those data collected and/or modeled). How much does the volume of spring freshet vary from year to year? How much do lake levels rise during the spring freshet, and what quantity of the littoral zone is submerged?**

As previously stated, to ensure water levels in Third Portage Lake and Wally Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of the source lakes (Wally and Third Portage Lakes) has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original license hearings.

2.3.2 Section 8 Recommendations

"*Include the Phaser deposit in the application to renew the Type A Water License which is due to be submitted in June 2014, one year in advance of expiration of the current License. Also include this updated Plan in the application.*"

- **DFO note that this recommendation has not been fulfilled. Earlier in this Plan (2.2.3 Vault Pit Area), Agnico-Eagle states that "*the Phaser Pit … is conceptual and is not currently in the water management plan …should AEM decide to mine this area approval from NIRB and amendments to the NWB will be required*." In addition, in the 'Nunavut Water Board (NWB 2AM MEA0815) Type A Water License Renewal Application – Main Supporting Document', section 2.4 (Future Plans), Agnico-Eagle states that "*Vault Pit Expansion is not included in the License Renewal*" even though "*AEM has begun discussions regarding the Vault Pit expansion with the Baker Lake HTO, KIA and DFO.*" DFO request that Agnico-Eagle clarify why the dewatering of Phaser Lake, as well as the subsequent re-flooding, has been excluded from the entire License Renewal Application.**

This concern was brought up by EC. Unfortunately, this may not be possible until NIRB has completed their review of the Vault Expansion into Phaser Lake. AEM has submitted an application for a straight renewal with administrative updates; this will ensure that the renewal of the License is completed within the appropriate timelines. If the timing permits, AEM would prefer to include it and have discussed the possibility of merging the Vault Pit Expansion into Phaser Lake as part of the Type A Water License renewal.

3 Aboriginal Affairs and Northern Development Canada (AANDC) Comments and Recommendations

3.1 *Appendix B17 – 2013 Water Management Report and Plan, Version 1 (March 2014)*

The Freshet Action Plan is referred to in the Water Management Plan, and in particular, for managing RSF seepage water, but has not been included with the license application.

- **The proponent should include a copy of the Freshet Action Plan with the application. Many mine facilities around the mine site are vulnerable to excess water. Review of the Freshet Action Plan would provide a better understanding of the management plan for contact waters and their potential environmental impacts during operations and closure.**

  AEM agrees with the AANDC recommendations. You will find in Appendix B of this document the Freshet Action Plan (AEM, 2014).

3.2 *Appendix B14 – Interim Closure and Reclamation Plan, Version 2 (Jan 2014)*

The Interim Closure and Reclamation Plan provides a permanent closure and reclamation financial security estimate that was prepared using a dated version of the RECLAIM model (Version 6.1, March 2009).

The RECLAIM model has been revised (Version 7, March 26, 2014) to include unit costs that are benchmarked against actual abandoned mine site remediation projects situated in the Northwest Territories.

- **The Proponent should re-calculate its permanent closure and reclamation financial security estimate using the latest RECLAIM template (Version 7, March 26, 2014). Furthermore, the current mine operating costs, RECLAIM Version 7 unit costs, and inflation should be reflected in the security estimate.**

  A revised cost estimate should be provided to ensure that the requirements of the Mine Site Reclamation Policy for Nunavut are satisfied (i.e., adequate security should be provided to ensure the cost of reclamation, including shutdown, closure, and post-closure, is born by the operator of the mine rather than the Crown).

  As agreed upon by AEM and AANDC during a conference call on October 6th, 2014, AEM will complete a cost re-evaluation in RECLAIM 7.0, provide the results of the reanalysis as an addendum to the ICRP and provide an update prior to the Technical hearings. AEM will present information on closure during the technical meetings.

3.3 *July 2014 Monitoring Program Summary Report: Appendix C – Assay Road Seepage, Phase 2 Environmental Site Assessment and Engineering QA/QC (Aug 2014)*

The Phase 2 Environmental Site Assessment of the Assay Road Seepage and the Quality Assurance / Quality Control monitoring for the construction of the interception trench designed to contain cyanide impacted soil and groundwater is relevant to closure planning but has not been included in the licence application (was available until after AEM submitted its application).

This report was included in AEM's July 2014 monitoring program summary report

- **The Proponent should include a copy of the Assay Road Seepage Assessment and Engineering QA / QC Report with the application.**

  The management of cyanide impacted soil and groundwater will result in monitoring and possibly, additional mitigation measures that will affect AEM's closure plan.

  AEM agree with the AANDC recommendation. You will find in Appendix C of this document the Assay Road Seepage Phase 2: Environmental Site Assessment and Engineering QA/QC (Tetra Tech EBA, 2014).

4 Kivalliq Inuit Association (KIA) Comments and Recommendations

4.1 *Main Supporting Document*

4.1.1 KIA-01 Change in obtainable freshwater limit

- **The NWB should permit maximum yearly obtainable quantities of freshwater based on the yearly requirements anticipated by AEM. These should cover known water requirements and are not to encompass anticipated water use as part of the IVR site should AEM move forward with the environmental assessment process there.**

  This will be discussed during the technical meetings.

4.1.2 KIA-01-B Change in obtainable freshwater limit (p.22)

AEM has proposed an increase in annual water takings from Third Portage Lake and state that no significant impacts to the local aquatic ecosystem are anticipated as a result of the requested increase in fresh water use, because the total volume withdrawn for mining under maximum use for 2010 – 2018 would be less than 2.5% of the volume of Third Portage Lake. Withdrawal of 2.5% of the lake volume annually will represent a consumptive use of water until the pits are refilled and the rate of withdrawal needs to be considered against the annual inflow to the lake to determine its significance.

- **The KIA suggests that AEM provide a comparison of the projected increase in water volume taking against the annual volume of inflow to Third Portage Lake.**

  To ensure water levels in Third Portage Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of Third Portage Lakes has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original licensing hearings.

4.1.3 KIA-02 Discharge Limits and Determination of Environmental Effects (p.23-28)

AEM has concluded that the overall analysis of water quality is adequate based on internal monitoring stations and limits that are adequately protecting the receiving water environment. However, there have been a few periodic exceedances. The KIA is concerned that the assessment of impacts to receiving waters begins by comparison of monitoring results to Water License Limits. This presupposes that the Water License limits represent adequate protection of the receiving waters.

- **The KIA recommend that the assessment should begin by checking the CREMP results to:**

  a) determine if any changes were documented in the receiving waters, and
  b) if the changes were within the ranges predicted in the EIS.

This would allow checking of water quality for parameters for which no license limits were set and allow a better assessment of the adequacy of the existing license limits. This would provide a more robust approach to adaptive management as it is based on testing the hypothesis that "Water License limits are adequate to protect the environment" vs testing the implications of not meeting license limits.

The evaluation of the receiving environment presented annually in the CREMP does exactly what KIA has recommended. The CREMP evaluates monthly water quality data against triggers and thresholds to ensure CCME limits are respected or changes are not significantly different from reference or baseline data conditions; this is done irrespective of the license limits. It serves as a "checks and balance" to ensure the limits are protective of the environment. If exceedances of the thresholds or triggers occur in the receiving environment, AEM evaluates the potential sources and takes corrective or mitigative action. The approach that the KIA is proposing is what AEM completes on a monthly basis and is reported annually within the CREMP. AEM believes the methods used to evaluate the appropriateness of the limits in support of the Type A water license was adequate and that the evaluation of changes in the receiving environment are well documented in the actual CREMP.

4.1.4 KIA-03 Altered License Condition - Water License Part D, Item 11

AEM has proposed a changed wording from "in Third Portage Lake, Second Portage Lake and Wally Lake" to "nearby Lake". This may alleviate the need to sample each lake, particularly because lake has not been pluralized.

- **We request that AEM continue to name specific lakes they shall monitor to increase accountability in the AEMP.**

AEM agrees with the KIA recommendation and will continue to name the lakes by their specific names.

4.1.5 KIA-04 Altered License Condition - Water License Part E, Item 8

AEM has proposed to remove the following condition: "*The Licensee shall, on an annual basis during Operations, compare the predicted water quantity and quality within the pits, to the measured water quantity and quality. Should the difference between the predicted and measured values be 20% or greater, then the cause(s) of the difference(s) shall be identified and the implications of the difference shall be assessed and reported to the Board*."

We find it concerning that AEM will not be required to validate model predictions under the water license and that removal of the annual comparison will not provide the timely feedback that is necessary for effective adaptive management.

- **The KIA recommend that the current schedule of annual comparisons of predicted water quality and quantity within the pits to measured water quality and quantity be continued.**

As discussed during a WebEx on November 28th, 2013 with KIA, NWB, EC and AANDC, and agreed upon by all parties at the time, AEM will continue to monitor the pit water quality and model on an annual basis to ensure that pit water quality will meet CCME limits and ultimately protect aquatic biota, prior to breaching the dikes. See attached Appendix D for meeting minutes and presentations made.

4.1.6 KIA-05 Altered License Condition - Water License Part F, Item 2 and 3

Total cyanide does not have an associated CCME guideline. While it is helpful to measure the total within the water column, weak acid dissociable cyanide represents the toxic fraction and should be assessed as part of routine monitoring.

- **We request Portage Attenuation Pond effluent discharges monitored at Station ST-9 include weak acid dissociable cyanide as well as total cyanide in the suite of monitored parameters as it represents the toxic fraction of total cyanide and is associated with a CCME water quality guideline. We also request that effluent discharged from the Vault Attenuation Pond monitored Station ST-10 include the same provision for monitoring weak acid dissociable cyanide.**

  The following row should be added to Part F Item 2 and Part F Item 3:

Parameter	Maximum Average Concentration	Maximum Allowable Grab Sample Concentration
Free Cyanide	0.0025 mg/L	0.005 mg/L

AEM's strategy for cyanide includes complementary monitoring of both the receiving environment and effluent. As proposed in the renewal, AEM will continue to monitor cyanide in the receiving environment as part of the CREMP. Our approach is consistent with KIA's recommendation to ensure that receiving environment sampling includes the bioavailable/toxic forms of cyanide. To that end, the CREMP includes free cyanide (in addition to total cyanide), which is consistent with CCME's water quality guideline for the protection of aquatic life (i.e., based on free cyanide). The effluent monitoring program (for discharges at ST-9 and ST-10) is based on MMER requirements, which includes characterization of total cyanide and toxicity testing and stipulates standard decision criteria for management actions. AEM's position is that MMER requirements are protective of the environment, that the receiving environment is thoroughly monitored under the CREMP and that KIA's recommended addition stated above is not necessary.

4.1.7 KIA-06 Altered License Condition - Water License Part F, Item 3 and 23

AEM has removed Part F Item 3 stating it will be included under Part F Item 23. The parameter list for Part F Item 23 does not include all removed parameters and only applies to the "*Baker Lake Bulk Fuel Storage Facility and the Meadowbank Fuel Storage Facility (ST-37 through ST40)*".

AEM has also proposed removing total lead and ammonia from the parameter list. Increases in either of these parameters may impair aquatic life and should be included in the discharge criteria for fuel containment facilities discharging to Land. We recognize that, while MMER and CCME do not apply to discharges to land, the criteria provide a framework for assessing these discharges in the event that runoff reaches the aquatic environment.

- **AEM should harmonize the required criteria between Part F Item 3 and Part F item 23. The breadth of the updated Part F Item 23 should reflect Part F Item 6. The introductory text should read "Effluent from fuel containment facilities that require Discharge to land, shall not exceed the following Effluent quality limits:"**

  Lead and ammonia should continue to be part of parameter list for Baker Lake Bulk Fuel Storage Facility and the Meadowbank Fuel Storage Facility (ST-37 through ST40).

  AEM has removed Part F Item 6 (effluent from fuel containment facilities that require discharge to land) and not Part F Item 3 which is the list of parameters for discharge from the Vault Attenuation Pond.

  All the parameters deleted from Part F, Item 6 were included in Part F, Item 23. The discharge limits are the same for benzene, toluene and ethylbenzene and more stringent for oil and grease. The only change from Part F Item 6 to Part F Item 23 is the limit of Lead for which we ask a limit of 0.1mg/L instead of 0.001 mg/L. The rationale behind this request is that during the original license, water was planned to be centrally collected by a series of ditches and sumps and ultimately discharged directly into Baker Lake. However, this is not occurring, rather all of the secondary containment berms are

discharged to land, which is an improvement in the practices originally proposed, thus avoiding direct discharge into Baker Lake. As proposed in the Type A renewal, AEM will continue to monitor discharge from fuel containment for ammonia.

AEM agrees with the KIA and will include the proposed introductory text as it relates to secondary containment discharge to land in Baker Lake Bulk Fuel Storage Facility and the Meadowbank Fuel Storage Facility (ST-37 through ST40).

4.1.8 KIA-07 Altered License Condition - Water License Part I, Item 7

AEM has proposed rewording the condition to read: "*The Licensee shall confirm the locations and GPS coordinates for all monitoring stations referred to in Schedule I ~~with an Inspector~~.*" External accountability is a critical part of environmental protection and begins with site selection.

- **AEM should continue to confirm monitoring station locations with an Inspector if changes to the monitoring program are required to reflect current mine activity. Confirmation with an Inspector should also be required if any new stations are added during the proposed water license tenure.**

AEM is in agreement with KIA recommendations. All stations are currently approved by the inspector and it is for this reason that AEM removed this statement. In the case that future station are added, AEM will confirm the stations location with the Inspector.

4.1.9 KIA-28 Altered License Condition - Water License Part H, Item 3

AEM has proposed to remove Part H, item 3 of the water license renewal application as they feel it is covered off by Part D, item 29. In item 29 the word "fuel" is used while in item 3 the words 'petroleum products" are used. The words "petroleum products" are preferred as they are more inclusive (i.e. hydraulic fluid, motor oil, etc.) than the word "fuel".

- **The KIA requests that words "petroleum products" be included along with the word "fuel" in Part D, item 29.**

AEM agrees with the KIA recommendation.

4.1.10 KIA-IR-08 Altered License Condition - Water License Part I, Item 18

AEM has proposed removing this condition. Any new construction required over the next ten years will alter the existing environment. A photographic record will assist AEM in reclamation activities.

- **The Water License should continue to require a digital photographic record of all watercourse crossings before, during and after the construction has been completed under the water license. The condition should not be removed from the license as it is reasonable to expect that additional construction activities may occur.**

AEM agrees with the KIA recommendation.

4.1.11 KIA-29 Altered License Condition - Water License Part J, Item 6

AEM has proposed to add the words "if possible" to Part J, item 6. A significant effort should be put into re-vegetation of the tailings.

- **The KIA requests that words "if possible" be removed as a significant effort should be put into re-vegetation of the tailings.**

  AEM will put significant effort into the revegetation of the site, however does not agree with the KIA recommendation to remove "if possible". This has been discussed previously with the KIA; to AEM's knowledge there are no northern mines that have successfully revegetated their waste rock piles or capped areas.

4.1.12 KIA-09 Trend of Increasing Parameter Concentrations in Near Field sites (Review Freshwater Aquatic Environment between 2010 and 2013).

Several parameters of concern were identified as part of the water quality results review between 2010 and 2013. Sites in which water quality that may be of concern to the environment were identified were those which 1) had measured water quality parameters exceeding applicable criteria (MMER, CCME, BC MOE) or 2) trends in key parameters that are considered to be representative of mine activity (SO4, TDS, TSS, conductivity, NH3, Fe and cyanide) which were tracked to identify any apparent patterns.

Station locations with exceedances and parameters with increasing trends were:

- **Associated with the diversion ditches with water discharging to Third Portage Lake,**
- **The attenuation pond discharging to Third Portage Lake,**
- **Near the Tailing Storage Facility (TSF) eventually discharging to Second Portage Lake**
- **Stations which discharged to land. Note criteria may not be applicable as these discharges do not directly reach surface water but we note that the close proximity of surface water receivers to land and for inundation during the freshet suggest that any exceedances warrant concern.**

The aquatic ecosystem monitoring program also identified waterbodies and watercourses with changes resulting from mine activity. TSS exceeded criteria where indicated; other parameters indicate an increasing trend:

- **Third Portage Lake (East) – TSS, conductivity, calcium, TDS, sulphate, phytoplankton, benthic invertebrates**
- **Third Portage Lake (North) – conductivity, sulphate**
- **Third Portage Lake (South) – Sulphate, phytoplankton, benthic invertebrates, zinc in sediment**
- **Second Portage Lake – TSS, alkalinity, TDS, phytoplankton, benthic invertebrates**
- **and Tehek Lake (near field site) – TSS, sulphate, benthic invertebrates**

AEM indicated that several parameters were elevated during the dike construction. Elevated parameters during construction of the East Dike were nitrate, total phosphorus, total aluminum*, total chromium*, total copper*, total iron*, total manganese, total nickel, total titanium, and total uranium. Elevated parameters during construction of the Bay-Goose Dike were TSS, total aluminum*, total chromium*, total copper*, total iron*, total manganese, total nickel, total titanium, and total uranium. Parameters with a * exceeded CCME guidelines.

- **The KIA requests that AEM provide a discussion of mitigation measures which will be taken to address the trend of increasing key parameters in the Near Field sites. This discussion should provide modeled water quality in the Near Field receiving environment where appropriate and make comparisons of the observations with predictions made in the EIS.**

The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in December 2012. These complementary documents provide details ranging from how/when samples are collected to how monitoring results are interpreted (e.g., employing early warning "triggers" that lead to action [see next paragraph] before the corresponding "thresholds" are reached) and linked to follow-up management actions (see Management Response Plan [Section 4] of the AEMP design document [AEMP 2012]).

The Management Response Plan consists of two main components: assessment and mitigation. The assessment process focuses on characterizing the situation (to determine magnitude, spatial scale and reversibility), assessing risks (to determine to ecological significance of any changes), and causality assessment (to ensure that the underlying mechanisms responsible for the change are understood and that it is related to the mine). The results of the assessment process inform whether the response needs to proceed to mitigation and provides clear direction on what needs to be done. Without rigorous assessment of apparent changes in the receiving environment the need for or effectiveness of any mitigation measures would be questionable. This process leads to informed decision making.

The CREMP includes a comprehensive spatial-temporal assessment monitoring results and has identified some mine-related changes with temporal trends at near-field stations in the receiving environment (CREMP 2013). Management actions to date have focused on further assessment (with rationale provided in CREMP 2013); data to date suggest that the observed changes are generally consistent with those predicted in the EIS.

4.2 *Review of existing CREMP Monitoring Program*

4.2.1 KIA-10 Wally Lake Reference Site (Main Supporting Document, CREMP Stations and Control/Impact Designations)

AEM states "*A reference station for Wally Lake has not been established. While the characteristics of Wally Lake are somewhat unique (it is much shallower than other lakes), further evaluation of the advantages and disadvantages of establishing a separate reference station (versus using existing reference stations) is needed in advance of the commencement of construction activities at Wally Lake.*"

The Vault Site is entering operation which may influence water quality in Wally Lake, the near field site. Despite lack of baseline information, establishment of an appropriate reference lake will discern changes in water quality resulting from year to year variation from mine related impacts.

- **The KIA recommends that AEM establish a reference site for Wally Lake. The evaluation of the advantages and disadvantages of establishing a separate reference station should be conducted and presented for review prior to water license renewal.**

The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in December 2012.

The CREMP design document (2012) does state that "further evaluation of the advantages and disadvantages of establishing a separate reference station (versus using existing reference stations) is needed…" While not formally documented, AEM chose to rely on the existing reference stations for Wally Lake. The primary reason for this decision is that there are varying degrees of differences among the lakes surrounding the mine and that the before-after-control-impact (BACI) approach does not rely on the assumption that control (reference) and impact (nearfield) stations are the same, only that they respond in a similar way to broader natural changes (e.g., climate-induced changes affecting the region). The BACI takes baseline differences into account when testing for temporal changes related to mining. Given that monitoring continued at Wally Lake in the absence of local mining activity, there are many more years of "before" data available for this lake, making the design more robust for this lake. Furthermore, Wally Lake is the only sampling area where the second reference area (Pipedream Lake, which was added in 2009) can formally be used within the BACI framework. The addition of a new reference area for Wally Lake would preclude the use of BACI and force a reliance on control-impact (CI) type designs whose foundation is the assumption that the control and impact sites are inherently the same. Our experience with the Meadowbank lakes since the mid-1990s is not consistent with this assumption. Thus, the establishment of a unique reference area for Wally Lake is unwarranted.

4.2.2 KIA-11 Data Quality Objectives (CREMP QA/QC, Appendix B5 - QA/QC plan)

Data quality objectives used for the QA/QC program were less stringent than indicated by the USEPA.

The water sample Data Quality Objectives (DQOs) for this project were:

- **Laboratory Duplicate = 25% RPD for concentrations that exceed 10x the method detection limit (MDL).**
- **Field Duplicate = 50% RPD for concentrations that exceed 10 x MDL.**

The USEPA DQO is a 20% RPD for all concentrations that exceed 5x the MDL and is a more widely accepted standard.

AEM reported that "*Although there were some exceedences of the established DQOs, these exceedances represent much less than 1% of the total for QA samples and parameters measured.*" While this is an acceptably low rate of DQO failure, we are concerned the failure percentage may increase to an unacceptable level if more stringent DQOs are applied. Similarly the DQO failure rates for other sample types were:

- **0 of the sediment samples**
- **~1% in phytoplankton samples**
- **2.2% in benthic invertebrate samples**

Discussion of DQOs are also not provided in Appendix B5, the QA/QC plan.

- **The KIA recommends that future CREMP years should use a more stringent DQOs to evaluate blanks and duplicates. It is suggested that the USEPA DQO criteria should be used. A discussion should be provided if AEM proposes continued use of less stringent DQOs.**

- **Discussion of DQOs should also be added to Appendix B5. This discussion should also include what actions will be taken if data fails to achieve the DQO. Together this will ensure only high quality data is used to characterize the aquatic environment and provide the basis for management decisions.**

  The CREMP is a comprehensive monitoring program that results in the generation of substantial data in any given year. CREMP DQOs for duplicate samples and field duplicates were set in consideration of the realities of analytical laboratory performance and receiving environment heterogeneity (field duplicates). We have worked closely with the main laboratory (ALS) to understand their capabilities regarding replication of laboratory results and feel that the DQOs are appropriate for this program. AEM feels that understanding the inherent limitations in analytical methods is important in setting realistic DQOs and that blind application of more stringent criteria would not serve the program. To that end, we have also worked with ALS to ensure that detection limits are appropriate for each parameter. The success of this approach is exemplified by the CREMPs proven ability to identify mine-related changes over time, which is founded on the integrated interpretations CREMP data accumulated over the years. That said, AEM continues to work on improving overall data quality.

4.2.3 KIA-12 Hold Times (CREMP QA/QC)

AEM discussed several problems with sample transportation. Most issues appear to stem from mine proximity to an accredited laboratory. AEM identifies:

1. **Hold times were most often exceeded for the following parameters:**
   a. **Colour**
   b. **Turbidity**
   c. **Nitrate**
   d. **Nitrite**
   e. **Ortho-phosphate (dissolved as P)**

2. **Lack of temperature control resulted in broken bottles on route to analysis.**

We are concerned the violation of hold times may compromise data quality used to make management and mitigation decisions and characterize the aquatic environment.

- **The KIA recommends that AEM commit to Part I, Item 23 of the existing water license requiring establishment of an accredited laboratory on-site. AEM has not adhered to this condition. Use of an on-site accredited laboratory will likely alleviate issues associated with sample hold times. As an alternative, please elaborate on what measures are being undertaken to improve holding time compliance.**

  AEM recognizes that sample transport has been a logistical challenge for the CREMP. Drastic changes were implemented in 2014 to improve the sample transport process for the CREMP. Reducing hold times was a key driver of this initiative. To that end, AEM started working closely with Multilab in Val D'Or and ALS in Burnaby to address the holding time and other transport issues (e.g.,

temperature control). Multilab has taken on the analysis of time-sensitive parameters and coordination of shipments from site to ALS. ALS continues to conduct the highly specialized trace metals and other analyses requiring extremely low detection limits. We have already seen improvements and will continue to refine this process to achieve better results.

AEM does not think establishing an accredited lab onsite will improve overall data quality for the CREMP. Rather, keeping the practice of sending samples to highly specialized, third party, accredited labs ensures data quality and highly rigorous standards

4.2.4 KIA-IR-13 Hold Times (CREMP Data Evaluation Criteria)

Data was evaluated against trigger and threshold values. Trigger values for AEM consider that corrective actions are initiated:

1. **When a threshold (e.g., CCME guideline) was established, the trigger was set as the maximum of either (a) the value halfway between the baseline median and the threshold ("Method A"), or (b) the 95th percentile of the baseline data ("Method B").**
2. **When a threshold was not established, the trigger was set equal to the maximum of either the 95th percentile of the baseline data ("Method B") or two times the current detection limit ("Method C").**

In most cases, the threshold was equal to a given guideline. In cases where a water quality guideline exists but Method B was used for trigger development (i.e., cases where baseline data already exceed the guideline for > 5% of cases), it is possible for the trigger to equal or exceed the guideline. In such cases, the guideline is reported as the threshold but is not used as a criterion for action; rather, the trigger is the only criterion for action as is the case for variables lacking water quality guidelines.

This additional consideration was not needed for sediment data as threshold values could be developed for all parameters.

AEM states that the "*formal application of the trigger for decision-making purposes was to the yearly mean for each sampling area*". This is concerning as parameters concentrations vary more over the course of a year than a month making it difficult to statistically differentiate a yearly mean from a trigger concentration.

- **Yearly means are appropriate for sediment and benthic invertebrate samples as they are collected at a yearly frequency. Water quality samples are collected seasonally. Seasonal means should be used for decision making purposes or triggers should consider individual measurements or repeated individual measurements as decision criteria.**

  The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in

December 2012. These complementary documents provide details ranging from how/when samples are collected to how monitoring results are interpreted (e.g., employing early warning "triggers" that lead to action [see next paragraph] before the corresponding "thresholds" are reached) and linked to follow-up management actions (see Management Response Plan [Section 4] of the AEMP design document [AEMP 2012]).

The application of triggers/thresholds and associated statistical testing for decision making purposes were presented and discussed in the aforementioned workshops. The CREMP Design Review (2012) provides more details. In short, program design contemplated identification of both short-term and longer-term changes in the receiving environment. For water quality samples, a detailed statistical power analysis was conducted to help inform what the design could be achieve (i.e., what the expected power would be for a range of time periods). The results suggested that formal application of the BACI design to single events provided low power to identify changes of interest and that 5 to 6 events provided good power. It should be noted that the formal BACI application includes paired events (i.e., events for near-field and reference areas occur at the same time), which serves to account for natural seasonal patterns. The trigger/threshold comparison process starts with the comparison of the results of each event to identify short-term, localized changes of interest. Temporal trends are also examined using time series plots that include the trigger/threshold values. These tools serve to identify cases where parameters exceed the triggers in one or more events; these are "flagged" for more scrutiny. The BACI-(paired) statistical model is formally applied to any parameters where the annual mean exceeds the trigger; these are indicative longer-term trends or a substantial short-term event. Combined, this approach provides a set of sensitive tools to identify mine-related changes in the receiving environment.

4.2.5 KIA-14 Water Chemistry Discussion Criteria (CREMP Water Chemistry Discussion)

Water quality parameters were only reported on when at least 10% of the samples exceeded the MDL. This presents a minimum threshold for discussion that may cause significant but acute changes to water quality to be overlooked. For example, a temporary failures in the treatment process may increase some water quality parameters in the effluent. These elevations still warrant discussion in the CREMP despite not exceeding license conditions.

- **AEM should alter the minimum criteria to discuss parameters to provide greater assurance that all potential adverse changes to water quality resulting from mine activity are highlighted. The KIA recommends that parameters are discussed in future CREMP reports when:**

  1. greater than 10% of the samples are above the MDL, and
  2) parameters that are detected less frequently than in 10% of samples but are >5x MDL in some samples where they were detected.

This will provide assurance that the mine has had no or reversible adverse impacts to the aquatic environment under current water license conditions. This is critical as the water license has not been significantly altered in the renewal application.

The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft

design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in December 2012. These complementary documents provide details ranging from how/when samples are collected to how monitoring results are interpreted (e.g., employing early warning "triggers" that lead to action [see next paragraph] before the corresponding "thresholds" are reached) and linked to follow-up management actions (see Management Response Plan [Section 4] of the AEMP design document [AEMP 2012]).

AEM has worked hard over the past few years to make the CREMP a more user-friendly document while maintaining transparency. Given that results for the Meadowbank lakes and Baker Lake are reported separately and that there are over 70 parameters included in the analysis, a conservative rule set was adopted to identify parameters for the formal trend assessment that included consideration of: (1) overall detection frequency (>10%), (2) control-impact detection frequency - where the proportion of detected values did not differ by more than 0.1 between station types, and (3) for Meadowbank only, where the apparent pattern in detected values matched mining activity. Parameters for which <u>any</u> of these rules were met were included in the trend assessment; plots for all parameters that failed all rules are still provided in a CREMP appendix. AEM believes this approach is conservative, defensible and transparent. AEMs rule 1 is consistent with KIAs recommendation. AEMs rules 2 and 3 ensure that all parameters (even those less than 5x MDL) that possibly show a mine-related pattern are included in the trend assessment.

4.2.6 KIA-15 Elevated Sediment Concentrations: Zinc and Lead (CREMP Sediment Chemistry Discussion, Table 3.4-1)

There were a few trigger values exceeded at impact areas (e.g., copper [WAL], chromium [TPN] and zinc [SP, WAL]) but were within the range of baseline conditions. Interestingly zinc was not highlighted as a potential risk to the environment in the CREMP but was highlighted in the summary in the Main Supporting Document.

Lead was found at above both the trigger and threshold concentrations in WAL sediment samples in August 2013 but was not highlighted in the text.

- **The KIA recommends that AEM harmonize the existing aquatic environment summary presented in the Main Supporting Document with results and findings presented in the CREMP. A discrepancy has been noted for zinc. The CREMP also does not discuss elevated lead concentrations in the WAL sediment samples. These concentrations are above both the trigger and threshold concentrations and require management actions. It is recommended that a condition be included in the water license that requires management actions when concentrations are above a threshold value.**

- **The KIA also requests an explanation as to why elevated lead concentrations were overlooked in the CREMP discussion.**

  AEM will discuss these recommendations and comments related to sediment during the technical hearings.

4.2.7 KIA-16 Elevated Sediment Concentrations: chromium (CREMP Sediment Chemistry Discussion)

There was a temporal/spatial pattern observed in 2013 for chromium in TPE sediments which demonstrated a continued increase from the pattern highlighted in the 2012 CREMP. Chromium

exceeded the trigger concentration in 2013 TPE sediments. A coring study is currently planned for 2014 to confirm the trend. This study is timed to coincide with the year's EEM program.

- **The CREMP recommends management action to follow up with increased chromium concentrations. Management action can be coupled with more stringent discharge criteria for chromium in the water license. The KIA recommends a condition in the water license to address elevated chromium in TPE sediments prior to reaching the threshold value. We initially suggest more stringent discharge criteria for chromium. We invite AEM to provide other management options.**

  AEM will discuss these recommendations and comments related to sediment during the technical hearings.

4.2.8 KIA-17 Zooplankton Sampling (Appendix B2, Sampling Frequency)

AEM has indicated a violation of the water license condition requiring monthly water quality samples. We are sympathetic to this violation based on our understanding of challenges faced by arctic environmental sampling. Statements such as "*Sampling in June, October and early November is highly dangerous due to thin ice conditions*" reflect AEM's understanding of these challenges. Six months (April, May, July, Aug, Sept, plus November or December) of full water chemistry data for the annual period was proposed to support BACI analyses of the aquatic environment. AEM has also proposed collection of "basic field water quality data" in nearfield areas (i.e., TPN, TPE, SP and eventually Wally) at least once mid-winter.

AEM has provided a useful rationale for sampling frequency of each parameter based on expected response time to mine impacts.

- **Water quality – up to 6x/year**
- **Phytoplankton – up to 6x/year in open water season samples**
- **Sediment – yearly**
- **Benthic invertebrates – yearly**
- **Zooplankton and periphyton – discontinued due to variability in data collected to date**

- **The distribution of samples is acceptable as it adequately characterizes both under ice conditions and the open water. However, the KIA are concerned that zooplankton and periphyton sampling will be discontinued. The KIA recognizes that zooplankton sampling is not required by EEM under MMER. However, the inclusion of zooplankton monitoring is required by the NWT in Aquatic Effects Monitoring Programs (AEMPs) within similar environmental conditions. Furthermore zooplankton are important to young of the year fish and can help characterize changes related to mine impacts. The KIA recommends to continue including zooplankton as part of the AEMP for the project.**

  The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and

thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in December 2012. These complementary documents provide details ranging from how/when samples are collected to how monitoring results are interpreted (e.g., employing early warning "triggers" that lead to action [see next paragraph] before the corresponding "thresholds" are reached) and linked to follow-up management actions (see Management Response Plan [Section 4] of the AEMP design document [AEMP 2012]).

The potential inclusion of zooplankton was studied in detail in the CREMP Design Report (2012). Despite early discussions during the aforementioned workshops to drop zooplankton from further consideration, AEM decided to conduct further sampling to reassess the situation. Samples were collected in 2010 and 2011; these data were assessed for power using the BACI statistical framework. There was low power for detecting 20% (over any number of years) or 50% changes in zooplankton metrics in a single year. Power improved only when trying to detect a 50% change with two to three years of after data. Consequently, it was removed as a monitoring component of the CREMP. That said, it was acknowledged that zooplankton studies may still be appropriate for more intensive spatial-gradient designs as those employed for targeted studies (i.e. TSS Effects Assessment Studies (EAS)) where they might also be coupled with zooplankton-based toxicity testing. Considering the comprehensive and conservative approach applied to water in the CREMP, AEM does not feel that this decision detracts from the CREMPs ability to detect mine related changes in the receiving environment (i.e., as the assessment phase of the Management Response Plan would address the ecological significance of changes to water quality [e.g., as described for the EAS case above).

4.2.9 KIA-18 Depth Samples (Appendix B2, Experimental Design)

Depth water quality samples are not proposed for Meadowbank. They were collected in 2009-2010, to determine the potential importance of differences in measurements associated with depth but the magnitude of differences associated with depth was minimal compared to the magnitude of differences occurring naturally between samples and stations. AEM did document an earlier response of elevated TSS in Third Portage Lake resulting from dike construction. Concentrations during the curtain breach were elevated at surface but above the threshold for acute lethality to fish at depth, as shown in the special investigations undertaken by Azimuth in response to the silt curtain breach. Consistent sampling at depth may better inform mitigation decisions through increased probability of detection of any episodic changes to water quality.

This point will be further discussed in KIA-IR 23, Seepage at ST-16 and Lake NP2.

- **The KIA recommends that depth samples should be required from 1 meter off lake bottom as part of the CREMP at sample sites where stratification has been demonstrated through routine lake profiles of field temperature, conductivity, dissolved oxygen and pH.**

  The CREMP has been designed to detect changes in the receiving environment at the lake basin spatial scale. Complementary programs were developed specifically to monitoring changes requiring more spatially and temporally more intensive monitoring (e.g., dike construction monitoring). AEM agrees that there are times when sampling at depth would be useful to better characterize the receiving environment.

  Based on baseline limnological data, the Meadowbank lakes are generally considered to be well mixed. This assumption was formally tested in the CREMP Design Report (2012) to determine if a routinely collecting depth sample was warranted in the CREMP; the conclusion was that surface samples adequately characterized the water column. That said, it is recognized that stratification may occur and that sampling at depth may be appropriate. This has been incorporated into the CREMP by instructing field teams to take samples at depth when vertical profiling suggests the presence of stratification (e.g., abnormally high conductivity measurements).

4.2.10 KIA-19 Statistical comparison of Biological Monitors (Appendix B2, Experimental Design)

The use of Before-After-Control-Impact (BACI) analysis is an appropriate analysis framework to evaluate potential impacts in a particular lake or basin over a particular time period. It is also effectively used to identify long-term trends in data.

Benthic invertebrate and phytoplankton sample and statistical design are not problematic. We acknowledge the low statistical power of phytoplankton sample comparison resulting from high natural variability. Similarly as stated by AEM: "*zooplankton variables are not realistically capable of detecting effects in a given year*". However, we disagree with AEM's decision to remove zooplankton from the CREMP.

- **Biological monitoring is inherently variable but can be partially addressed using an approach recommended by Wiens and Parker and used in the Doris North AEMP analysis of benthos. This approach is an impact level-by-time analysis, where the benthos and other biological monitor trends at exposure sites are compared to the trends at reference sites to determine if there is evidence of non-parallelism over time. The KIA recommends the use of the Wiens and Parker approach in addition to the BACI assessment for biological monitoring results (benthic invertebrates, phytoplankton, zooplankton).**

  The Type A water license (2AM-MEA0815) for the project issued by the Nunavut Water Board (NWB) in 2008 required a revised AEMP, and specified some of the requirements for that revision. Beginning in 2009, AEM began collecting data in support of this revision to strengthen the ability of the CREMP to detect changes in the receiving environment. AEM hosted workshops with the NWB (including representatives from KIA, Environment Canada and Fisheries and Oceans Canada) in March (Yellowknife) and June (Edmonton) 2010 to review the redesign of the AEMP (now an overarching 'umbrella' that serves to integrate the results across AEM's individual, but related, monitoring programs in accordance with the Type A water license requirements) and the CREMP (the core receiving environment monitoring program). The workshops were followed up with the submission of draft design documents for both the AEMP (which showed the linkages between monitoring program results and management actions) and CREMP (which included details for receiving environment monitoring such as statistical design, station identification, proposed references, decision criteria [triggers and thresholds], sampling protocols, and DQOs) and final design documents submitted to the NWB in December 2012. These complementary documents provide details ranging from how/when samples are collected to how monitoring results are interpreted (e.g., employing early warning "triggers" that lead to action [see next paragraph] before the corresponding "thresholds" are reached) and linked to follow-up management actions (see Management Response Plan [Section 4] of the AEMP design document [AEMP 2012]).

  In addition to presentation/discussions at the two NWB workshops, the statistical approaches employed in the CREMP were also discussed with Dr. Carl Schwarz of Simon Fraser University. The BACI models employed in the CREMP take advantage of baseline data collected prior to mine development to provide an understanding of the natural dynamic state present at all stations; these models specifically incorporate natural initial differences among stations and track changes (non-parallelism) over time related to mining. We are familiar with Wiens and Parker (1995) and agree that the authors provide some practical approaches for environmental monitoring in cases when trying to assess the implications of environmental perturbations that were not envisioned (e.g., where baseline data do not exist and investigators need to make inferences regarding impacts). That said, the statistical approaches presented by Wiens and Parker are no less susceptible to reduced power; the authors quote Underwood (1994): "When natural variation in time and space is great, the only effects of human disturbance that are likely to matter are very large ones." While zooplankton was dropped from the CREMP, AEM acknowledges that zooplankton studies may still be appropriate for more intensive spatial-gradient designs as those employed for the targeted studies (i.e.TSS Effects

Assessment Studies (EAS)) where they might also be coupled with zooplankton-based toxicity testing. Considering the comprehensive and conservative approach applied to water in the CREMP, AEM does not feel that this decision detracts from the CREMPs ability to detect mine related changes in the receiving environment (i.e., as the assessment phase of the Management Response Plan would address the ecological significance of changes to water quality [e.g., as described for the EAS case above).

4.3 *Review of Management Plan and Report*

4.3.1 KIA-20 Lack of Event Monitoring Discussion (Appendix B6, Event Monitoring, Appendix B7 and Appendix B9)

A critical aspect of the water management plan is event monitoring. The reader is directed to Appendix B6 - Meadowbank Gold Project Spill Contingency Plan (November 2013); and Appendix B9 - Meadowbank Gold Project Emergency Response Plan (August 2013). Event monitoring has not been addressed in these appendices.

- **AEM should include the event monitoring requirements in Appendix B7 and Appendix B9 as discussed in Appendix B6.**

  AEM agrees and will make a clearly reference to the event monitoring requirements in the next revision of the Spill Contingency Plan (SCP) as discussed in the Water Quality and Flow Monitoring Plan. The Emergency Response Plan (EMR) is a consolidated source of information for employees, contractors, and site visitors to respond quickly and efficiently to any foreseeable emergency (for example major spill) that would likely occur at the Meadowbank project site and do not provide information on monitoring after response. Emergency Response Plan (ERP) already refers to the Spill Contingency Plan in which event monitoring requirement will be clarify. Both plan (SCP and ERP) are considered to be implement in the case of an event monitoring depending of the magnitude of the event.

4.3.2 KIA-21 Monitoring Parameters (Appendix B6, Event Monitoring Water License, Schedule I, Monitoring Group)

AEM has proposed to simplify the number of monitoring groups used at each sample site. The parameters included in each group are acceptable. This list has been presented in both Appendix B6 and as part of the Water License.

Use of adequate detection limits is a common problem when assessing environmental data. Detection limits used for silver, cadmium and total phosphorus are often too high to allow for a useful assessment of environmental conditions.

We also note that weak acid dissociable (WAD) cyanide has not been included in all parameter groups where cyanide will be assessed.

- **The KIA requests that AEM commit to use of the lowest commercially available detection limits for water quality parameters and present a list of what these will be.**

  AEM uses an accredited laboratory that use low detection limits for all parameters in the CREMP and additional AEMP receiving environment ponds. You will find in Appendix E a list of detection limits from our accredited laboratory in Val-D'Or and ALS.

- **WAD cyanide should be included in Group 1 and Group 3 or AEM should commit to taking a conservative approach and compare total cyanide with the CCME guideline for free cyanide: 0.005 mg/L free cyanide.**

  As proposed in the renewal, AEM will continue to collect free and total cyanide samples as part of the CREMP monitoring to ensure the protection of the receiving environment (i.e. group 3). As originally suggested by the KIA in 2013, AEM will continue to monitor free cyanide in the receiving environment and AEM will continue to monitor total cyanide at discharge points ST-9 and ST-10, as per MMER.

4.3.3 KIA-22 Impact of violating obtainable freshwater limit (Appendix B9, What is a Spill?, Appendix B9, Materials and reportable (to regulatory authorities) spills)

The plan provides guidance for addressing a spill and a hierarchical framework to progress through a spill response. Chemicals stored on site are described and a list of response equipment and locations is provided.

Materials and reportable (to regulatory authorities) spills on site are described. The substances and compulsory reporting amounts are provided in Table 1 of the appendix:

Table 1 - Spill quantities that must be reported to the NT-NU 24-HOUR SPILL REPORT LINE

Transportation Class	Type of Substance	Compulsory Reporting Amount
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity exceeding 100 L
2.2	Compressed gas (non-corrosive, non- flammable)	Any amount from containers with a capacity exceeding 100 L
2.3	Compressed gas	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid	100 L
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solid	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 L or 50 kg
5.2	Organic peroxides	1 L or 1 kg
6.1	Poisonous substances	5 L or 5 kg
7	Radioactive substances	Any amount
8	Corrosive substances	5 L or 5 kg
9.1 (in part)	Miscellaneous substances	50 L or 50 kg
9.2	Environmentally hazardous	1 L or 1 kg
9.3	Dangerous wastes	5L or 5 kg
9.1 (in part)	PCB mixtures of 5 ppm or more	0.5 L or 0.5 kg
None	Other contaminants	100 L or 100 kg

***Note**: L = litre; kg = kilogram; PCB = polychlorinated biphenyls; ppm = parts per million.*

Seepages have not been considered spills under the spill contingency plan. We are concerned that seepages like that from the waste rock storage facility to Lake NP2 was not immediately reported when changes were detected at sampling station ST-16.

- **The KIA requests that AEM provide a discussion of unanticipated seepages as part of the spill contingency plan. Seepages such as that in Lake NP2 was brought to the attention of regulatory bodies by an AANDC inspector rather than AEM itself. These seepages should be considered "spills" as they have unintentionally or accidently been allowed to breach their intended containment and may have an adverse impact on the environment. This is in line with AEM's definition of what a spill is: "*major spill is defined as an accidental release of product into the environment that has the potential for adverse impact*."**

  AEM agrees with KIA recommendation and will add a section in the updated version of the Spill Contingency Plan that will include unanticipated seepage that can occur on the mine site.

4.3.4 KIA-30 RSF Design (Appendix B10 section 2.3, page 4)

AEM has indicated that the Vault RSF is not expected to require capping, as the bulk of the material from this deposit is expected to be NPAG (Golder, 2005a).

- **The KIA requests that AEM report on and monitor the amount of PAG versus NPAG material in the Vault RSF in order to ensure that, if required, the RSF is capped with an appropriate amount of material to ensure that freezeback of the RSF occurs upon closure.**

  AEM also takes note of the request from KIA and will update the requested information in the Annual report. The quantity of PAG vs NPAG material is monitored and updated on a routine basis and geochemical testing on rock are conducted to ensure the ratio is still valid. From the prediction that are into the Updated Mine Waste Rock and Tailings Management Plan - 2013, AEM will mine from 2014 to 2017 43.1 Mt of waste rock from which approximately 95% will be NPAG and 5% will be PAG. This ratio will ensure no future ARD from the Vault Waste Rock Pile.

4.3.5 KIA-31 Waste Rock Storage Facilities (Appendix B14 section 3.3.6.3, page 61)

AEM has indicated that runoff water quality and water volume from the Portage and Vault Waste Rock Storage Facilities will be monitored throughout the mine life, including operations, closure and post-closure. Given that the height and crest elevation of these facilities is 13% to 17% higher than the surrounding topography will fugitive dust emissions also be monitored, in particular, during closure and post-closure.

- **The KIA requests that AEM include fugitive dust as part of closure and post-closure monitoring.**

  AEM agrees with the KIA recommendation and will continue to monitor fugitive dust as part of closure and post closure monitoring.

4.3.6 KIA-23 Impact of violating obtainable freshwater limit (Appendix B18, 3.2.1 Water Management Plan and Water Balance)

AEM outlines the water management strategy stating "*At Meadowbank, there are three major sources of water entering into the water management system: freshwater pumped from Third Portage Lake, natural pit groundwater inflow and freshet flows. The water is removed from the system through the following mechanisms: water treatment plants at the attenuations ponds (Portage ATP and Vault ATP), trapped in the capillary voids of the tailings fraction and ice entrapment at the TSF, East Dike seepage discharge into Second Portage Lake and water trapped within the in-pit central wasterock disposal area voids.*

***The AEM water balance is subdivided into the following sections: Fresh Water from Third Portage, Reclaim Tailings Water, Mill, North Cell TSF, South Cell TSF, ATPs (Portage and Vault), Portage Pit, Goose Pit, Water Transfers and East Dike Seepage pumped to Portage. The following sections will discuss each item and their inherent parameters.*"**

The strategy continues to outline exactly how water was used, a critical point in understanding why the current maximum quantity of obtainable freshwater outlined in the existing water license was exceeded in 2013 and earlier years. AEM attributes exceedances of the 700,000m^3/year license limit to "*problems associated with the booster pump and the reclaim barge at the North Cell TSF*".

The impact of the additional draw on Third Portage Lake is not discussed nor are the implications of unused reclaim water on the TSF capacity.

- **The KIA recommends that AEM provide a discussion of the impact additional use of freshwater from Third Portage Lake for milling purposes has had. Initial discussion should outline the influence on lake level and outflow. If there was a significant change to either, a follow up discussion should focus on impacts to aquatic life (particularly fish habitat) and water quality. AEM should also provide a discussion of the impact diminished use of reclaim water will have on the TSF and what measures are in place to prevent a significant loss of freeboard or unanticipated discharge volumes.**

  AEM refers the KIA to previous responses to DFO comments and recommendations related to pit reflooding and closure planning. To ensure water levels in Third Portage Lake will not be affected during pit flooding, in Section 4.6 of Golder (2009) Doc 833 0717_09 RTP-Updated Water Management Plan specifies that the maximum allowable drawdown of Third Portage Lakes has been assumed to correspond to the water level necessary to maintain a minimum flow equal to the average annual (1:2-year return period) 60-day low flow at the outlet of the lakes over the four summer months (June through September). The low flow rates were computed based on regression curves developed by AMEC (2003) and presented in the original licensing hearings. In response to the final point of this recommendation, it is important to note that as per the NWB Water License Part J, Item 3, AEM will submit the Final Closure and Reclamation Plan at least twelve (12) months prior to the expected end of mining (targeted date of Q3 2016). However, during the technical meetings, AEM will discuss conceptual plans to close the TSF.

4.3.7 KIA-24 Modeling Results and Mitigation (Appendix B18, Water Quality Modeling Report, Appendix D – Water Quality Report)

Condition Part E Item 6 of the existing water license requires AEM to compare predicted (originally modelled during the NWB Type A License) water quality parameters in the pits to actual measurements. Total cyanide has been modeled rather than free cyanide as is regulated by the CCME. The summary of water quality in the pits is presented in Table 4.1 from the Water Management Report and Plan below. The full SNC Water Quality Report is presented in Appendix D – Water Quality Report.

Table 4.1: Comparison of originally predicted pit water quality versus SNC(2014) modelled water quality

Parameter	CCME (mg/L)	Portage Pit (mg/L)				Goose Pit (mg/L)			
		Original Prediction		SNC, 2014		Original Prediction		SNC, 2014	
		Probable	Possible Poor end Scenario	Aug 2017	Dec 2025	Probable	Possible Poor end Scenario	July 2015	Dec 2025
Total Cyanide (CN)	0.005 as free CN	-	-	0.00	0.00	-	-	0.00	0.00
Copper (Cu)	0.004	0.0014	0.013	0.0042	0.06	0.001	0.001	0.0048	0.28
Iron (Fe)	0.3	-	-	0.00	0.006	-	-	0.00	0.029
Ammonia (NH3)	0.86 (mg N/L)	0.00057	0.0006	0.212	0.97	0.0006	0.0006	0.2956	3.38
Nitrate (NO3)	2.9 (mg N/L)	2.60	4.40	0.00	0.26	4.00	4.00	0.00	1.13
Chloride (Cl)	120	630	630	0.00	12.97	440	440	0.00	51.61

Grey shading indicates exceedances of CCME guidelines

Comparison of total cyanide concentrations to the free cyanide guideline is sufficiently conservative. Free cyanide is a component of the total thus use of the free cyanide guideline would over represent the risk posed to aquatic life. Mitigation would be required at lower concentrations of free cyanide.

The full SNC water quality report outlines the potential for elevated copper and ammonia concentrations in the pits after reflooding. This poses a risk to aquatic life in Third Portage Lake which will mix with pit water once water levels are equivalent to Second Portage Lake and the dike is breached. The water license stipulates that this will not occur until pit water quality meets CCME criteria.

- **The KIA recommends that AEM provide modeling results for free cyanide or commit to comparing total cyanide to the free cyanide guideline in all samples. The approach varies between reports and plans and should be harmonized prior to renewal of the water license.**

- **The KIA also recommends that AEM provide modeling results in the water management report and plan indicating when pit water quality will meet CCME guidelines. This will provide insight into management actions AEM may consider to mitigate copper and ammonia concentrations in the pit water.**

  AEM will discuss these recommendations and comments during the technical meetings.

4.3.8 KIA-25 Seepage at ST-16 and Lake NP2 (Appendix 18, Appendix D – Water Quality Report)

This report details AEM's response to the seepage discovered at the ST-16 site in Lake NP2 from the rock storage facility. The interim till plug was located on the upstream side of the access road to the North Cell Ditches, between the Waste Rock Storage Facility (RSF) and the NP2 lake.

A staff gauge was been placed at the seepage location to determine and visually quantify the water level increases. AEM has instructed a water truck to pump the water and dispose of it in the tailings pond should water levels become too high on the upstream side of the till plug as seen in Appendix A Figure 10.

Figure 10: photo of the final result of the entire till plug from West to East. The actual pumping station and the 2 active seepage channels are visible on the eastern abutment.

- **As indicated in HESL 2014, we conclude that both Golder and AEM have followed a reasonable approach in response to the seepage detected at ST-16. Monitoring ST-16 and Lake NP2 during and after the 2014 freshet will confirm if the mitigation measures were successful.**

  AEM acknowledges the KIA comment.

4.3.9 KIA-26 Depth sample collection for Dike Monitoring (Appendix B19)

AEM discusses the East Dike - Seepage Collection System stating its purpose is to collect and convey seepage and runoff away from the downstream toe area; and allow measurement of seepage through the dike. It was installed to capture and pump the seepage water that started in September 2011. Despite the potential risk posed to aquatic life, detection of seepages during construction rely on visual monitoring in combination with installed thermistors and piezometers for dike integrity. Assessment of TSS and turbidity concentrations are not conducted.

In a previous HESL (2013) review, TSS were reported to escape the silt curtains by movement beneath or between the curtain panels during routine operations and extremely high TSS values were recorded in a deep plume of TSS in Third Portage Lake in late August 2009. Elevated TSS was potentially acutely lethal at depth but not at the surface. TSS also escaped the silt curtains in the fall of 2008 during construction of the East Dike.

Reliance of visual inspections alone may be insufficient to detect implications of the TSS seepage of September 2011 allowing AEM to employ mitigation measures in a timely manner.

AEM states regarding water quality that "*Water quality of the seepage and runoff collected in the sumps and ditches at the toe of the Dewatering Dikes is to be monitored during operations. Daily inspections during dewatering and weekly inspections during operation are required as an indicator of dike performance to note whether seepage water is clear, cloudy or if fine material is present.*" As part of the seepage monitoring during operations, AEM also states "*the water quality should be monitored daily by visual observations for sediments (turbidity).*" Visual inspection should document sediment, ice or snow deposits in the ditches and sumps. This represents the detail of water quality monitoring which is employed during mine operation as described in the manual.

Further water quality monitoring will occur during dewatering as described in the water management plan as per the Water License.

- **The Samples collected at depth downstream of all dikes during operation are required to detect water chemistry changes resulting from seepages. Aquatic life downstream of the dikes is**

unnecessarily put at risk by reliance on visual monitoring of seepage water in the ditches and the toe rather than in the potential receiver should failures occur.

Water quality monitoring should be required as part of the emergency response plans when conditions for Threshold Criteria "Yellow" or above are met:

- **East dike: seepage through dike of > 3000 m^3/day and/or turbidity in seepage water.**
- **Bay Goose Dike at toe: seepage of > 300 m^3/day and/or turbidity in seepage water**
- **Bay Goose Dike at North Channel Area: seepage of > 150 m^3/day and/or turbidity in seepage water**
- **South Camp Dike: seepage of > 300 m^3/day and/or turbidity in seepage water**
- **Vault Dike: seepage of > 300 m^3/day and/or turbidity in seepage water**

The KIA understands that AEM has taken daily profiles using a hand held turbidity meter during dike construction downstream of the silt curtains. The KIA requests that a turbidity profile be collected downstream of the dike when the outlined Threshold Criteria "yellow" is met. Potential profile collection locations and mitigation measures should be evaluated and presented for review prior to renewal of the water license.

AEM is requesting clarification on the comments from KIA. There are statements throughout this comment such as "detection of seepage during construction rely on visual monitoring in combination with installed thermistors and piezometers for dike integrity" and the statement "Reliance of visual inspections alone may be insufficient to detect implications of the TSS" and "Aquatic life downstream of the dikes is unnecessarily put at risk by reliance on visual monitoring of seepage water in the ditches and the toe rather than in the potential receiver should failures occur." AEM would like to clarify the differences between dike seepage monitoring (which is monitoring the inflow of water quality and quantity for lake water that is seeping into the pit through the dike; this water most often reports to a down-gradient sump and is collected and pumped to the reclaim area, and therefore does not impact the receiving environment) and dike construction monitoring; the methods used for monitoring are different. AEM refers the KIA to the dike construction monitoring plan included in the Type A renewal and the associated annual monitoring reports that document the thoroughness of AEM's dike construction monitoring and subsequent targeted studies. As per the dike construction monitoring plan, AEM does not rely solely on visual observations. Rather as approved by the NWB, during dike construction, AEM uses calibrated turbidity meters at numerous stations outside of the turbidity curtains to collect depth profiles and real-time TSS data for immediate mitigation, we have used the onsite laboratory for TSS monitoring (including dewatering and seepage water monitoring) and routine sample collection at all depths in areas with maximum readings of turbidity / TSS for submission to an accredited laboratory. AEM also refers the KIA to the annual geotechnical inspections reports and the Meadowbank dike review board reports that ensure the geotechnical structures are constructed, monitored and that the integrity of the structure is not impacted by seepages.

4.3.10 KIA-27 Anomalous Thermistor or Piezometer Reading Response (Appendix B20, 6.2.2 Anomalous Readings)

AEM has provided a response progression when anomalous readings are recorded from thermistors or piezometers used to monitor the tailings storage facility (TSF). Operators are instructed to "*increase monitoring frequency to assess progression of [the] anomaly*" if they are able to confirm readings are not a relic of the instrumentation. While this is the appropriate response it provides no assurance monitoring will be sufficiently increased to detect failures that may results in increased seepage. This concern is bolstered by delayed detection of the seepage from the waste rock facility bordering the northeast side of the TSF.

- **The KIA requests that AEM describe the frequency of monitoring associated with their instruction to "*increase monitoring frequency*". This will provide assurance that the response**

to thermistor and piezometer reading changes is sufficient to protect the aquatic environment from potential seepages resulting from TSF structural deficiencies and wear over time.

AEM will discuss this request and comments during the technical meetings.

Appendix A

AEM Letter Proposed Water Level Trigger for Weekly Monitoring in TPL

Appendix B

AEM Freshet Action Plan

Appendix C

Meadowbank Mine, Assay Road Seepage Phase 2: Environmental Site Assessment and Engineering QA/QC

Appendix D

November 28th, 2013, Meadowbank Annual report workshop minutes

Appendix E

Laboratory Detection Limit