Meliadine
Type A Water Licence
Technical Review

Prepared for: The Kivalliq Inuit Association
Job #: J150077

October 2015

Executive Summary

We have completed our technical review of Water Licence application submitted by Agnico Eagle Mines Ltd. (AEM) to the Nunavut Water Board (NWB): (2AM-MEL---Application for Type 'A' Water Licence, Meliadine Gold Project; Agnico-Eagle Mines Ltd.). Our initial review was submitted on July 21, 2015 and focused on ensuring AEM's application provided sufficient information for a full technical review and conformed to the minimum requirements of the Nunavut Water Board (NWB). Our technical review raised a variety of issues focusing on:

- Saline and freshwater discharges to the receiving environment,
- Modelling,
- Waste management,
- Dust management, and
- Environmental monitoring,

Hutchinson Environmental Sciences Ltd. and GeoVector Management Inc. have prepared 27 information requests and technical comments with regards to AEM's submission, and have either partially or completely resolved 16 of those issues through teleconferences and technical memorandums throughout September and early October of 2015.

We hope to resolve our remaining issues prior to the technical hearings scheduled for October 14 and 15, 2015 in Rankin Inlet, NU, through AEM's review of our technical review and a forthcoming teleconference scheduled for October 8, 2015. This teleconference will be attended by AEM and their consultants, and the KIA and their consultants (Hutchinson Environmental Sciences Ltd. and GeoVector Management Inc.).

Given the progress made on this licence to date, we are confident the project can proceed with the requested amendments and commitments in a way that will provide benefit to AEM, Nunavummiut, and Canada overall while safeguarding the environment from long term adverse effects.

Table of Contents

Appendices

1. Background

We have completed our technical review of Water Licence application submitted by Agnico Eagle Mines Ltd. (AEM) to the Nunavut Water Board (NWB): (2AM-MEL---Application for Type 'A' Water Licence, Meliadine Gold Project; Agnico-Eagle Mines Ltd.) Our initial review was submitted on July 21, 2015 and focused on ensuring AEM's application provided sufficient information for a full technical review and conformed to the minimum requirements of the NWB. The latter relied on the "150513 2AM-MEL---Master Concordance Table Meliadine Type A Water Licence-IMLE". We have included these initial information requests (IRs), AEM's responses and our subsequent technical comments in Section 2 of this report. AEM's full responses are included in Appendix A of this report. Section 3 of this report provides new comments stemming from our technical review of the project.

As part of this technical review, we reviewed the Main Application Document (Version 1, April 2015), the Screening Report for the revised project design (Ver. 1, April 2015) and the following supporting plans as submitted by AEM:

1. Aquatic Effects Monitoring Program (AEMP) Design Plan, April 2015;
2. Borrow Pits and Quarries Management Plan, Version 4, April 2015;
3. Environmental Management and Protection Plan (EMPP), Version 4, April 2015;
4. Explosives Management Plan, Version 4, April 2015;
5. Hazardous Materials Management Plan, Version 4, April 2015;
6. Incineration Management Plan, Version 4, April 2015;
7. Landfarm Management Plan, Version 1, April 2015;
8. Landfill and Waste Management Plan, Version 4, April 2015;
9. Mine Waste Management Plan, Version 1, April 2015;
10. Mine Plan, Version 1, April 2015;
11. Ore Storage Management Plan, April 2015;
12. Preliminary Mine Closure and Reclamation Plan, Version 1, April 2015;
13. Quality Assurance and Quality Control Plan, Version 1, April 2015;
14. Risk Management and Emergency Response Plan, Version 4, April 2015;
15. Roads Management Plan, Version 4, April 2015;
16. Spill Contingency Plan, Version 4, April 2015; and
17. Water Management Plan; Version 1, April 2015.

The public engagement and consultation baseline was captured in this technical review.

2. Completeness Review Information Request Follow Up

2.1 KIA-WL-01: Segregation of Overburden

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-01
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Segregation of Overburden**
References:	Main Application Document p.38, p.64-65, Water Management Plan p.18, Section 3.3.3. Appendix G Section 4.2, FEIS-KIA-IR-23
Issue / Concern or Information Deficiency and Rationale:	AEM has indicated the *"results of geochemical characterization indicate that the overburden produced is NPAG, and leachate concentrations are generally lower than waste rock and meet MMER monthly mean limits."* However, AEM further indicates *"Waste rock and overburden have compatible geochemical characteristics such that overburden material can be managed together in the same disposal facility."* The proponent only commits to *"explore the feasibility and practicality of topsoil/organic matter salvage as part of phased approach to Project development, with updates to its Closure and Reclamation Plan to reflect any changes based on this investigation."* At present, the proponent plans to store overburden and waste rock together in waste rock storage facilities (WRSFs) within the project footprint. However, the proponent also states *"An engineered cover will be progressively placed on the surface of the tailings storage facility. The proposed cover includes a 0.5 m thick of overburden followed by a layer of 2.5 m thick waste rock. The overburden material placed is intended to limit runoff water infiltration into the tailings."* This suggests that the overburden can be applied sequentially with the waste rock, which would only be possible if they are stored separately.
Technical Comment/ Information Request:	The proponent should clarify how they intend to store overburden and waste rock on site. If overburden materials are not stored in the WRSF then it is less likely they will be frozen and can then be used for revegetation. AEM should include their specific plans to investigate the feasibility and practicality of segregating overburden during construction for use at closure within the Preliminary Closure and Reclamation Plan for intervener review. The proponent should commit to segregating the overburden throughout the project life for use at closure. This does not necessarily require the 3m tailing cap (indicated in the Water Management Plan) to increase in depth, rather ensure 2.5m of waste rock and 0.5m overburden are applied sequentially to the dry stack tailings rather than collectively.
AEM's Response	As per Section 5.2.3 – Waste Rock and Overburden Storage Facilities of the Preliminary Closure and Reclamation Plan (CRP) document. Waste rock from the open pits and underground mining not used for site development purposes will be trucked to the Waste Rock Storage Facilities (WRSFs) until the end of mining. Three WRSFs are planned for the Project: WRSF1 to WRSF3. Overburden material stripped as part of the mine development will either be co-disposed within the WRSFs or be stored within the temporary overburden stockpile facility for later use as Tailings Storage Facility (TSF) closure cover material.

	Approximately 31.8 Mt of waste rock will be mined from which about 2.0 Mt will be backfilled to the underground mine, 1.6 Mt will be used for construction, and 2.5 Mt will be used as TSF closure cover material. Approximately 7.4 Mt of overburden material will be removed from which about 0.095 Mt will be used for the TSF closure cover. The temporary overburden stockpile is located at the east side of the TSF and has a plan area of 1.12 ha. The overburden materials are relatively high in moisture content and are expected to be completely frozen at the time of closure. The need for additional dust control measures will be evaluated and implemented during operations and closure, as required. As per Section 6.0 – Progressive Reclamation of the CRP document. The TSF will be closed progressively as shown in Mine Waste Management Plan submitted in support of the Type A Water Licence Application. The TSF cover design will be finalized during the detailed design phase of the Project and will consider operational experience at other northern mine sites, and available design guidelines including MEND Report 1.61.5c – Cold Regions Cover System Design Technical Guidance Document (MEND 2012). The proposed closure cover includes a layer of 0.5 m thick of overburden followed by a layer of 2.5 m thick waste rock on the top of the facility. The TSF slopes closure cover includes only a 3.7 m to 4.2 m thick waste rock layer only. It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time. **References** MEND (Mine Environment Neutral Drainage Program). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. Mining Environment Neutral Drainage Program, Natural Resources Canada. December 2009.
KIA Technical Response	We thank the proponent for clarifying how overburden will be handled on site. We request further clarification regarding the objective of sequentially applying overburden then waste rock atop the tailings. Most overburden on site is expected to have relatively high moisture content and can applied first (prior to the 2.5 m of waste rock cover) to create an impermeable layer due to its high water content followed by waste rock to stabilize the structure. We note that overburden intended for storage in the temporary stockpile that will be placed below the 2.5m waste rock cover is indicated as “ice-poor overburden” as per Section 5.4 of the Waste Management Plan. Please explain why this overburden is appropriate for use below the waste rock pile. Section 5.4 of the Waste Management Plan also indicates that the volume of overburden which will be stored in the temporary stockpile is *“about 0.1 Mt”* and is intended for use *“as TSF closure cover material”*. We are concerned that segregated overburden is only intended for use as part of the TSF closure strategy. The seed bank and organic content of overburden means it is potentially valuable for closure and reclamation of roads, pads and other site infrastructure. AEM should: - Commit to minimize the loss of overburden wherever possible to allow for its use as closure material. - Provide an estimate of whether the 0.1 Mt of overburden intended for the temporary stockpile is sufficient to cap the TSF and support the closure of other site infrastructure. - If the amount is insufficient, please include additional overburden in the temporary stockpile. - Include a section in the next iteration of the closure and reclamation plan indicating other uses for overburden at closure in addition to capping the TSF.

2.2 KIA-WL-02: Additional Cover Material and Re-vegetation

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-02
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Neil J. Hutchinson, Hutchinson Environmental Sciences Ltd.
Subject:	**Additional Cover Material and Re-vegetation**
References:	Main Application Document p.38, p.64-65, Water Management Plan p.18, Section 3.3.3. Appendix G Section 4.2, Closure and Reclamation Plan p. vii, , FEIS-KIA-IR-23
Issue / Concern or Information Deficiency and Rationale:	The proponent states: *"All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time."* However, we note that the goals outlined in the Closure and Reclamation Plan do not mention re-establishment of vegetation as a closure objective or the subject of monitoring. This appears to run counter to AEM's admission that the project will result in *"Potential [residual] vegetation effects…relating to the use of water or disposal of waste include the potential loss or alteration from the waste rock, ore, and tailings storage facilities and the general construction/operation of the mine."* Segregated overburden can be used at closure to mitigate potential residual effects to vegetation by encouraging natural re-establishment of the plant community on site over time.
Technical Comment/ Information Request:	Please indicate the source of overburden and cover material referenced here in the Closure and Reclamation Plan. Importantly, will additional land need to be disturbed to obtain this or will AEM provide segregated storage for overburden produced during construction? Furthermore, please provide commentary on the expected timelines for re-establishment of a) grasses, b) woody shrubs and c) lichens with reference to examples from Arctic climates.
AEM's Response	At this time, it is not planned to disturb additional land to obtain overburden and cover materials. The sources for these materials are as described below. Agnico Eagle will manage the use of the overburden material needed in a separate temporary stockpile for reclamation purposes as described in IR No. KIA-WL-01. As per Section 5.2.3 – Waste Rock and Overburden Storage Facilities of the Preliminary Closure and Reclamation Plan (CRP) document. Approximately 31.8 Mt of waste rock will be mined from the open pits and underground and about 2.0 Mt will be backfilled to the underground mine, 1.6 Mt will be used for construction, and 2.5 Mt will be used as TSF closure cover material. Waste rock from the open pits and underground mining not used for site development purposes will be trucked to the Waste Rock Storage Facilities (WRSFs) until the end of mining. Overburden material stripped as part of the mine development will either be co-disposed within the WRSFs or be stored within the temporary overburden stockpile facility adjacent to the Tailings Storage Facility for later use as closure cover material.

	Approximately 7.4 Mt of overburden material will be removed from which about 0.095 Mt will be used for the TSF closure cover. It is anticipated that the native lichen community will naturally re-vegetate the TSF cover and WRSFs over time. Re-vegetation studies would be completed to assess the potential for vegetation to establish in disturbed areas or on rockfill covers during the Project development. In general, re-vegetation of disturbed sites in the Arctic is variable and depends on the extent and intensity of the disturbance (i.e., removal of vegetation or removal of vegetation and soil) and how far north of the tree line the disturbance occurs. Forbes et al. (2001) and Walker and Everett (1991) indicated that arctic ecosystems can take from 20 to 75 years for vegetation to recover following disturbance. However, native sedges (Carex spp) and cotton grasses (Eriophorum spp.) may revegetate in Arctic tundra in 5 to 10 years (Chapin and Chapin 1980). Additionally, Forbes et al. (2001) reported that viviparous species such as Poa alpigena sp. colpodea, Polygonum viviparum, Saxifraga rivularis, and S. foliolosa were successful in recolonating within 20 years following disturbance. In contrast lichens failed to recolonize disturbed areas. Research on abandoned winter roads on peatlands in the Hudson Bay Lowland also showed that lichen, bryophyte, and vascular plant cover returned to a similar state as the adjacent undisturbed peatlands within 5 years, though species composition was different (Campbell and Bergeron 2012). **References** Campbell D. and J. Bergeron. 2012. Natural Revegetation of Winter Roads on Peatlands in the Hudson Bay Lowland, Canada Arctic, Antarctic & Alpine Research. May2012, Vol. 44 Issue 2, p155-163. 9p Chapin III, F.S and M.C. Chapin. 1980. Revegetation of an Arctic Disturbed Site by Natuve Tundra Species. Journal of Applied Ecology 17, 449-456 Forbes, B.C., J.J. Ebersole and B. Strandberg. 2001. Anthropogenic Disturbance and Patch Dynamics in Circumpolar Arctic Ecosystems. Conservation Biology, 8/1/2001, Vol. 15, Issue 4, p. 954-969 Walker, D.A., and K.R. Everett. 1991. Loess ecosystems of Northern Alaska: regional gradient and toposequence at Prudhoe Bay. Ecological Monographs, 61(4): 437-464.
KIA Technical Response	We thank AEM for providing an estimate of when recolonization may occur. We request further clarification-regarding what appears to be conflicting statements in AEM's response. Please reconcile research results from Forbes *et al.* (2001) that *"lichens failed to recolonize disturbed areas"* with AEM's statement *"It is anticipated that the native lichen community will naturally re-vegetate the TSF cover and WRSFs over time"*. Please: - Document your assessment of the feasibility of lichens recolonizing the disturbed areas based on the best available scientific understanding at this time. - Provide site specific information from the forthcoming revegetation studies in future iterations of the closure and reclamation plan. - Include in these studies an evaluation of whether segregated overburden may provide a seed source for future revegetation efforts.

2.3 KIA-WL-03: Water Balance Assumptions

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-03
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Water Balance Assumptions**
References:	Main Application Document p.79, Water Management Plan Appendix B
Issue / Concern or Information Deficiency and Rationale:	The proponent has chosen to calculate the site-wide water balance under a mean precipitation year scenario for *"CP1 to CP6, Tiriganiaq Pit 1, Tiriganiaq Pit 2, water in the underground mine operation, make-up water for the mill, water for the WTP, and freshwater from the mine construction to mine closure".* Use of the mean does not account for varying degrees of runoff or infiltration associated with greater and lesser magnitude precipitation events, nor does it account for the response of various water management and reclamation infrastructure. We are further concerned that modeling was conducted on precipitation data and runoff conditions based on average conditions at Rankin Inlet from 1982 to 2009, which does not include climate change predictions. We acknowledge that the *"water management infrastructure will be designed to handle a 1 in 100 wet-year spring freshet"*, but this does not provide sufficient confidence in the water balance provided. We assert that the water balance can be equally influenced by unusually wet conditions as well as dry conditions. AEM has not provided full details of the water balance in the Water Management Plan and thus a full review cannot be completed to assess whether it is sufficiently robust.
Technical Comment/ Information Request:	The proponent should include a full list of assumptions and supporting rationale as well as all results for the site water balance in the water licence application. The water balance should be calculated under at least three scenarios: mean precipitation, 1:100 precipitation and under drought conditions. We further request the proponent expressly state how climate change scenarios have been incorporated into the site water balance; the mean precipitation and runoff conditions at Rankin Inlet between 1982 and 2009 may not adequately represent conditions under future climate change scenarios differing from the status quo.
AEM's Response	AEM has provided their response in a technical memorandum on October 1, 2015 which is included in Appendix B.
KIA Technical Response	The KIA consider this issue resolved.

2.4 KIA-WL-04: Incorporation of Inuit Qaujimajatuqangit into Monitoring Activities

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-04
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Incorporation of Inuit Qaujimajatuqangit into Monitoring Activities**
References:	Water Management Plan P3, Section 1.5
Issue / Concern or Information Deficiency and Rationale:	The proponent states *"Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected through IQ can contribute to mine design and planning, as well as monitoring activities."* AEM has demonstrated that IQ concerns regarding the project effects have been considered in the Water Management Plan, summarized in Section 1.5 of the Plan. These concerns briefly indicate that IQ has been incorporated into mine design and planning. The plan does not however, indicate how IQ has been incorporated into ongoing monitoring activities.
Technical Comment/ Information Request:	Please provide a discussion on how IQ has been incorporated into the monitoring activities associated with the water management plan.
AEM's Response	Section 1.5 of the Water Management Plan states "IQ indicated that the rivers and Meliadine Lake are important fish harvesting sites, and Elders expressed concerns regarding potential adverse effects from the Project on fish populations in waterbodies of the Meliadine watershed. [ ] Water quality monitoring will be conducted during construction, operation and decommissioning phases to ensure that water quality trends are similar to baseline conditions and so that adaptive management can be conducted should differing trends be observed." Station selection was based upon protection of Meliadine Lake so stations were selected to test treated effluent before release to Meliadine Lake. The importance of clean water and the health of vegetation, fish, birds, caribou, and other wildlife was emphasized by the Elders and other people in the communities who rely on these resources for traditional use. Subsequently station selection also considered local lakes in the area that might be influenced by the Project during construction, operations, and closure (See Table 9.1 in the Water Management Plan). In addition, stations were selected in areas of seepage collection including the landfill, the Tailings Storage Facility, the Waste Rock Storage Facilities, and the Ore Storage Facilities, to confirm water quality predictions and to verify that once the mine closes there will be no adverse effects to traditional land use due to seepage.
KIA Technical Response	We appreciate the clarification of how IQ has been used to establish the importance of clean water and the health of vegetation, fish, birds, caribou, and other wildlife. We request however, that a more direct use of IQ is incorporated into monitoring initiatives. From discussions with AEM, we understand that IQ holders are being embedded with the aquatic monitoring teams currently collecting baseline data for AEM's Amaruq project. From technical discussions with AEM on September 29, 2015, we now understand AEM is committed to work with the KIA to develop techniques that better use IQ to monitor and report to the community. Through this commitment, AEM should explore the feasibility of including IQ holders along with the aquatic monitoring teams collecting data at the AEMP sites.

	Goals of imbedding IQ holders with the aquatic monitoring team should include:
	
	• Building aquatic monitoring capacity in the community,
	• Providing additional employment opportunities,
	• Looking for IQ assessments of the aquatic environment that
	  ○ May overlap with the scientific assessment. If this is the case, IQ can be used to corroborate the scientific assessment of the aquatic environment.
	  ○ May differ from the scientific assessment. If this is the case, more targeted scientific investigation may be warranted as IQ may have detected changes to the aquatic environment that are being missed.
	• Refining station locations so they overlap with locations of specific importance to Inuit.
	
	We further request a discussion indicating if IQ holders highlighted any specific concerns with water quality, and what changes to water quality would be considered detrimental or important to Inuit. Please also refer to KIA-WL-11.
	
	We note that the KIA is currently engaged in research to explore ways to monitor the aquatic environment, and that other parties may have also investigated the overlap between scientific monitoring and IQ. We therefore request AEM to commit to participate in or host a workshop to investigate how IQ can be used to effectively monitor the Meliadine project.

2.5 KIA-WL-05: Saline Groundwater Inflows

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-05
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Saline Groundwater Inflows**
References:	Water Management Plan p.28, sec 4.4.7.2, Appendix F, Main Application Document p.31 section 3.2.3., NIRB T&C #25.
Issue / Concern or Information Deficiency and Rationale:	The proponent outlines volumes of saline groundwater projected to flow into the underground works in Table 4.5: **Table 4.5 Estimated Rates of Passive Groundwater Inflow to Underground Mine** Year: Estimated Passive Inflow (m^3/day)* Yr -5 to First Quarter of Yr -3: 0 Second Quarter of Yr-3 to End of Yr-3: 420 Yr -2 to Yr 7: 526 AEM states: *"A hydrogeological investigation program is planned for 2015 and 2016, which will provide additional information on potential volumes and quality of the saline groundwater to be managed."* We note that a saline water management plan was requested from the NIRB as Term and Condition (T&C) #25; Appendix F of the Water Management Plan does not provide full details for the management plan. Mean salinity of groundwater below the permafrost which will infiltrate the underground workings is approximately 57,000 mg/L. The volume and concentration of the groundwater indicate that T&C #25, the saline water management plan, should be fully developed prior to issuance of the water licence. Additional information is required to fully assess the ocean disposal option. One primary concern arises from AEM's statement that *"excess underground water will be treated for TSS and metals, and pumped to a surface tank for temporary storage prior to being trucked to a discharge facility at Itivia Harbour."* We request that AEM also treat these discharges for nutrients, particularly nitrates, and oil and gas residue due to blasting and contact with machinery.
Technical Comment/ Information Request:	AEM should provide full details of the saline water management plan in the water licence application. Full details including volume and discharge criteria should be provided for the preferred disposal/treatment option.
AEM's Response	Potential saline water will come from groundwater infiltration below the permafrost and will mix with other groundwater. Hydrogeological studies are planned for 2015 and 2016 to increase the accuracy of current estimates for groundwater flow and saline water content. Groundwater will be re-circulated for underground operations and excess groundwater will be pumped to the surface for management. Agnico Eagle is considering several options for the long-term management of groundwater reporting to the underground workings at the Project (Appendix F). During Year -5 and Year -4 of construction, a hydrogeological investigation program will be completed to improve estimates of the amount and quality of groundwater that may potentially report to the underground mine. In Year -3 (i.e., 2017), following the completion of the investigation, the long-term groundwater management strategy for

the Project will be finalized and submitted to the NWB for approval.

An interim plan is required for the first two years of groundwater inflows (i.e., Year -3 and Year -2) to allow for implementation of the long-term groundwater management strategy. Excess water from the underground mine will be pumped to the surface for storage for Years -3 and -2. Based on the estimated groundwater inflow rates (Table 4.5) and underground drilling water make-up requirements (Appendix B, Table B.7), up to approximately 0.25 Mm3 of groundwater will require storage on surface. The surface storage option selected will be dependent on the results of the hydrogeological study and the amount of groundwater encountered.

Table 4.5, page 28, Water Management Plan, April 2015
Table 4.5. Estimated Rates of Passive Groundwater Inflow to Underground Mine

Year	Estimated Passive Inflow (m^3/day)*
Yr -5 to First Quarter of Yr -3	0
Second Quarter of Yr-3 to End of Yr-3	420
Yr -2 to Yr 7	526

*based on data provided in Agnico Eagle (2014); to be reassessed based on results from the planned 2015 and 2016 hydrogeological investigation program

Appendix B, Table B.7, Water Management Plan, April 2015
Table B.7. Assumptions for Underground Mine Water Balance

Property	Value	Source or Comments
Drilling Water for Underground Mine (m^3/day)	263 for Year -5; 574 for Year -4	Agnico Eagle
	830 for Year -3; 1,376 for Year -2	
	1,390 for Year -1; 1,459 for Year 1	
	1,260 for Year 2; 1,083 for Year 3	
	1,158 for Year 4; 1,179 for Year 5	
	941 for Year 6; 753 for Year 7	
Water Loss in Ore and Waste Rock from Underground Mine	3% by weight	Agnico Eagle
Sludge from Underground TSS Removal Plant	2.6% of total feed	Agnico Eagle
Fresh Water Supply to Underground Saline Water Tank to Reduce Salt Concentration in Drilling Water	2.5 m^3/h (October of Year -1 to Year 7)	Agnico Eagle

KIA Technical Response

We appreciate the clarification provided by AEM's response. The KIA understands that ocean discharge is not part of the current WL application and would therefore require a WL amendment, and that this would be supported by the necessary studies at that time. We recommend that the NWB include a condition in the licence that requires submission of a long-term saline groundwater management plan for approval by the NWB 6 months prior to any planned discharge.

2.6 KIA-WL-06: Site-Specific Water Quality Objective Derivation

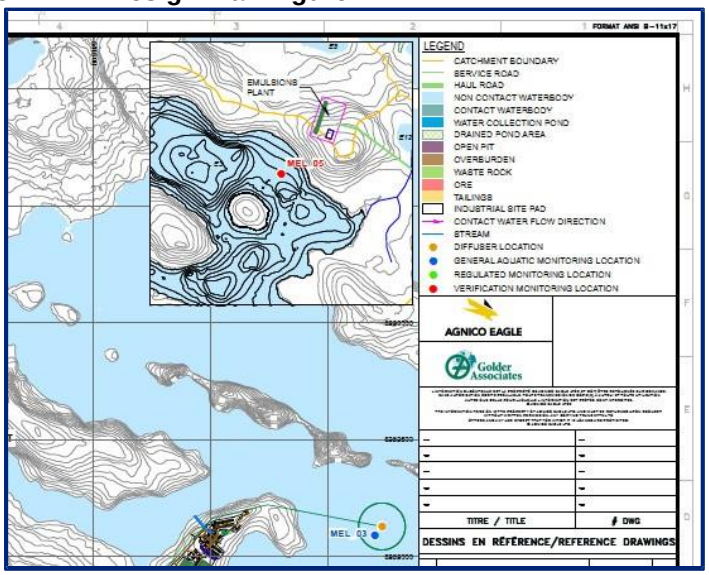
Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-06
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Site-Specific Water Quality Objective Derivation**
References:	Water Management Plan p.46 Section 8.3., Appendix H Table 302
Issue / Concern or Information Deficiency and Rationale:	AEM states that *"The long-term, post-closure water quality in the Project ponds and in the flooded open pit lakes are anticipated to meet MMER limits and CCME water quality guidelines for the protection of aquatic life (CCME-WQG) or the SSWQOs developed for the Meliadine site for aluminum, fluoride, and iron. Arsenic concentrations in CP4 could slightly exceed the* [site-specific water quality objective] *SSWQO post-closure, a criteria that is conservatively protective of the receiving aquatic environment (Golder, 2013a)."* While the exceedances of a calculated SSWQO may be minor, it can only be deemed non-significant if the SSWQO has been appropriately derived. AEM has not included the derivation methodology for any SSWQO for review in the application. This also applies to discharges to Meliadine Lake via the diffuser.
Technical Comment/ Information Request:	Please provide a discussion of how all SSWQOs used for the project were derived. This should specifically include the Golder, 2013a reference[1]. We note that the CCME SSWQO derivation protocols[2] are the preferred methodology.
AEM's Response	Derivation of the site-specific water quality objectives (SSWQOs) occurred in a step-wise, technically defensible manner including discussions and meetings with Environment Canada in Ottawa. Substances of potential concern were initially identified to determine whether it would be appropriate to develop SSWQOs following procedures outlined by CCME (2003, 2007). Specific factors assessed included the basis for respective CCME water quality guidelines (WQGs), site-specific exposure and toxicity modifying factors (ETMFs) that may influence the bioavailability of these substances to aquatic receptors, and background concentrations of these substances in surface waters within the study area together with leachate chemistry. Chemical parameters were both measured and modelled, including predominant chemical species. Site-specific water quality objectives were developed for parameters for which conservative modelling predicted exceedances of background concentrations. The SSWQOs for fluoride, arsenic, and iron for the Project were derived following CCME (2003), using the CCME (2007) species sensitivity distribution (SSD) approach. Detailed information is provided in Golder (2013) (attached). For the purpose of SSD derivation, the receiving environment was assumed to include Meliadine Lake and surrounding smaller lakes within the study area (e.g., Lake A1, Lake B5). The SSD approach provided no-effect benchmarks above which effects may or may not occur in these waterbodies. In addition to the development of the SSDs, toxicity testing agreed-upon with

[1] *Golder. 2013a. Site specific Water Quality Objectives (SSWQO) Assessment – Meliadine Gold Project, Nunavut. Document 371. Report to Agnico-Eagle Mines Ltd. February 22, 2013. 57 p.*

[2] *Canadian Council of Ministers of the Environment. 2003. Canadian water quality guidelines for the protection of aquatic life: Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.*

	Environment Canada was conducted to provide a final answer to the question: is leachate from the Meliadine waste rock toxic to aquatic life in the site-specific receiving environment? Toxicity testing involved direct exposure of fertilized rainbow trout eggs to waste rock in Meliadine Lake water and raising these eggs to the alevin stage over 30 days. There were no adverse effects to the rainbow trout early life stages. Detailed information is provided in Golder (2014) (attached). **References:** CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Water Quality Guidelines for Protection of Aquatic Life – Guidance for Site-Specific Application of Water Quality Guidelines in Canada and Procedures for Deriving Numerical Water Quality Objectives. Winnipeg, MB, Canada. CCME. 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007. In: Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada. Golder (Golder Associates Ltd.). 2013. Site-Specific Water Quality Objective (SSWQO) Assessment - Meliadine Gold Project, Nunavut. Technical Memorandum to Agnico Eagle Mines Ltd. February 22, 2013. 57pp. Golder. 2014. Assessment of Site-Specific Exposure and Toxicity Modifying Factors on Aluminum Toxicity and Validation of Non-Deleterious Nature of All Parameters of Potential Concern in Waste Rock Leachate – Meliadine Gold Project, Nunavut. Technical Memorandum to Agnico Eagle Mines Ltd. March 14, 2014. 7pp + appendices.
KIA Technical Response	AEM has provided the relevant information to satisfy our concerns regarding SSWQO derivation. We will any discuss outstanding issues with AEM during the teleconference scheduled for October 8, 2015.

2.7 KIA-WL-07: Mixing Zone Water Quality Monitoring

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-07
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Mixing Zone Water Quality Monitoring**
References:	Water Management Plan p.48 Section 9 Table 9.1, AEMP Design Plan Figure 2-1., p.50 Section 9.2.
Issue / Concern or Information Deficiency and Rationale:	Only one mixing zone site is provided for the project near the diffuser (MEL_03). The effluent is not discharged into a river where one site downstream would be sufficient to capture the impact to the receiving environment. Wind (particularly in an area prone to high winds) and flow effect mixing zone dynamics limit the capacity of a single monitoring station (MEL_03) to appropriately monitor the size and characteristics of the mixing zone and assimilative capacity of Meliadine Lake. **Subsection of AEMP Design Plan Figure 2-1**  A minimum of three sites around the discharge point are recommended to characterize the impacts to the receiving environment and capacity of the mixing zone to assimilate the effluent. This is based on the assumption that *"The Mine will be operated so that water quality objectives are met at the edge of the mixing zone in Meliadine Lake and the Project does not have a significant adverse effect on opportunities for traditional and non-traditional use of fish, and the health of aquatic life, and human health."* We note that *"The monitoring programs summarized* [in the AEMP Design Plan] *are provisional, and both the regulated monitoring program and verification monitoring program, including monitoring parameters, frequency, and reporting, will be further developed through the water licencing process."* We will provide further design recommendations in our full technical review.
Technical Comment/ Information Request:	Please provide two additional monitoring sites around the diffuser or sufficient rationale why a single monitoring station is sufficient to characterize the receiving environment at the edge of the mixing zone for discharges to a lake.

AEM's Response	Agnico has identified five stations in the near-field area where data will be collected to characterize the receiving environment in the mixing zone. In the Water Management Plan, one general aquatic monitoring station was identified at the edge of the mixing zone for water management purposes. However, in the Aquatic Effects Monitoring Program (AEMP) Design Plan, five general aquatic monitoring stations were identified in the near-field exposure area, including the station at the edge of the mixing zone (Mel-01-02). The near-field exposure area is the area of Meliadine Lake where the diffuser will be located and is thus the initial receiving environment. The single station in the Water Management Plan is the same as one of the five stations in the AEMP near-field area. Five stations in an area was selected to be consistent with the Metal Mining Technical Guidance for Environmental Effects Monitoring (EC 2012). The actual locations of the monitoring stations will be determined during the 2015 field program, and adjusted as necessary, after installation of the diffuser, but three of the five stations can be positioned to the edge of the mixing zone. All stations will be sampled on the same schedule (Table 5-1 in the AEMP and Table 4-1 in the Environmental Management and Protection Plan [EMPP]) with samples analyzed for the same suite of parameters (Table 5-2 in the AEMP and Table 4-2 in the EMPP). Results from these stations will be reported to the NWB in the annual report or in the annual AEMP report. **References:** EC (Environment Canada). 2012. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. Gatineau, QC: Environment Canada.
KIA Technical Response	We note that the near-field exposure monitoring area as outlined in Figure 4-1 of the AEMP is a much larger area than the mixing zone which AEM has defined as a 100 m radius from the diffuser. This indicates only a sub selection of sites will monitor the mixing zone. We request that AEM increase the total number of AEMP sites in the near-field exposure area from 5 as indicated in AEMP Table 4-3 to a total of 7 noting that the general aquatic monitoring sites referred to by AEM in their response, MEL-01 and MEL-02, are not located in the receiving environment. MEL_01 is located within the *"Water treatment plant (post treatment), end of pipe (before offsite release)"* and MEL_02 is located outside the *"Water treatment plant (pre-treatment) coming from H17 station will be off the pipe and not in the pond"*. MEL_03 is the only site currently proposed within the "Mixing zone in Meliadine Lake" We recommend that 3 sites be located to triangulate the predicted mixing zone boundary 100m from the diffuser (i.e. sites at 120^{o}, 240^{o} and 360^{o} , 100m from the center of the diffuser). These will serve to test the predicted size of the mixing zone under all weather conditions. Profiles of temperature dissolved oxygen, conductivity and pH would be taken at each site, and a full parameter set sampled at the depth of maximum conductivity. These sites are recommended for continuing monitoring using the same parameter list and sampling frequency as proposed for MEL_03 and are not to be discontinued after the special study to delineate the mixing zone has been conducted. Conductivity may be an effective tracer of the effluent given the higher concentration of total dissolved solids (TDS) in the effluent as compared with the surface water. Note this statement of TDS reflects the summary of discharge scenarios presented by AEM in section 2.2.3 of Appendix E in the Water Management Plan; only one of six scenarios report TDS at the same concentration as the receiving environment while all other scenarios are higher.

2.8 KIA-WL-08: Sample Locations at Rankin Inlet

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-08
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Sample Locations at Rankin Inlet**
References:	AEMP Design Plan, Environmental Management and Protection Plan
Issue / Concern or Information Deficiency and Rationale:	No water sampling locations are provided around Rankin Inlet. The hamlet port will be the primary shipping route and monitoring should be included to assess potential impacts from shipping. Potential impacts may arise from, for example, ballast water exchange and spills.
Technical Comment/ Information Request:	Please add aquatic sample locations and a sampling schedule around Rankin Inlet to the AEMP Design Plan and provide specific discussion on the management of aquatic invasive species. This may be provided as a standalone management plan or a subsection to the Environmental Management and Protection Plan.
AEM's Response	N/A
KIA Technical Response	We will any discuss outstanding issues with AEM during the teleconference scheduled for October 8, 2015.

2.9 KIA-WL-09: Plume Delineation Model Assumptions

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-09
Project:	Meliadine Gold Project FEIS
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Plume Delineation Model Assumptions**
References:	Water Management Plan Appendix E Table 2.2-1, Appendix H Table 3-2., FEIS KIA-IR-22
Issue / Concern or Information Deficiency and Rationale:	The effluent plume was delineated using CORMIX as outlined in Appendix E of the Water Management Plan. We approve the conservative approach applied which accounted for the ± 50% accuracy of CORMIX by dividing the dilution at the edge of the mixing zone (100 m) by 2. However, we are concerned by the validity of some of the inputs to the model. For example, a maximum wind speed of 15 m/s was assumed which corresponds to 54 km/h. This is not realistic in an area that regularly experiences wind speeds of over 100 km/h.
Technical Comment/ Information Request:	Please provide a discussion on the appropriateness of each input to the CORMIX model for review. This may impact the proposed end of pipe discharge criteria presented in Appendix H if inputs are not found to be sufficiently conservative.

AEM's Response	The mixing behaviour of mine effluent in the mixing zone (100 m radius from the outfall) of the diffuser was predicted using the Cornell Expert Mixing System (CORMIX) model (Doneker and Jirka 2007). CORMIX is one of the most extensively used models for predicting plume mixing and dilution of substances in surface waterbodies. This model has been used for conceptual design and analysis of effluent outfalls in other northern Canadian waterbodies. As CORMIX results are considered accurate to within ±50% (Doneker and Jirka 2007), the dilution ratios predicted by the model are divided by two, to ensure the most conservative results are presented.
	
	A summary of model inputs is presented in Table 1, along with explanatory notes for the data or assumptions used for each input. The CORMIX model system assumes steady-state and generally uniform ambient conditions and effluent discharges. As natural systems are expected to vary, several model scenarios were developed to assess a range of possible ambient conditions and changes in effluent. In total, 72 simulations of the CORMIX model were developed from combinations of the following:
	
	• Six possible concentrations of total dissolved solids (TDS) in the effluent:
	  ○ 2400 mg/L, 1800 mg/L, 1200 mg/L, 600 mg/L, 300 mg/L, and 35 mg/L;
	• Two possible effluent flow rates:
	  ○ maximum (0.12 m3/s), and average (0.047 m3/s);
	• Three possible ambient wind conditions:
	  ○ average, maximum, and none (stagnant conditions); and
	• Two possible angles of effluent discharge:
	  ○ Perpendicular and parallel to lake current.
	
	The lowest dilution rate (65x) was predicted using the maximum flow rate, near stagnant conditions. Under stagnant conditions, discharge orientation has a relatively small effect on mixing, compared to non-stagnant conditions. Changes in effluent TDS have a relatively small effect on mixing compared to changes in effluent flow rate, lake velocity, and discharge orientation.
	
	Table 1: Summary of Inputs to Plume Delineation Model with Detailed

	Explanation [Excerpt from Water Management Plan, Appendix E, Table 2.2-1 with additional detail in notes] Of the ambient geometry inputs listed in Table 1, lake velocity (as derived from wind speed) has the largest effect on dilution of effluent or the plume mixing zone. The rate of effluent dilution at the edge of the mixing zone (100 m) generally increases with lake velocity, and thus windy conditions predict a higher dilution rate than near-stagnant conditions. Effluent quality criteria (EQC) (i.e., the proposed end of pipe criteria presented in Appendix H of the Water Management Plan) were developed based on the minimum predicted dilution rate (65x) in the mixing zone. This minimum dilution is predicted under near-stagnant, open-water conditions using a lake velocity of 0.0005 m/s. The near-stagnant condition is generally assumed to only occur in under-ice conditions when wind effects on the lake velocity are blocked by ice cover. To apply conservatism to the development of EQCs, the near-stagnant condition was assumed for the open-water period. Effluent will be discharged during the open-water period (i.e., June to September or October). Discharge is not planned during under-ice conditions, and thus under-ice modeling is considered not to be required. Instead, it can be assumed that lake turnover and mixing prior to ice formation would enhance mixing and dilute plume concentrations. Therefore, the near-stagnant, open-water predictions used to calculate the EQCs represent a conservative, reasonable case. **References:** Cole, T.M. and S.C. Wells. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6 - User Manual. Instruction Report EL-08-1, Prepared for U.S. Army Corps of Engineers, Washington, DC. Doneker, R.L. and G.H. Jirka. 2007. CORMIX User Manual. U.S. Environmental Protection Agency: EPA-823-K-07-001, Washington, DC. Golder (Golder Associates Ltd.), 2014. Final Environmental Impact Statement (FEIS) – Melidaine Gold Project, Volume 7.0 Freshwater Environment. Report number: Doc 314-1314280007 Ver. 0. April 2014. Metal Mining Effluent Regulations (MMER). 2014. Minister of Justice. Government of Canada. SOR/2002-222. Wetzel, RG. 2001. Limnology: Third Edition. Academic Press; New York.
KIA Technical Response	We thank AEM for the additional detail provided in their response. We acknowledge that under ice modeling is not required as no winter discharge is planned. We are generally satisfied with the inputs to the CORMIX model with the exception of the ambient density of the receiving environment. AEM intends to discharge to the receiving environment throughout the open water season but has chosen to calculate the average open water temperature using data from June and July. The selected temperature does not capture the full range of potential temperatures and does not accurately estimate the density of colder, denser water. Please provide additional modelling of the discharges using the minimum lake temperatures expected during the planned discharge periods. We make this request acknowledging that wind may provide the biggest influence on plume mixing during

	the discharge season. This issue was resolved through a technical memorandum provided to the KIA on October 2, 2015. AEM has rerun the CORMIX model using 4^{o}C which indicated *"little to no impact on the dilution factors or the conclusions"* of the model. This memorandum has been included in Appendix C.

2.10 KIA-WL-10: Quality Control Responses

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-10
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Quality Control Responses**
References:	AEMP Design Plan p.34 Section 5.1.5.2.1.
Issue / Concern or Information Deficiency and Rationale:	AEM states it will collect duplicate samples and assess them using a 20% relative percent difference (RPD) threshold. However, no discussion is provided on how data violating this QA/QC threshold will be handled. High quality data is essential for accurately monitoring the receiving environment. Standardized protocols for QA/QC data that violate established thresholds are essential to prevent low quality data from being considered alongside data that accurately reflect the sampled environment.
Technical Comment/ Information Request:	AEM should provide a discussion on how data will be handled if the 20% RPD threshold is violated. Please provide a discussion on what criteria will be used to disqualify the inclusion of, for example: single parameters, discrete samples and sampling events.
AEM's Response	Validation of data collected through a monitoring program is a multiple step process. First there is the collection of quality control samples to detect potential contamination (done through analysis of travel and field blank samples) and to confirm within-site variability and field sampling (done through the analysis of duplicate samples); second, results for dissolved and total parameters are compared; third, data are reviewed for potential unusual values or outliers. Quality Control Sample Review: Blank Samples As described in the Aquatic Effects Monitoring Program (AEMP) Design Plan document, the field quality control (QC) program for water quality will include the collection and analysis of blank QC samples. Results from blank samples (travel and/or field blanks) will be considered notable if concentrations are greater than or equal to five times the corresponding detection limit (DL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency and takes into account the potential for reduced accuracy when concentrations approach or are below DLs (USEPA 2000; AENV 2006). Results for notable parameters from the blanks will be evaluated to determine if: • the result is limited to a field blank or if it is apparent in corresponding water samples; • there was a consistent bias in the results for the parameter across all samples; and • if the notable result was severe enough to warrant invalidating the affected data. Quality Control Sample Review: Duplicate Samples As described in the AEMP Design Plan document, the field QC program for water quality will also include the collection and analysis of duplicate QC samples. The threshold of 20 percent (%) or less relative percent difference (RPD) between duplicate samples has been selected to identify if results are considered acceptable. For each set of duplicate samples, RPDs will be calculated for each parameter and for the overall duplicate pair. The RPD value for a given parameter will be considered

notable if:

- it is greater than 20%; and
- concentrations in one or both samples are greater than or equal to five times the DL.

The number of notable parameters will be compared to the total number of parameters analyzed to evaluate analytical precision. Analytical precision will be rated as follows:

- high, if less than 10% of the total number of parameters are notably different from one another;
- moderate, if 10% to 30% of the total number of parameters are notably different from one another; or
- low, if more than 30% of the total number of parameters are notably different from one another.

Total and Dissolved Comparison

Corresponding dissolved and total concentrations will be compared for each parameter (where both are measured) to determine if the dissolved values are greater than the total values. Where dissolved concentration values are more than the corresponding total concentration value, the results will be further evaluated through RPD values and values relative to five times the DL (5xDL). If the dissolved concentration value is more than the total concentration value, but the RPD between the dissolved and total concentration is less than 20%, the result will be accepted as valid. If the dissolved concentration value is more than the total concentration value, the RPD between the dissolved and total concentration is greater than 20%, and both (total and dissolved) concentrations are greater than 5xDL, the dissolved concentration will be considered notable.

For all notable results, the laboratory will be contacted to confirm the result; if the results are confirmed by the laboratory, the data will be further reviewed for other causes. If no other cause is identified, then the data will be considered valid for the total parameters, but the dissolved values will be qualified as having a dissolved to total RPD outside the acceptable range.

Data Validation

Data will be further validated with a two-step process. The first step will be a visual review of the data on a parameter basis using scatterplots to identify outliers from the overall dataset for that parameter. Data from the database will be exported, appropriately grouped, and plotted. Unusually high or low data values will be selected for further investigation. The second step of the process will involve data validation of the selected outlying data. The selected data will be invalidated on a case-by-case basis. Invalidated data will be retained in the database, but will be flagged indicated that the sample could be contaminated or results are designated as not correct due to an internal review of the data.

References

AENV (Alberta Environment). 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Edmonton, AB, Canada. 67 pp. ISBN: 0-7785-5081-8 (Print Edition); 0-7785-5082-6 (On-line Edition).

USEPA (United Sates Environmental Protection Agency). 2000. EPA Quality Manual for Environmental Programs. CIO 2105-P-01-0 (formerly 5360 A1).

Additional information was provided by AEM on October 2, 2015 and has been attached in Appendix D.

KIA Technical Response	We appreciate the discussion of how data is assessed but this does not provide insight into the response framework when quality control thresholds have been violated. **Duplicate Samples:** Duplicate samples are collected to help detect pervasive problems in a given dataset or field event. We cite the US EPA (2012) in their discussion of why duplicate samples are collected, indicating that they are "…used to estimate sampling and laboratory analysis precision." We understand that in the analysis of environmental duplicate samples, even analytical imprecision of 30% (>20% RPD and one or both samples >5X MDL) is somewhat conservative. We are, however, still concerned as duplicate samples are also used to detect sampling imprecision. AEM should provide a response framework within the QA/QC section of their AEMP for when duplicates indicate low precision, to prevent the incorporation of suspect data into the analysis of mine related impacts. This response framework should include a) Validation of sample collection techniques and precision, b) Validation of analytical precision, and c) Whether all samples from the suspect field event or those collected from a given field team be excluded from the dataset. **Total and Dissolved Comparison:** We are satisfied with AEM's response. **Data Validation:** Evaluating suspect values and flagging them as potentially contaminated or incorrect is satisfactory for handling yearly monitoring data and presenting it in the narrative of an annual report. We request that values identified as incorrect or contaminated be excluded from the statistical analysis of mine related impacts. **References** United States Environmental Protection Agency. 2012. Quality Assurance, Quality Control, and Quality Assessment Measures. Retrieved September 28, 2015 from: http://water.epa.gov/type/rsl/monitoring/132.cfm

2.11 KIA-WL-11: Significance Thresholds for Water Quality, Sediment Quality, and Fish Tissue Chemistry

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-11
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Significance Thresholds for Water Quality, Sediment Quality, and Fish Tissue Chemistry**
References:	AEMP Design Plan Section 8.3
Issue / Concern or Information Deficiency and Rationale:	The discussion of significance thresholds only focuses on potable water, fish consumption and vaguely on ecological function. The discussion of ecological function specifies, *"Significance thresholds are not defined for water quality, sediment quality, and fish tissue chemistry as they relate to ecological function. Action levels are defined for these components* [elsewhere]. *These endpoints provide early warning indication of potential adverse effects to plankton and benthos (which are food for fish), to fish health, and to the maintenance of ecological function."* This does not address water quality, sediment quality and fish tissue chemistry as valued ecosystem components (VECs) in their own right.
Technical Comment/ Information Request:	Please provide significance thresholds for water quality, sediment quality, and fish tissue chemistry as standalone VECs. This should be accompanied by a discussion of specific changes in the receiving environment that necessitate progression through the adaptive management response framework.
AEM's Response	As described in the Aquatic Effects Monitoring Program (AEMP) Design Plan, a Significance Threshold in an AEMP is defined as "a magnitude of change that would result in significant adverse effects". A Significance Threshold is a clear statement of environmental change that must never be reached (i.e., the "no-go" condition). Significance Thresholds centre on key values to protect (i.e., water and fish that can be safely consumed by humans, and maintenance of aquatic ecological function), and spans all monitoring components and impact hypotheses of the study design (i.e., the threshold is based on ecology and not change in a single VEC). In the AEMP design plan document (Section 8.3), Significance Thresholds were proposed as follows: • Water is not drinkable (human health and/or wildlife risk); • Fish are not safe for consumption (human health and/or wildlife risk); and • Ecological Function is not maintained. Action Levels that relate to ecological function were defined for water quality, sediment quality, and fish tissue chemistry (Section 8.4 in the AEMP Design Plan). These aquatic components, and the measurement endpoints considered for each component (Table 3-1 in the AEMP), provide early warning indication of potential adverse effects to plankton and benthos (i.e., food for fish), to fish health, and to the maintenance of ecological function (including water quality and sediment quality). The proposed Low Action Levels (Table 8-2 and 8-3 in the AEMP Design Plan) are designed such that changes of sufficient magnitude to trigger a Low Action Level are reported, documented, investigated, and ultimately addressed (i.e., mitigation measures or operational changes are implemented) before Significance Thresholds would ever be reached; If a Low Action Level is reached, Medium and High Action Levels (with response actions) are also developed to provide further adaptive management guidance to the Mine to avoid reaching the Significance Thresholds. The type of management response taken after reaching an Action Level will depend

	on the type and magnitude of effect observed, and cannot be defined a priori; examples of management responses were provided in Table 8-1 in the AEMP design plan. The Action level response examples are aligned with options developed for the Meadowbank Mine.
KIA Technical Response	We appreciate the action levels related to ecological function and the "no-go" conditions, which, by AEM's assertion, will never be reached. We are also satisfied with the discussion of Low Action Levels and the imbedded potential for subsequent action levels should problems persist. We do note that none of the three significance thresholds address the loss of cultural value to Inuit. This issue is one of long standing importance which is rarely adequately addressed by proponents. Given AEM's experience in the north, their intention for continued involvement and the commitments made with the KIA under the Meliadine IIBA, they are well placed to host a working group to discuss loss of cultural value to Inuit as a significance threshold and a response framework to ensure it does not occur. A working group could establish the significance threshold incorporating cultural value to Inuit while minimizing the implications of isolated or tenuous observations to project feasibility. Please also see KIR-WL-04 for recommendations to incorporate IQ into monitoring and action levels into the AEMP and response framework. We recommend the NWB require this working group hosted by AEM as a condition of the licence The KIA are concerned with long term environmental quality at the mine site and are also entitled to compensation should changes to water quality, quantity and flow occur beyond that which was agreed to in the Inuit Impact Benefit Agreement (IIBA) and Water Compensation Agreement. Should those changes occur, particularly accidental changes to water quality, quantity and flow, an agreeable compensation claim reached under the Nunavut Land Claims Agreement (NLCA) will be facilitated by a predetermined standalone definition of significance for changes to these valued ecosystem components (VECs). This does not supersede a case by case evaluation of compensation but would ensure all parties are working from the same basic definitions of significant adverse effects for each VEC.

2.12 KIA-WL-12: Fish Tissue Baseline

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-12
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Fish Tissue Baseline**
References:	FEIS KIA-IR-29, AEMP Design Plan Section 8.4
Issue / Concern or Information Deficiency and Rationale:	The KIA requested as part of the FEIS review process that AEM conduct a survey to collect fish tissue chemistry to provide a recent baseline dataset; this fish tissue baseline was over 10 years old and not necessarily appropriate for use as the site baseline. Table 8-2 indicates fish health will be assessed in part by examining *"statistically significant differences in fish health endpoints or fish tissue chemistry that are beyond the normal range"*. This normal range relies on a robust baseline which at this point does not exist. Table 8-2 indicates some benchmarks used in the AEMP will be set once *"supplemental baseline data are collected"*. AEM has not indicated additional fish tissue baseline data will be collected in the AEMP, a commitment by AEM as part of its response to FEIS KIA-IR-29.
Technical Comment/ Information Request:	Please collect additional fish tissue data to update the baseline prior to issuance of the water licence.
AEM's Response	Baseline fish health and fish tissue data collection was planned for 2015 in the near field area of Meliadine Lake from Lake Trout and Threespine Stickleback. Data will be collected in August 2015 and prior to issuance of the water licence.
KIA Technical Response	We request that the NWB require AEM to: • Update the fish tissue baseline report prior to construction for review by the NWB, KIA and other key stakeholders, • Include an evaluation of how the 2015 fish tissue data compares with the historical data, ○ Discuss any changed predictions of potential project impacts presented in the FEIS should newer data diverge from the historical data.

2.13 KIA-WL-13: Additional Supplemental Information Guidelines

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-13
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Andrea L. Smith, Hutchinson Environmental Sciences Ltd.
Subject:	**Landfarm and on-site storage of hydrocarbon contaminated soil**
References:	Master Concordance Table 3.0 General Water Licence Application Section No. 15 d
Issue / Concern or Information Deficiency and Rationale:	The proponent is required to provide information on any other Supplemental Information Guidelines that apply to the undertaking, including a landfarm and on-site storage of hydrocarbon contaminated soil. AEM has indicated that information about a landfarm is not applicable because *"This activity is currently not planned"*. The Main Application Document, however, has several sections pertaining to the design, creation and use of a landfarm, including: ❁ Section 4, p. 43, 2nd paragraph: *"A landfarm will be constructed on-site to treat soils contaminated with light hydrocarbons"* ❁ Section 4.2.2 Proposed Site Infrastructure ❁ Section 4.2.7.3 Landfarm ❁ Section 7.7 Landfarm Management ❁ Appendix B, Table 4.6 Landfarm Design Criteria
Technical Comment/ Information Request:	Please indicate in the Concordance Table all sections of the Water Licence Application that refer to a landfarm and provide the requisite documentation.
AEM's Response	Reference to «Landfarm» activities are made in : - Main Application Document, Section 4, specifically in section 4.2.7.3. - Main Application Document, Section 7.7 - Main Application Document, Appendix B, table 4.5 and 4.6 - Landfarm Management Plan, in support of Licence A application
KIA Technical Response	The KIA consider this issue resolved.

2.14 KIA-WL-14: Plans for Abandonment and Restoration

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-14
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Andrea L. Smith, Hutchinson Environmental Sciences Ltd.
Subject:	**Plans for Abandonment and Restoration**
References:	Master Concordance Table 3.0 General Water Licence Application Section No. 45
Issue / Concern or Information Deficiency and Rationale:	Section No. 45 indicates that the proponent is required to provide plans for the abandonment and restoration of the project, including detailed costs to carry out the plan, and a proposal for financial assistance to cover these costs. The information provided by AEM does not indicate the estimated costs of the plan, nor include information for how these costs will be covered.
Technical Comment/ Information Request:	Please provide detailed information on the anticipated costs of the abandonment and restoration components of the project, as well as plans for addressing these costs.
AEM's Response	As per Section 10 – Financial Security of the Preliminary Closure and Reclamation Plan (CRP) document. A permanent closure and reclamation financial security cost estimate has been prepared to a conceptual level with the present mine layout and infrastructure. The cost estimate covers the closure and reclamation of all Project facilities as described in the CRP and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project. A copy of the RECLAIM model was provided as Attachment E to the Cover Letter. The anticipated cost for abandonment and restoration is 47.5M. Summary of costs is provided in the table below. [Costs summarized from Cover Letter, Attachment]
KIA Technical Response	We thank the proponent for the clarification and consider this resolved.

3. Technical Review Comments

3.1 KIA-WL-15: Sample Station Categorization

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-15
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Sample Station Categorization**
References:	Environmental Management and Protection Plan, Figure 4-2, Table 4-1; Water Management Plan, Table 9.1; FEIS Figure 7.3-3
Issue / Concern or Information Deficiency and Rationale:	AEM provides "*Figure 4-2*[,] *a map showing the location of all aquatic monitoring stations,* [and] *Table 4-1* [summarizing] *the sample frequency and parameter groups for each location".* The locations of monitoring stations within the project footprint are satisfactory, but we note that Table 4-1 further categorizes stations as "Verification", "Regulated" or "General Aquatic". Verification samples are *"for operational and management purposes by Agnico Eagle"* and are not required to meet CCME water quality guidelines nor are they evaluated for compliance. This categorization of samples is appropriate for locations totally contained within the project footprint with either a regulated or general aquatic monitoring location further downstream prior to the receiving environment. General Aquatic samples are *"subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addresses identified issues."* This categorization of samples is appropriate for locations either within the receiving environment or within the project footprint that discharge directly to the environment without the need for further monitoring. We are concerned with the following sites which AEM has categorized as "Verification" samples: • MEL-05, located in Lake E3. Lake E3 flows to E2, Lake E1 and subsequently to Meliadine Lake. • MEL_06 is located in Lake G2. Lake G2 flows into G1 and subsequently into Meliadine Lake. No berms or diversion structures exist between Lake G2 and Meliadine Lake. • MEL_07 monitors Lake H1 which flows directly into Meliadine Lake.
Technical Comment/ Information Request:	Please re-categorize MEL-05, MEL-06 and MEL-07 as general aquatic monitoring stations so that they are evaluated against established water quality guidelines or effluent quality criteria and are subject to compliance. At present, these locations are under the influence of project infrastructure and activities as indicated in Table 4-1, yet no water management infrastructure is currently in place should these locations indicate adverse project related effects. This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has committed to include MEL_05, MEL_06 and MEL_07 in the annual reports for review by regulators and stakeholders. Samples collected from these three sites will be compared to CCME water quality guidelines or baseline concentrations for those naturally exceeding CCME guidelines for the protection of aquatic life. If samples indicate water quality concentrations are within a percent of background concentrations (as to be proposed by AEM) or approaching CCME where appropriate,

	AEM's low action level response will be: • To recategorize the specific location of concern as a General Aquatic Monitoring Station, • Include the location as an additional station in the Aquatic Environment Monitoring Program, • Investigate the source of contamination, and • Mitigate the source to prevent further contamination of the water body. This response framework is acceptable acknowledging the lower likelihood of mine related changes to water quality in MEL_05, MEL_06 and MEL_07 which could result in detectable changes within Meliadine Lake. We further acknowledge that increasing trends in parameter concentrations within these three waterbodies would be gradual providing sufficient time for source mitigation.

3.2 KIA-WL-16: Detection Limits

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-16
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Detection Limits**
References:	Environmental Management and Protection Plan, Table 4-2; Quality Assurance/Quality Control Plan, Section 2.2.2, Section 2.2.4,
Issue / Concern or Information Deficiency and Rationale:	AEM provides Table 4-2 to outline which parameters will be analyzed at each monitoring location. We are satisfied with the inclusivity of the parameter suite but note that detection limits are not provided in Table 4-2. Reporting detection limits in the licence application is essential to establish that the analytical sensitivity is sufficient to detect mine related changes so that they can be mitigated prior to the occurrence of adverse effects in the receiving environment. AEM has indicated no accredited laboratory will be located on site. AEM has proposed the use of several analytical laboratories including MultiLab in Val d'Or, Quebec; Maxxam in Edmonton, Alberta; Maxxam Analytique in Quebec City; Exova in Saint-Augustin-de-Desmaures, Quebec; SGS in Lakefield, Ontario; and ALS global. It is essential that hold times are met when transporting samples to offsite laboratories to ensure analytical precision while detection limits are also achieved. Detection limits for the same variables and analytical methods must be comparable between labs to permit pooling and comparison of data from different laboratories. If at all possible, one laboratory should be selected for each type of sampling. In particular, samples that will be used to demonstrate the potential for change due to the mine must be comparable and preferably from one lab at one detection limit. We note that AEM's proposed method to extend the hold times of total metals and chlorophyll α (once filtered through ashless filter paper) by freezing samples are acceptable for these parameters. Analytical precision of other parameters may be negatively impacted through freezing; freezing is not a recommended practice to extend hold times for other parameters.

Technical Comment/ Information Request:

Please indicate available and intended detection limits for the parameter suite outlined in Table 4-2. We provide the following recommendations for freshwater detection limits relying on those used at Doris North, Meadowbank and the Back River Project:

Recommended Freshwater Detection Limits					
Variable	**Units**	**Detection Limit**	**Variable**	**Units**	**Detection Limit**
Physical Tests			**Total Metals**		
pH	pH	0.1	Aluminum (Al)	mg/L	0.0005
Temperature	°C	-	Antimony (Sb)	mg/L	0.00001
Alkalinity, Total (as $CaCO_3$)	mg/L	1	Arsenic (As)	mg/L	0.00005
Specific Conductivity	µS/cm	1	Barium (Ba)	mg/L	0.0001
Total Suspended Solids	mg/L	1	Beryllium (Be)	mg/L	0.000005
Total Dissolved Solids	mg/L	1	Bismuth (Bi)	mg/L	0.00005
Turbidity	NTU	0.1	Boron (B)	mg/L	0.005
Nutrients			Cadmium (Cd)	mg/L	0.000005
Ammonia (as N)	mg/L	0.005	Cesium (Cs)	mg/L	0.000005
Nitrate (as N)	mg/L	0.04	Chromium (Cr)	mg/L	0.0005
Nitrite (as N)	mg/L	0.001	Cobalt (Co)	mg/L	0.00005
Total Kjeldahl Nitrogen	mg/L	0.05	Copper (Cu)	mg/L	0.0002
Ortho-Phosphate	mg/L	0.002	Iron (Fe)	mg/L	0.0005
Total Phosphorus	mg/L	0.002	Lead (Pb)	mg/L	0.00005
Dissolved Phosphorus	mg/L	0.002	Lithium (Li)	mg/L	0.0002
Organics			Manganese (Mn)	mg/L	0.0002
Total Organic Carbon	mg/L	0.2	Mercury (Hg)	µg/L	0.0005
Dissolved Organic Carbon	mg/L	0.2	Molybdenum (Mo)	mg/L	0.00005
Cyanides			Nickel (Ni)	mg/L	0.0001
Cyanide Total	mg/L	0.001	Rubidium (Rb)	mg/L	0.00002
Cyanide, Free	mg/L	0.001	Selenium (Se)	mg/L	0.0001
Major Ions			Silver (Ag)	mg/L	0.000005
Calcium (Ca)	mg/L	0.05	Strontium (Sr)	mg/L	0.00005
Chloride (Cl)	mg/L	0.1	Thallium (Tl)	Mg/L	0.000002
Fluoride (F)	mg/L	0.01	Tin (Sn)	mg/L	0.0001
Hardness (as $CaCO_3$)	mg/L	0.5	Titanium (Ti)	mg/L	0.0002
Magnesium (Mg)	mg/L	0.1	Uranium (U)	mg/L	0.000002
Potassium (K)	mg/L	0.1	Vanadium (V)	mg/L	0.00005
Reactive Silica	mg/L	0.01	Zinc (Zn)	mg/L	0.0005
Sodium (Na)	mg/L	0.1	**Radiochemistry**		
Sulphate (SO_4)	mg/L	0.2	Lead-210	Bq/L	0.02
Other			Polonium-210	Bq/L	0.005
Oil and Grease		Visible	Radium-226	Bq/L	0.005
			Thorium-230	Bq/L	0.01

Please also provide a discussion of how hold times will be met given the difficulties experienced at Meadowbank ensuring samples reach MultiLab in Val d'Or within the prescribed time.

This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has committed to review the proposed minimum detection limits. They will include the full suite of analyzed parameters and include a list of minimum acceptable detection limits within the Quality Assurance / Quality Control Plan. These detection limits will apply to all contracted analytical laboratories for water quality samples collected at:

- General Aquatic Monitoring Stations,
- Aquatic Environment Monitoring Program Stations,
- Regulated Monitoring Stations, and
- The MEL_05, MEL_06 and MEL_07 Verification Locations.

3.3 KIA-WL-17: Potential Impacts to Lake B7

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-17
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Potential Impacts to Lake B7**
References:	FEIS, Mine Plan 2.7.2
Issue / Concern or Information Deficiency and Rationale:	We accept AEM's move towards dry stack tailings rather than the thickened slurry option proposed in the FEIS. AEM provides rationale for this change stating that *"In a report studying the 'Engineering challenges for tailings management facilities and associated infrastructure with regard to climate change in Nunavut' (Journeaux Assoc. 2012), it was concluded that dry stacking combined with backfilling and/or open pit disposal are recommended for tailings disposal techniques for future mining endeavours. These disposal methods are deemed to be the best practices for tailings disposal in Nunavut."* We have reviewed AEM's citation which further indicates *"The main concern of dry stacking is dust generation during operation; therefore, more research is recommended on ways to reduce dust generation, particularly for mine operations in windy environments"* (Journeaux Assoc. 2012). AEM has not provided a map indicating all dust fall monitoring stations in the application. Additionally, as Lake B7 is no longer part of the TIA and is potentially subject to dust deposition from adjacent dry stacking, a discussion of potential impacts to water quality in that water body is now warranted.
Technical Comment/ Information Request:	Please provide a map of all existing and proposed dust fall monitoring stations and the sources they are intended to track during operations. Ensure concentric stations are established from the TSF at geometric intervals (eg: 50m, 100m, 200m, 350m, 600m) based on the strongest wind direction. Please provide a discussion of the impacts dust deposition originating from the dry stack TSF may have on Lake B7 following the format used in an environmental impact statement style environmental assessment. Please also see KIA-WL-20: Incinerator Dust Fall Monitoring. This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has committed to include all dust fall monitoring stations and locations within the Dust Management Plan prior to any material being placed in the Tailings Storage Facility taking into consideration the aforementioned considerations in sample location selection. See KIA-WL-20: Incinerator Dust Fall Monitoring for more requirements for dust fall monitoring.

3.4 KIA-WL-18: Dust Management at Closure

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-18
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Dust Management at Closure**
References:	Ore Storage Management Plan Section 6.2.3
Issue / Concern or Information Deficiency and Rationale:	AEM states that dust control at closure will be *"evaluated and implemented during closure activities as required"*. While *"it is anticipated that specific dust controls will not be required"*, dust management is still an issue of significant concern to the community. To allay their concerns, AEM should provide a discussion of thresholds to determine if dust control will be required at closure.
Technical Comment/ Information Request:	Please provide a discussion of thresholds that will be used to determine if dust management is required at closure as per section 6.2.3 of the Ore Storage Management Plan. This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has committed to including a discussion of these thresholds in the next iteration of the Closure Plan.

3.5 KIA-WL-19: Fuel Contact Water Discharge Criteria

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-19
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Fuel Contact Water Discharge Criteria**
References:	Hazardous Materials Management Plan, Section 5.3.3
Issue / Concern or Information Deficiency and Rationale:	AEM states *"Due to melting snow that accumulates over the winter and precipitation, contact water will unavoidably collect inside the secondary containment berm. During visual inspections, the quantity of contact water collected inside the secondary containment berm will be evaluated. If there is a visible sheen on the contact water or if water withdrawal is deemed necessary, water samples will be collected and analyzed. Accumulated water will only be released to the receiving environment if it meets discharge criteria."* It is not clear what the discharge criteria will be nor the receiver for this contact water.
Technical Comment/ Information Request:	Please clarify what discharge criteria will be used for melting snow and precipitation within secondary contact berms of the Fuel Tanks. Given Itivia is located away from treatment infrastructure and will contain fuel tanks, it is important to establish what the receiver would be should contact water exceed the discharge criteria. This issue has been partially resolved with AEM in a teleconference held October 2, 2015. AEM has clarified that water within the secondary containment berms will never be discharged at Itivia. Water meeting discharge criteria will be used as a dust suppressant along the roads. Water not meeting discharge criteria will be trucked to CP1 for further treatment as required. We request that AEM provide discharge criteria in the next iteration of the dust management plan prior to construction.

3.6 KIA-WL-20: Incinerator Dust Fall Monitoring

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-20
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Incinerator Dust Fall Monitoring**
References:	Incinerator Management Plan, Section 6.1.3
Issue / Concern or Information Deficiency and Rationale:	AEM states *"Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and/or odour control measures is not anticipated."* While this is a good example of mitigation by design, we assert that the control of incinerator dust emissions are also based on operator performance. The precautionary approach is therefore to establish routine dust fall monitoring stations to characterize potential impacts the incinerator may be having on the surrounding environment. We also note that Table 5-1 of the incinerator management plan only includes emissions guidelines for mercury, dioxins and furans. While this is in line with other arctic mines, metals can still be released through incomplete combustion or operator failures.
Technical Comment/ Information Request:	We recommend that AEM • Include a summary of all dust monitoring stations around the project site. • Specify which sources they are able to characterize such as the incinerator. • Place high volume air samples downwind (using a wind rose to establish prevailing winds) of the open pits and the TSF within 500 m of the source depending on the availability of power. • Indicate the detection limits that will be applied to the analysis and whether samples will be filtered or bulk samples. This should also be accompanied with proposed snowpack monitoring locations, specifying the source they are intended to characterize. Please select snowpack monitoring locations in areas that are susceptible to incinerator dust accumulation and flow into the receiving environment during spring freshet. This issue has been partially resolved with AEM in a teleconference held October 2, 2015. AEM has committed to include all dust fall monitoring stations and locations within the Dust Management Plan prior to any material being placed in the Tailings Storage Facility taking into consideration the aforementioned considerations in sample location selection. Please also refer to KIA-WL-17: Potential Impacts to Lake B7. We further request that AEM include the information requested in the aforementioned recommendations for the Dust Management Plan.

3.7 KIA-WL-21: Landfarm Microbial Degradation Rates

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-21
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Landfarm Microbial Degradation Rates**
References:	Landfarm Management Plan, Section 2.1
Issue / Concern or Information Deficiency and Rationale:	AEM states *"Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity stops between 0 to -5 degrees Celsius (°C) restricting biodegradation to the months of June to September. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008)."* Natural biological process are relied on for the *"Remediation of fine grained PHC contaminated soil in landfarms* [which] *occurs naturally through volatilization and aerobic microbial degradation. Soil aeration and nutrient amendment are recognized as methods of improving rates of remediation. While it is recognized that pH, salinity, moisture content, and microbial population density also contribute to rates of degradation, these factors will not be explicitly investigated or managed unless remediation rates are too slow to allow meeting targets set for closure."*
Technical Comment/ Information Request:	As landfarms are relied on for the management of contaminant such as PHCs in soil, please indicate how typical results are from Meadowbank. Please provide a discussion on how applicable results from Resolution Island are to the Meliadine project area given the area around the former is dominated by a marine environment. Please also indicate if anticipated degradation rates at the Meliadine landfarm sufficient to ensure no residual effects, and if additional measures will be required (eg modification of pH, salinity, nutrients, etc) to improve the rate of biodegradation.

3.8 KIA-WL-22: STP Discharge Criteria

<table>
<tr><td>Comment Source:</td><td>Kivalliq Inuit Association</td></tr>
<tr><td>Information Number:</td><td>KIA-WL-22</td></tr>
<tr><td>Project:</td><td>Meliadine Gold Project WL</td></tr>
<tr><td>Comment From:</td><td>Kivalliq Inuit Association</td></tr>
<tr><td>Comment For:</td><td>Agnico Eagle Mines Limited</td></tr>
<tr><td>Reviewer:</td><td>Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.</td></tr>
<tr><td>Subject:</td><td>STP Discharge Criteria</td></tr>
<tr><td>References:</td><td>Water management plan Section 4.5.2, Table 4.7.</td></tr>
<tr><td>Issue / Concern or Information Deficiency and Rationale:</td><td>AEM intends to use “Biological reactors like Bionest Kodiak units… to treat camp waste water.” Table 4.7 is provided by AEM to outline anticipated sewage treatment plant performance. We note that no discharge criterion has been included for oil and grease which may be somewhat conservative through CP1 to the receiving environment.

Table 4.7 Anticipated STP Treatment Performance
<table><tr><th>Parameter</th><th>WSER[1] (average concentration in the effluent)</th><th>STP Treatment Performance</th></tr><tr><td>Carbonaceous Biochemical Oxygen Demand</td><td>25 mg/L</td><td>10 mg/L</td></tr><tr><td>Total Suspended Solid</td><td>25 mg/L</td><td>10 mg/L</td></tr><tr><td>Total Residual Chlorine</td><td>0.02 mg/L (if chlorine used in treatment of waste water)</td><td>No chlorine to be used in treatment</td></tr><tr><td>Un-ionized ammonia</td><td>1.25 mg/L (expressed as nitrogen at 15 °C ± 1°C</td><td><10 mg/L NH4-N, which represents ~<0.03 mg/L un-ionized ammonia (at 15 °C, pH 7)</td></tr></table>[1] Waste Water System Effluent Regulations

The Bionest unit used at AEM’s Amaruq site has experienced problems over the summer of 2015 which have been addressed through the addition of a filtration system and subsequent UV disinfection. While this may not be necessary given the sewage treatment plant (STP) will discharge to CP1, we express some concern with the Bionest technology.</td></tr>
<tr><td>Technical Comment/ Information Request:</td><td>If AEM envisions a scenario where discharges to CP1 are not possible, please include the option for additional filtration and subsequent UV disinfection as a contingency. These need not be engaged while discharges to CP1 continue.

Please include discharge criteria for oil and grease in STP discharges to CP1, and install grease traps from the outset of the kitchens and other possible sources of oil and grease.</td></tr>
</table>

3.9 KIA-WL-23: Untested Cyanide Detoxification Process

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-23
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Untested Cyanide Detoxification Process**
References:	Water Management Plan, Appendix G Section 4.4, Appendix G Section 4.4.1.
Issue / Concern or Information Deficiency and Rationale:	We are concerned that *"Cyanide degradation products (cyanate, thiocyanate, and thiosalts) are not modelled; their concentration in process water and in CP3 will depend on the efficiency of the cyanide detoxification process, yet to be tested."* We are concerned that AEM is introducing uncertainty into their assessment of site water quality with an unproven cyanide detoxification process. This concern is compounded in AEM's statement that *"The concentrations of arsenic, cyanide products, and thiosalts at CP3 and CP1 will depend on the ability to achieve dry stack tailings. If tailings are discharged at a higher water content than intended and more tailing process water is collected in CP3, the concentration of these parameters is likely to be higher than predicted."* Together, these factors introduce two layers of uncertainty into the final cyanide concentrations which will be discharged to the environment.
Technical Comment/ Information Request:	AEM has indicated the cyanide detoxification has yet to be tested at the Meliadine Site and that the total volume of process water to be managed has yet to be confirmed. AEM can allay some of this concern prior to gaining experience at the Meliadine site with dry stack tailings by providing examples where the proposed cyanide detoxification process has been tested. These case studies should have been exposed to similar climates to demonstrate the technology will be effective at the Meliadine site. This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has indicated that while the cyanide detoxification technology has not been tested at the Meliadine Site, it is the same technology that was applied at Meadowbank. AEM indicated it will use an "as needed" treatment approach for discharges to Meliadine Lake from CP1. AEM has committed to add cyanide detoxification to the treatment plant (in addition to what is used at the mill) if they are unable to meet the cyanide discharge criteria. They have further committed to recirculate effluent that does not meet discharge criteria and store it in CP1 until the treatment system has been installed and is operational.

3.10 KIA-WL-24: Application of Water Quality Criteria to Modelled Results

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-24
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Application of Water Quality Criteria to Modelled Results**
References:	Water Management Plan, Appendix G Section 5.2, Appendix G Section 5.3
Issue / Concern or Information Deficiency and Rationale:	AEM has provided *"A summary of the predicted water quality for parameters of interest to the site (dissolved concentrations)… in Table 11."* Table 12 subsequently provides *"A summary of the predicted water quality for parameters of interest post-closure (dissolved concentrations)"*. AEM then goes on to state *"Dissolved constituent concentrations in most of the other collection ponds… meet MMER monthly mean discharge limits with the possible exception of arsenic, on occasion at CP3."* This is not an accurate comparison as MMER discharge criteria are for the total constituent in water as opposed to the dissolved fraction. Modelling the dissolved fraction in the collection ponds may under represent total loadings to CP1 as particulate metals which initially precipitate out of the solution may eventually resuspend and thereby transport to CP1 and subsequently Meliadine Lake.
Technical Comment/ Information Request:	Please model total metals in addition to the dissolved fraction in the collection ponds. Please compare modeled total metal results rather than those for the dissolved fraction to MMER discharge criteria. This comparison should be used to determine the need for treatment at closure; this comparison should be included in a future iteration of the Closure and Reclamation Plan.

3.11 KIA-WL-25: Dust Suppression Along Roads

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-25
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Richard A. Nesbitt, Hutchinson Environmental Sciences Ltd.
Subject:	**Dust Suppression Along Roads**
References:	FEIS Appendix 7.2-A Table 3; Road Management Plan, Appendix C Dust Management Plan Section 7.2.
Issue / Concern or Information Deficiency and Rationale:	*"As part of its Meliadine Update Technical Study Phase 2, 2015 Agnico Eagle plans to use saline groundwater as the primary dust suppressant (Agnico Eagle 2015). If this proves not to be sufficiently efficient, Agnico Eagle will evaluate other dust suppression techniques and chemical dust suppressants with the results to be used in selecting the chemical dust suppressant(s) that will work best at the Project."* However, AEM also accurately states that *"Presently, only fresh water, seawater, DL10, calcium chloride, EK-35 and DUST-STOP are approved for use in Nunavut."* Further review of the document "Environmental Guideline for Dust Suppression" (Government of Nunavut, 2002) does not indicate that saline groundwater would be appropriate as a dust suppressant in Nunavut at this time. Results from collected groundwater samples (presented in the FEIS) indicate chloride, calcium and sodium concentrations are representative of seawater and/or calcium chloride dust suppressants. However, data presented for strontium indicates a higher concentration than present in seawater; other metals data are not presented. Stagnant saline aquifers such as that which is likely present at the project site can potentially contain elevated concentrations of a variety of metals resulting in toxicity thereby disqualifying their use as a dust suppressant. It has been noted to proponents applying to use saline groundwater as a dust suppressant in Ontario that while ground-sourced brines may be exempted from being considered a "contaminant" under the US EPA if used for melting snow and ice in winter, no such exemption exists for the use of brines as a dust suppressant. Furthermore, these high-sodium brines have been found to be toxic under the Canadian Environmental Protection Act. The Ministry of Environment and Ministry of Transportation documents and guidelines do not address, or even refer to, the use of high-sodium brines as dust suppressants. We are therefore concerned with AEM's intended use of saline brines
Technical Comment/ Information Request:	If AEM still intends to use saline groundwater as a dust suppressant, please provide the results of a full chemical analysis of groundwater intended for use as a dust suppressant. If the analytical results do not indicate potential toxicity, create a test plot and apply saline groundwater as a dust suppressant at the intended volumes using the intended method. Provide results on the effectiveness of saline groundwater as a dust suppressant in the arctic and the impacts on the surrounding terrestrial ecosystem. These results should be presented to the Government of Nunavut to establish saline groundwater as an approved dust suppression technique in the territory. Results should also be provided to the NWB, KIA and other stakeholders for evaluation. If saline groundwater is not approved for use as a dust suppressant at the Meliadine site or within Nunavut, please indicate AEM's preferred alternative dust suppressant. If freshwater is selected, please outline where the water will be sourced and the volumes required. Please complete these tests prior to submission of the long term saline water management plan.

	This issue has been resolved with AEM in a teleconference held October 2, 2015. AEM has committed to apply to the Government of Nunavut to approve application of saline groundwater originating from the Meliadine Site as a dust suppressant prior to its use.

3.12 KIA-WL-26: Dust Deposition to Nippisar Lake

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-26
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Alan Sexton, GeoVector Management Inc.
Subject:	**Dust Deposition to Nippisar Lake**
References:	Main Application Document
Issue / Concern or Information Deficiency and Rationale:	Impact of dust from the bypass road on the Rankin Inlet water supply located in Nippisar Lake.
Technical Comment/ Information Request:	This issue has been resolved with AEM in a teleconference held September 29, 2015. Alternative road routes are being discussed with the hamlet council of Rankin Inlet.

3.13 KIA-WL-27: Reclamation of Dry Stack Tailing

Comment Source:	Kivalliq Inuit Association
Information Number:	KIA-WL-27
Project:	Meliadine Gold Project WL
Comment From:	Kivalliq Inuit Association
Comment For:	Agnico Eagle Mines Limited
Reviewer:	Alan Sexton, GeoVector Management Inc.
Subject:	Reclamation of Dry Stack Tailing
References:	Mine Waste Management Plan
Issue / Concern or Information Deficiency and Rationale:	The time line for progressive reclamation of the dry stack tailings.
Technical Comment/ Information Request:	This issue has been resolved with AEM in a teleconference held September 29, 2015. AEM has indicated progressive reclamation will be started in year 7.

4. Conclusion

As of this submission, we have either partially or completely resolved 16 of our 27 issues. We hope to resolve our remaining issues prior to the technical hearings scheduled for October 14 and 15, 2015 in Rankin Inlet, NU, through AEM's review of our technical review and a forthcoming teleconference scheduled for October 8, 2015.

Given the progress made on this licence to date, we are confident the project can proceed with the requested amendments and commitments in a way that will provide benefit to AEM, Nunavummiut, and Canada overall while safeguarding the environment from long term adverse effects.

Appendix A. AEM Responses to KIA Completeness Review

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-01**
Re:	**Segregation of Overburden**		

Comment made by Interested Party:

The proponent should clarify how they intend to store overburden and waste rock on site. If overburden materials are not stored in the WRSF then it is less likely they will be frozen and can then be used for revegetation.

AEM should include their specific plans to investigate the feasibility and practicality of segregating overburden during construction for use at closure within the Preliminary Closure and Reclamation Plan for intervener review.

The proponent should commit to segregating the overburden throughout the project life for use at closure. This does not necessarily require the 3m tailing cap (indicated in the Water Management Plan) to increase in depth, rather ensure 2.5m of waste rock and 0.5m overburden are applied sequentially to the dry stack tailings rather than collectively.

Agnico Eagle's Response to Comment:

As per Section 5.2.3 – Waste Rock and Overburden Storage Facilities of the Preliminary Closure and Reclamation Plan (CRP) document.

Waste rock from the open pits and underground mining not used for site development purposes will be trucked to the Waste Rock Storage Facilities (WRSFs) until the end of mining. Three WRSFs are planned for the Project: WRSF1 to WRSF3. Overburden material stripped as part of the mine development will either be co-disposed within the WRSFs or be stored within the temporary overburden stockpile facility for later use as Tailings Storage Facility (TSF) closure cover material.

Approximately 31.8 Mt of waste rock will be mined from which about 2.0 Mt will be backfilled to the underground mine, 1.6 Mt will be used for construction, and 2.5 Mt will be used as TSF closure cover material. Approximately 7.4 Mt of overburden material will be removed from which about 0.095 Mt will be used for the TSF closure cover. The temporary overburden stockpile is located at the east side of the TSF and has a plan area of 1.12 ha.

The overburden materials are relatively high in moisture content and are expected to be completely frozen at the time of closure. The need for additional dust control measures will be evaluated and implemented during operations and closure, as required.

As per Section 6.0 – Progressive Reclamation of the CRP document. The TSF will be closed progressively as shown in Mine Waste Management Plan submitted in support of the Type A Water Licence Application. The TSF cover design will be finalized during the detailed design phase of the Project and

will consider operational experience at other northern mine sites, and available design guidelines including MEND Report 1.61.5c – *Cold Regions Cover System Design Technical Guidance Document* (MEND 2012).

The proposed closure cover includes a layer of 0.5 m thick of overburden followed by a layer of 2.5 m thick waste rock on the top of the facility. The TSF slopes closure cover includes only a 3.7 m to 4.2 m thick waste rock layer only. It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time.

References

MEND (Mine Environment Neutral Drainage Program). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. Mining Environment Neutral Drainage Program, Natural Resources Canada. December 2009.

Interested Party:	Kivalliq Inuit Association	IR No.:	KIA-WL-02
Re:	Additional Cover Material and Re-vegetation		

Comment made by Interested Party:

Please indicate the source of overburden and cover material referenced here in the Closure and Reclamation Plan. Importantly, will additional land need to be disturbed to obtain this or will AEM provide segregated storage for overburden produced during construction?

Furthermore, please provide commentary on the expected timelines for re- establishment of a) grasses, b) woody shrubs and c) lichens with reference to examples from Arctic climates.

Agnico Eagle's Response to Comment:

At this time, it is not planned to disturb additional land to obtain overburden and cover materials. The sources for these materials are as described below. Agnico Eagle will manage the use of the overburden material needed in a separate temporary stockpile for reclamation purposes as described in IR No. KIA-WL-01.

As per Section 5.2.3 – Waste Rock and Overburden Storage Facilities of the Preliminary Closure and Reclamation Plan (CRP) document.

Approximately 31.8 Mt of waste rock will be mined from the open pits and underground and about 2.1 Mt will be backfilled to the underground mine, 1.6 Mt will be used for construction, and 2.5 Mt will be used as TSF closure cover material. Waste rock from the open pits and underground mining not used for site development purposes will be trucked to the Waste Rock Storage Facilities (WRSFs) until the end of mining.

Overburden material stripped as part of the mine development will either be co-disposed within the WRSFs or be stored within the temporary overburden stockpile facility adjacent to the Tailings Storage Facility for later use as closure cover material. Approximately 7.4 Mt of overburden material will be removed from which about 0.095 Mt will be used for the TSF closure cover.

It is anticipated that the native lichen community will naturally re-vegetate the TSF cover and WRSFs over time. Re-vegetation studies would be completed to assess the potential for vegetation to establish in disturbed areas or on rockfill covers during the Project development.

In general, re-vegetation of disturbed sites in the Arctic is variable and depends on the extent and intensity of the disturbance (i.e., removal of vegetation or removal of vegetation and soil) and how far north of the tree line the disturbance occurs.

Forbes et al. (2001) and Walker and Everett (1991) indicated that arctic ecosystems can take from 20 to 75 years for vegetation to recover following disturbance. However, native sedges (*Carex* spp) and cotton grasses (*Eriophorum* spp.) may revegetate in Arctic tundra in 5 to 10 years (Chapin and Chapin 1980). Additionally, Forbes et al. (2001) reported that viviparous species such as Poa alpigena sp. colpodea, Polygonum viviparum, Saxifraga rivularis, and S. foliolosa were successful in recolonating within 20 years following disturbance. In contrast lichens failed to recolonize disturbed areas.

Research on abandoned winter roads on peatlands in the Hudson Bay Lowland also showed that lichen, bryophyte, and vascular plant cover returned to a similar state as the adjacent undisturbed peatlands within 5 years, though species composition was different (Campbell and Bergeron 2012).

References

Campbell D. and J. Bergeron. 2012. Natural Revegetation of Winter Roads on Peatlands in the Hudson Bay Lowland, Canada Arctic, Antarctic & Alpine Research. May2012, Vol. 44 Issue 2, p155-163. 9p

Chapin III, F.S and M.C. Chapin. 1980. Revegetation of an Arctic Disturbed Site by Natuve Tundra Species. Journal of Applied Ecology 17, 449-456

Forbes, B.C., J.J. Ebersole and B. Strandberg. 2001. Anthropogenic Disturbance and Patch Dynamics in Circumpolar Arctic Ecosystems. Conservation Biology, 8/1/2001, Vol. 15, Issue 4, p. 954-969

Walker, D.A., and K.R. Everett. 1991. Loess ecosystems of Northern Alaska: regional gradient and toposequence at Prudhoe Bay. Ecological Monographs, 61(4): 437-464.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-04**
Re:	**Incorporation of Inuit Qaujimajatuqangit into Monitoring Activities**		

Comment made by Interested Party:

Please provide a discussion on how IQ has been incorporated into the monitoring activities associated with the water management plan.

Agnico Eagle's Response to Comment:

Section 1.5 of the Water Management Plan states "*IQ indicated that the rivers and Meliadine Lake are important fish harvesting sites, and Elders expressed concerns regarding potential adverse effects from the Project on fish populations in waterbodies of the Meliadine watershed. [ ] Water quality monitoring will be conducted during construction, operation and decommissioning phases to ensure that water quality trends are similar to baseline conditions and so that adaptive management can be conducted should differing trends be observed*." Station selection was based upon protection of Meliadine Lake so stations were selected to test treated effluent before release to Meliadine Lake.

The importance of clean water and the health of vegetation, fish, birds, caribou, and other wildlife was emphasized by the Elders and other people in the communities who rely on these resources for traditional use. Subsequently station selection also considered local lakes in the area that might be influenced by the Project during construction, operations, and closure (See Table 9.1 in the Water Management Plan).

In addition, stations were selected in areas of seepage collection including the landfill, the Tailings Storage Facility, the Waste Rock Storage Facilities, and the Ore Storage Facilities, to confirm water quality predictions and to verify that once the mine closes there will be no adverse effects to traditional land use due to seepage.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-05**
Re:	**Saline Groundwater Inflows**		

Comment made by Interested Party:

We agree with AEM's preferred option, ocean disposal, but require more information to fully assess this option. One primary concern arises from AEM's statement that "excess underground water will be treated for TSS and metals, and pumped to a surface tank for temporary storage prior to being trucked to a discharge facility at Itivia Harbour." We request that AEM also treat these discharges for nutrients, particularly nitrates, and oil and gas residue due to blasting and contact with machinery.

AEM should provide full details of the saline water management plan in the water licence application. Full details including volume and discharge criteria should be provided for the preferred disposal/treatment option.

Agnico Eagle's Response to Comment:

Potential saline water will come from groundwater infiltration below the permafrost and will mix with other groundwater. Hydrogeological studies are planned for 2015 and 2016 to increase the accuracy of current estimates for groundwater flow and saline water content. Groundwater will be re-circulated for underground operations and excess groundwater will be pumped to the surface for management.

Agnico Eagle is considering several options for the long-term management of groundwater reporting to the underground workings at the Project (Appendix F). During Year -5 and Year -4 of construction, a hydrogeological investigation program will be completed to improve estimates of the amount and quality of groundwater that may potentially report to the underground mine. In Year -3 (i.e., 2017), following the completion of the investigation, the long-term groundwater management strategy for the Project will be finalized and submitted to the NWB for approval.

An interim plan is required for the first two years of groundwater inflows (i.e., Year -3 and Year -2) to allow for implementation of the long-term groundwater management strategy. Excess water from the underground mine will be pumped to the surface for storage for Years -3 and -2. Based on the estimated groundwater inflow rates (Table 4.5) and underground drilling water make-up requirements (Appendix B, Table B.7), up to approximately 0.25 Mm^3 of groundwater will require storage on surface. The surface storage option selected will be dependent on the results of the hydrogeological study and the amount of groundwater encountered.

Table 4.5, page 28, Water Management Plan, April 2015

Table 4.5 Estimated Rates of Passive Groundwater Inflow to Underground Mine

Year	Estimated Passive Inflow (m^3/day)*
Yr -5 to First Quarter of Yr -3	0
Second Quarter of Yr-3 to End of Yr-3	420
Yr -2 to Yr 7	526

*based on data provided in Agnico Eagle (2014); to be reassessed based on results from the planned 2015 and 2016 hydrogeological investigation program

Appendix B, Table B.7, Water Management Plan, April 2015

Table B.7 Assumptions for Underground Mine Water Balance

Property	Value	Source or Comments
Drilling Water for Underground Mine (m^3/day)	263 for Year -5; 574 for Year -4	Agnico Eagle
	830 for Year -3; 1,376 for Year -2	
	1,390 for Year -1; 1,459 for Year 1	
	1,260 for Year 2; 1,083 for Year 3	
	1,158 for Year 4; 1,179 for Year 5	
	941 for Year 6; 753 for Year 7	
Water Loss in Ore and Waste Rock from Underground Mine	3% by weight	Agnico Eagle
Sludge from Underground TSS Removal Plant	2.6% of total feed	Agnico Eagle
Fresh Water Supply to Underground Saline Water Tank to Reduce Salt Concentration in Drilling Water	2.5 m^3/h (October of Year -1 to Year 7)	Agnico Eagle

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-06**
Re:	**Site-Specific Water Quality Objective Derivation**		

Comment made by Interested Party:

Please provide a discussion of how all SSWQOs used for the project were derived. This should specifically include the Golder, 2013a reference. We note that the CCME SSWQO derivation protocols are the preferred methodology.

Agnico Eagle's Response to Comment:

Derivation of the site-specific water quality objectives (SSWQOs) occurred in a step-wise, technically defensible manner including discussions and meetings with Environment Canada in Ottawa. Substances of potential concern were initially identified to determine whether it would be appropriate to develop SSWQOs following procedures outlined by CCME (2003, 2007). Specific factors assessed included the basis for respective CCME water quality guidelines (WQGs), site-specific exposure and toxicity modifying factors (ETMFs) that may influence the bioavailability of these substances to aquatic receptors, and background concentrations of these substances in surface waters within the study area together with leachate chemistry. Chemical parameters were both measured and modelled, including predominant chemical species.

Site-specific water quality objectives were developed for parameters for which conservative modelling predicted exceedances of background concentrations. The SSWQOs for fluoride, arsenic, and iron for the Project were derived following CCME (2003), using the CCME (2007) species sensitivity distribution (SSD) approach. Detailed information is provided in Golder (2013) (attached). For the purpose of SSD derivation, the receiving environment was assumed to include Meliadine Lake and surrounding smaller lakes within the study area (e.g., Lake A1, Lake B5). The SSD approach provided no-effect benchmarks above which effects may or may not occur in these waterbodies.

In addition to the development of the SSDs, toxicity testing agreed-upon with Environment Canada was conducted to provide a final answer to the question: is leachate from the Meliadine waste rock toxic to aquatic life in the site-specific receiving environment? Toxicity testing involved direct exposure of fertilized rainbow trout eggs to waste rock in Meliadine Lake water and raising these eggs to the alevin stage over 30 days. There were no adverse effects to the rainbow trout early life stages. Detailed information is provided in Golder (2014) (attached).

References:

CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Water Quality Guidelines for Protection of Aquatic Life – Guidance for Site-Specific Application of Water Quality Guidelines in Canada and Procedures for Deriving Numerical Water Quality Objectives. Winnipeg, MB, Canada.

CCME. 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007. In: Canadian Environmental Quality Guidelines. Winnipeg, MB, Canada.

Golder (Golder Associates Ltd.). 2013. Site-Specific Water Quality Objective (SSWQO) Assessment - Meliadine Gold Project, Nunavut. Technical Memorandum to Agnico Eagle Mines Ltd. February 22, 2013. 57pp.

Golder. 2014. Assessment of Site-Specific Exposure and Toxicity Modifying Factors on Aluminum Toxicity and Validation of Non-Deleterious Nature of All Parameters of Potential Concern in Waste Rock Leachate – Meliadine Gold Project, Nunavut. Technical Memorandum to Agnico Eagle Mines Ltd. March 14, 2014. 7pp + appendices.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-07**
Re:	**Mixing Zone Water Quality Monitoring**		

Comment made by Interested Party:

Please provide two additional monitoring sites around the diffuser or sufficient rationale why a single monitoring station is sufficient to characterize the receiving environment at the edge of the mixing zone for discharges to a lake.

Agnico Eagle's Response to Comment:

Agnico has identified five stations in the near-field area where data will be collected to characterize the receiving environment in the mixing zone.

In the Water Management Plan, one general aquatic monitoring station was identified at the edge of the mixing zone for water management purposes. However, in the Aquatic Effects Monitoring Program (AEMP) Design Plan, five general aquatic monitoring stations were identified in the near-field exposure area, including the station at the edge of the mixing zone (Mel-01-02). The near-field exposure area is the area of Meliadine Lake where the diffuser will be located and is thus the initial receiving environment. The single station in the Water Management Plan is the same as one of the five stations in the AEMP near-field area. Five stations in an area was selected to be consistent with the Metal Mining Technical Guidance for Environmental Effects Monitoring (EC 2012). The actual locations of the monitoring stations will be determined during the 2015 field program, and adjusted as necessary, after installation of the diffuser, but three of the five stations can be positioned to the edge of the mixing zone. All stations will be sampled on the same schedule (Table 5-1 in the AEMP and Table 4-1 in the Environmental Management and Protection Plan [EMPP]) with samples analyzed for the same suite of parameters (Table 5-2 in the AEMP and Table 4-2 in the EMPP).

Results from these stations will be reported to the NWB in the annual report or in the annual AEMP report.

References:

EC (Environment Canada). 2012. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. Gatineau, QC: Environment Canada.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-09**
Re:	**Plume Delineation Model Assumptions**		

Comment made by Interested Party:

Please provide a discussion on the appropriateness of each input to the CORMIX model for review. This may impact the proposed end of pipe discharge criteria presented in Appendix H if inputs are not found to be sufficiently conservative.

Agnico Eagle's Response to Comment:

The mixing behaviour of mine effluent in the mixing zone (100 m radius from the outfall) of the diffuser was predicted using the Cornell Expert Mixing System (CORMIX) model (Doneker and Jirka 2007). CORMIX is one of the most extensively used models for predicting plume mixing and dilution of substances in surface waterbodies. This model has been used for conceptual design and analysis of effluent outfalls in other northern Canadian waterbodies. As CORMIX results are considered accurate to within ±50% (Doneker and Jirka 2007), the dilution ratios predicted by the model are divided by two, to ensure the most conservative results are presented.

A summary of model inputs is presented in Table 1, along with explanatory notes for the data or assumptions used for each input. The CORMIX model system assumes steady-state and generally uniform ambient conditions and effluent discharges. As natural systems are expected to vary, several model scenarios were developed to assess a range of possible ambient conditions and changes in effluent. In total, 72 simulations of the CORMIX model were developed from combinations of the following:

- Six possible concentrations of total dissolved solids (TDS) in the effluent:
    - 2400 mg/L, 1800 mg/L, 1200 mg/L, 600 mg/L, 300 mg/L, and 35 mg/L;
- Two possible effluent flow rates:
    - maximum (0.12 m^3/s), and average (0.047 m^3/s);
- Three possible ambient wind conditions:
    - average, maximum, and none (stagnant conditions); and
- Two possible angles of effluent discharge:
    - Perpendicular and parallel to lake current.

The lowest dilution rate (65x) was predicted using the maximum flow rate, near stagnant conditions. Under stagnant conditions, discharge orientation has a relatively small effect on mixing, compared to

non-stagnant conditions. Changes in effluent TDS have a relatively small effect on mixing compared to changes in effluent flow rate, lake velocity, and discharge orientation.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Effluent Data					
Temperature	°C	13.5			Observed temperatures in the waterbodies of the Meliadine peninsula are assumed to be representative of the range of temperatures expected at Contact Pond 1, and were therefore considered to characterize the mine effluent.
Total Dissolved Solids (TDS)	mg/L	2400, 1800, 1200, 600, 300, 35			Varying from ambient concentration (35 mg/L) to maximum allowable discharge concentration (2400 mg/L). This range captures all reasonably foreseeable conditions.
Total Suspended Solids (TSS)	mg/L	15			Conservatively assumed to be maximum allowable concentration from discharge (MMER 2002).
Density	kg/m^3	1001.2, 1000.7, 1000.3, 999.8, 999.6, 999.4			Calculated from temperature, TDS, and TSS, following method of Coles and Wells (2003).
Effluent Flowrate	m^3/s	Maximum = 0.12, Average = 0.047			Estimated maximum and average discharge rates from pipeline summary of water balance (June 2014 Mine Plan) for Meliadine Feasibility Study.
Concentration	%	100			Assumed 100% starting concentration. Used to evaluate dilution.
Ambient Geometry					
Average Depth	m	9			The diffuser is expected to be installed in Meliadine Lake to a depth of at least 9 m; this depth is supported by local bathymetry in the proposed diffuser location.
Depth at Discharge	m	9			
Ambient Velocity	m/s	0.18	0.45	0.005	Based on 3% of wind speed. The ratio of wind speed to lake currents can vary; however, assuming lake velocities equal to 3% of wind speed is considered reasonable (Wetzel 2001).
Wind Speed	m/s	6	15	0	Range of observed, open-water wind speed to represent average, maximum, and near stagnant conditions; from Environment Canada climate station Rankin Inlet A (Golder 2014). As effluent will only be released during open-water conditions, wind speeds observed during under-ice conditions were omitted.
Manning's Coefficient	-	0.015			A measure of the roughness of the lake bed. Assumed value; typical value for similar waterbodies.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Ambient Density Data					
Type	-	Freshwater			-
Temperature	°C	7.5			Average open water temperature (June to July) based on site monitoring data (Golder 2014).
Total Dissolved Solids (TDS)	mg/L	35			Median ambient concentration based on site monitoring data (Golder 2014).
Total Suspended Solids (TSS)	mg/L	3			
Density	kg/m^3	999.9			Calculated from temperature, TDS, and TSS, following method of Coles and Wells (2003).
Discharge Geometry					
Model	-	CORMIX2			-
Nearest Bank	-	Left			-
Distance to Nearest Bank	m	1000			Actual distance approximately 300 m, plume is not expected to be bank attached. A distance of 1000 m is used in model to ensure CORMIX does not model the plume as bank attached.
Port Spacing	m	6			Based on calculated plume width from preliminary modelling. Spacing used to ensure plumes do not interact.
Diffuser Length	m	30			Based on port spacing and number of ports.
Number of Ports	-	6			Based on preliminary modelling to ensure sufficient dilution and effluent velocity.
Vertical Angle	°	45			Common port angle (Doneker and Jirka 2007). The 45° angle of the port directs the plume upwards, reducing the mixing below port and erosion of lake bed.
Horizontal Angle	°	Coflow = 0, Crossflow = 90			Two possible angles of effluent discharge were evaluated: perpendicular and parallel to lake current. These angles were used to assess range of plume behavior under different lake current conditions.
Diffuser Alignment Angle	°	Coflow = 90, Crossflow = 0			
Relative Angle of Ports	°	90			Ports to be installed perpendicular to diffuser axis.
Port Diameter	m	0.051 (2 inches)			Used to ensure maximum effluent velocity does not exceed 10 m/s. This maximum velocity is used to ensure that the effluent plume does not cause lake bed erosion.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Port Height	m	1			A port height of approximately 1 m is recommended to ensure the plume does not erode or disturb lake bed sediments.

Of the ambient geometry inputs listed in Table 1, lake velocity (as derived from wind speed) has the largest effect on dilution of effluent or the plume mixing zone. The rate of effluent dilution at the edge of the mixing zone (100 m) generally increases with lake velocity, and thus windy conditions predict a higher dilution rate than near-stagnant conditions.

Effluent quality criteria (EQC) (i.e., the proposed end of pipe criteria presented in Appendix H of the Water Management Plan) were developed based on the minimum predicted dilution rate (65x) in the mixing zone. This minimum dilution is predicted under near-stagnant, open-water conditions using a lake velocity of 0.0005 m/s. The near-stagnant condition is generally assumed to only occur in under-ice conditions when wind effects on the lake velocity are blocked by ice cover. To apply conservatism to the development of EQCs, the near-stagnant condition was assumed for the open-water period.

Effluent will be discharged during the open-water period (i.e., June to September or October). Discharge is not planned during under-ice conditions, and thus thus under-ice modeling is considered not to be required. Instead, it can be assumed that lake turnover and mixing prior to ice formation would enhance mixing and dilute plume concentrations. Therefore, the near-stagnant, open-water predictions used to calculate the EQCs represent a conservative, reasonable case.

References:

Cole, T.M. and S.C. Wells. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6 - User Manual. Instruction Report EL-08-1, Prepared for U.S. Army Corps of Engineers, Washington, DC.

Doneker, R.L. and G.H. Jirka. 2007. *CORMIX User Manual*. U.S. Environmental Protection Agency: EPA-823-K-07-001, Washington, DC.

Golder (Golder Associates Ltd.), 2014. Final Environmental Impact Statement (FEIS) – Melidaine Gold Project, Volume 7.0 Freshwater Environment. Report number: Doc 314-1314280007 Ver. 0. April 2014.

Metal Mining Effluent Regulations (MMER). 2014. Minister of Justice. Government of Canada. SOR/2002-222.

Wetzel, RG. 2001. Limnology: Third Edition. Academic Press; New York.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-10**
Re:	**Quality Control Responses**		

Comment made by Interested Party:
AEM should provide a discussion on how data will be handled if the 20% RPD threshold is violated. Please provide a discussion on what criteria will be used to disqualify the inclusion of, for example: single parameters, discrete samples and sampling events.

Agnico Eagle's Response to Comment:

Validation of data collected through a monitoring program is a multiple step process. First there is the collection of quality control samples to detect potential contamination (done through analysis of travel and field blank samples) and to confirm within-site variability and field sampling (done through the analysis of duplicate samples); second, results for dissolved and total parameters are compared; third, data are reviewed for potential unusual values or outliers.

Quality Control Sample Review: Blank Samples
As described in the Aquatic Effects Monitoring Program (AEMP) Design Plan document, the field quality control (QC) program for water quality will include the collection and analysis of blank QC samples. Results from blank samples (travel and/or field blanks) will be considered notable if concentrations are greater than or equal to five times the corresponding detection limit (DL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency and takes into account the potential for reduced accuracy when concentrations approach or are below DLs (USEPA 2000; AENV 2006).

Results for notable parameters from the blanks will be evaluated to determine if:

- the result is limited to a field blank or if it is apparent in corresponding water samples;
- there was a consistent bias in the results for the parameter across all samples; and
- if the notable result was severe enough to warrant invalidating the affected data.

Quality Control Sample Review: Duplicate Samples
As described in the AEMP Design Plan document, the field QC program for water quality will also include the collection and analysis of duplicate QC samples. The threshold of 20 percent (%) or less relative percent difference (RPD) between duplicate samples has been selected to identify if results are considered acceptable. For each set of duplicate samples, RPDs will be calculated for each parameter and for the overall duplicate pair. The RPD value for a given parameter will be considered notable if:

- it is greater than 20%; and
- concentrations in one or both samples are greater than or equal to five times the DL.

The number of notable parameters will be compared to the total number of parameters analyzed to evaluate analytical precision. Analytical precision will be rated as follows:

- high, if less than 10% of the total number of parameters are notably different from one another;
- moderate, if 10% to 30% of the total number of parameters are notably different from one another; or
- low, if more than 30% of the total number of parameters are notably different from one another.

Total and Dissolved Comparison

Corresponding dissolved and total concentrations will be compared for each parameter (where both are measured) to determine if the dissolved values are greater than the total values. Where dissolved concentration values are more than the corresponding total concentration value, the results will be further evaluated through RPD values and values relative to five times the DL (5xDL). If the dissolved concentration value is more than the total concentration value, but the RPD between the dissolved and total concentration is less than 20%, the result will be accepted as valid. If the dissolved concentration value is more than the total concentration value, the RPD between the dissolved and total concentration is greater than 20%, and both (total and dissolved) concentrations are greater than 5xDL, the dissolved concentration will be considered notable.

For all notable results, the laboratory will be contacted to confirm the result; if the results are confirmed by the laboratory, the data will be further reviewed for other causes. If no other cause is identified, then the data will be considered valid for the total parameters, but the dissolved values will be qualified as having a dissolved to total RPD outside the acceptable range.

Data Validation

Data will be further validated with a two-step process. The first step will be a visual review of the data on a parameter basis using scatterplots to identify outliers from the overall dataset for that parameter. Data from the database will be exported, appropriately grouped, and plotted. Unusually high or low data values will be selected for further investigation. The second step of the process will involve data validation of the selected outlying data. The selected data will be invalidated on a case-by-case basis. Invalidated data will be retained in the database, but will be flagged indicated that the sample could be contaminated or results are designated as not correct due to an internal review of the data.

References

AENV (Alberta Environment). 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Edmonton, AB, Canada. 67 pp. ISBN: 0-7785-5081-8 (Print Edition); 0-7785-5082-6 (On-line Edition).

USEPA (United Sates Environmental Protection Agency). 2000. EPA Quality Manual for Environmental Programs. CIO 2105-P-01-0 (formerly 5360 A1).

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-11**
Re:	**Significance Thresholds for Water Quality, Sediment Quality, and Fish Tissue Chemistry**		

Comment made by Interested Party:

Please provide significance thresholds for water quality, sediment quality, and fish tissue chemistry as standalone VECs. This should be accompanied by a discussion of specific changes in the receiving environment that necessitate progression through the adaptive management response framework.

Agnico Eagle's Response to Comment:

As described in the Aquatic Effects Monitoring Program (AEMP) Design Plan, a Significance Threshold in an AEMP is defined as "*a magnitude of change that would result in significant adverse effects*". A Significance Threshold *is a clear statement of environmental change that must never be reached* (i.e., the "no-go" condition). Significance Thresholds centre on key values to protect (i.e., water and fish that can be safely consumed by humans, and maintenance of aquatic ecological function), and spans all monitoring components and impact hypotheses of the study design (i.e., the threshold is based on ecology and not change in a single VEC).

In the AEMP design plan document (Section 8.3), Significance Thresholds were proposed as follows:

- Water is not drinkable (human health and/or wildlife risk);
- Fish are not safe for consumption (human health and/or wildlife risk); and
- Ecological Function is not maintained.

Action Levels that relate to ecological function were defined for water quality, sediment quality, and fish tissue chemistry (Section 8.4 in the AEMP Design Plan). These aquatic components, and the measurement endpoints considered for each component (Table 3-1 in the AEMP), provide early warning indication of potential adverse effects to plankton and benthos (i.e., food for fish), to fish health, and to the maintenance of ecological function (including water quality and sediment quality). The proposed Low Action Levels (Table 8-2 and 8-3 in the AEMP Design Plan) are designed such that changes of sufficient magnitude to trigger a Low Action Level are reported, documented, investigated, and ultimately addressed (i.e., mitigation measures or operational changes are implemented) before Significance Thresholds would ever be reached; If a Low Action Level is reached, Medium and High Action Levels (with response actions) are also developed to provide further adaptive management guidance to the Mine to avoid reaching the Significance Thresholds.

The type of management response taken after reaching an Action Level will depend on the type and magnitude of effect observed, and cannot be defined *a priori*; examples of management responses were provided in Table 8-1 in the AEMP design plan. The Action level response examples are aligned with options developed for the Meadowbank Mine.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-12**
Re:	**Fish Tissue Baseline**		

Comment made by Interested Party:

Please collect additional fish tissue data to update the baseline prior to issuance of the water licence.

Agnico Eagle's Response to Comment:

Baseline fish health and fish tissue data collection was planned for 2015 in the near field area of Meliadine Lake from Lake Trout and Threespine Stickleback. Data will be collected in August 2015 and prior to issuance of the water licence.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-13**
Re:	**Landfarm and on-site storage of hydrocarbon contaminated soil**		

Comment made by Interested Party:

Please indicate in the Concordance Table all sections of the Water Licence Application that refer to a landfarm and provide the requisite documentation.

Agnico Eagle's Response to Comment:

Reference to «Landfarm» activities are made in :

- Main Application Document, Section 4, specifically in section 4.2.7.3.
- Main Application Document, Section 7.7
- Main Application Document, Appendix B, table 4.5 and 4.6
- Landfarm Management Plan, in support of Licence A application

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-14**
Re:	**Plans for Abandonment and Restoration**		

Comment made by Interested Party:
Please provide detailed information on the anticipated costs of the abandonment and restoration components of the project, as well as plans for addressing these costs.

Agnico Eagle's Response to Comment:
As per Section 10 – Financial Security of the Preliminary Closure and Reclamation Plan (CRP) document.

A permanent closure and reclamation financial security cost estimate has been prepared to a conceptual level with the present mine layout and infrastructure.

The cost estimate covers the closure and reclamation of all Project facilities as described in the CRP and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project. A copy of the RECLAIM model was provided as Attachment E to the Cover Letter. The anticipated cost for abandonment and restoration is 47.5M. Summary of costs is provided in the table below.

SUMMARY OF COSTS				
CAPITAL COSTS	**COMPONENT NAME**	**COST**	**LAND LIABILITY**	**WATER LIABILITY**
OPEN PIT	Tiriganiaq Pit 1	$2,781,689	$0	$2,781,689
	Tiriganiaq Pit 2	$54,436	$0	$54,436
UNDERGROUND MINE	Tiriganiaq	$969,540	$0	$969,540
TAILINGS FACILITY	Tailings Storage Facility	$1,489,584	$0	$1,489,584
ROCK PILE	Waste Rock Facility East	$0	$0	$0
	Waste Rock Facility West	$0	$0	$0
	Waste Rock Facility H19-H20	$0	$0	$0
BUILDINGS AND EQUIPMENT		$18,916,071	$0	$18,916,071
CHEMICALS AND CONTAMINATED SOIL MANAGEMENT		$1,917,861	$0	$1,917,861
SURFACE AND GROUNDWATER MANAGEMENT		$127,050	-	$127,050
INTERIM CARE AND MAINTENANCE		$1,684,380	-	$1,684,380
	SUBTOTAL: Capital Costs	**$27,940,612**	**$0**	**$27,940,612**
	PERCENT OF SUBTOTAL		**0%**	**100%**
INDIRECT COSTS		**COST**	**LAND LIABILITY**	**WATER LIABILITY**
MOBILIZATION/DEMOBILIZATION		$9,687,952	$0	$9,687,952
POST-CLOSURE MONITORING AND MAINTENANCE		$879,778	$0	$879,778
ENGINEERING	5%	$1,397,031	$0	$1,397,031
PROJECT MANAGEMENT	5%	$1,397,031	$0	$1,397,031
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$279,406	$0	$279,406
BONDING/INSURANCE	1%	$279,406	$0	$279,406
CONTINGENCY	20%	$5,588,122	$0	$5,588,122
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0	$0
	SUBTOTAL: Indirect Costs	**$19,508,726**	**$0**	**$19,508,726**
TOTAL COSTS		**$47,449,337**	**$0**	**$47,449,337**

Appendix B. Summary of Water Balance Key Assumptions and Results, Meliadine Gold Project.

TETRA TECH EBA

TECHNICAL MEMO

ISSUED FOR USE

To: Stephane Robert, Agnico Eagle Mines Limited	**Date:**	October 1, 2015
c: Nigel Goldup, P.Eng., Tetra Tech EBA	**Memo No.:**	001
From: Guangwen (Gordon) Zhang, P.Eng., Tetra Tech EBA **Hongwei Xia, P.Eng., Tetra Tech EBA**	**File:**	704-ENG.EARC03000-01

Subject: Summary of Water Balance Key Assumptions and Results, Meliadine Gold Project

1.0 INTRODUCTION

This technical memorandum is prepared to respond to the following information request for the Type A Water Licence Application of Meliadine Gold Project:

"The proponent should include a full list of assumptions and supporting rational as well as all results for the site water balance in the water licence application. The water balance should be calculated under at least three scenarios: mean precipitation, 1:100 precipitation and under drought conditions."

2.0 WATER BALANCE FOR MEAN PRECIPITATION YEARS

2.1 Basis and Assumptions

The water balance for mean precipitation years has been documented in Section 7 of the Water Management Plan report "Water Management Plan, Meliadine Gold Project, April 2015, Version 1, 6513-MPS-11, prepared by Agnico Eagle Mines Limited." The water balance input parameters and assumptions are summarized in tables found in Appendix B of the Water Management Plan.

2.2 Key Results

The water balance results for mean precipitation years are summarized in Section 7.2 of the Water Management Plan. The selected key results of the water balance are provided in tables found in Appendix D of the Water Management Plan.

Figure 1 presents the projected water elevation in CP1 water collection pond during mine operation under mean precipitation years.

3.0 WATER BALANCE FOR 1:100 WET PRECIPITATION YEARS

3.1 Basis and Assumptions

The basis and assumptions for the water balance for 1:100 wet precipitation years are similar to those for the mean precipitation years, except that the surface runoff estimation parameters for 1:100 wet precipitation years are used.

The adopted surface runoff estimation parameters for 1:100 wet precipitation years are presented in Table B.2 in Appendix B of the Water Management Plan.

3.2 Key Results

The estimated maximum annual water input/output from each of various water management facilities under 1:100 wet precipitation conditions are summarized in Table 1.

Table 1: Estimated Maximum Annual Volumes from Mine Site Water Balance for 1:100 Wet Precipitation Years

Item	Maximum Annual Water Volume (Mm^3)
Contact Water from CP1	1.474
Contact Water from CP2	0.014
Contact Water from CP3	0.170
Contact Water from CP4	0.172
Contact Water from CP5	0.461
Contact Water from CP6	0.146
Water Pumped from CP1 to WTP for Treatment	1.474
Treated Water from WTP to be Discharged to Outside Environment	1.361

The selected key results of the water balance for 1:100 wet precipitation years are provided in tables found in Appendix A. Note that the water balance assumes that each year during the mine operation would be a 1:100 wet precipitation year since we cannot predict which year would be a wet year during the mine operation.

Figure 2 presents the projected water elevation in CP1 water collection pond during mine operation under 1:100 wet precipitation years.

4.0 WATER BALANCE FOR 1:100 DRY PRECIPITATION YEARS

4.1 Basis and Assumptions

The basis and assumptions for the water balance for 1:100 dry precipitation years are similar to those for the mean precipitation years, except that the surface runoff estimation parameters for 1:100 dry precipitation years are used. The adopted surface runoff estimation parameters for 1:100 dry precipitation years are presented in Table 2.

Table 2: Various Parameters for Surface Runoff Estimation for a 1:100 Dry Precipitation Year

Item	Value	Source or Comment
Total adjusted annual precipitation for a 1:100 dry precipitation year	225 mm	FEIS Volume 1 – Popular Summary
Total adjusted annual rainfall for a 1:100 dry precipitation year	93 mm	FEIS Volume 1 – Popular Summary
Total adjusted annual water equivalent snowfall for a 1:100 dry precipitation year	132 mm	FEIS Volume 1 – Popular Summary
Total estimated snow sublimation	99 mm	FEIS Volume 1 – Popular Summary
Estimated snow melt water equivalent in spring freshet for a 1:100 dry precipitation year	33 mm	Calculated based on values above
Estimated rainfall runoff coefficient for natural on-land surface for a 1:100 dry precipitation year	0.7 in June 0.5 in July to October	Estimated based on various sources
Monthly rainfall distribution	16% in June, 21.2% in July, 30.8% in August, 24.5% in September, and 7.5% in October	FEIS Volume 1 – Popular Summary
Annual net runoff on natural on-land surface for a 1:100 dry precipitation year	81 mm (43 mm in June, 10 mm in July, 14 mm in August, 11 mm in September, and 3 mm in October)	Calculated based on values above
Estimated monthly lake surface evaporation	60 mm in June, 125 mm in July 96 mm in August, and 42 mm in September	FEIS Volume 1 – Popular Summary
Annual net runoff on lake surface for a 1:100 dry precipitation year	-196 mm (-12 mm in June, -105 mm in July, -67 mm in August, -19 mm in September, and 7 mm in October)	Calculated based on values above
Estimated monthly natural land surface evapotranspiration	6 mm in June, 14 mm in July 11 mm in August, and 5 mm in September	FEIS Volume 1 – Popular Summary
Annual net runoff on disturbed land surface for a 1:100 dry precipitation year	117 mm (49 mm in June, 24 mm in July, 25 mm in August, 16 mm in September, and 3 mm in October)	Calculated based on values above
Average start date for spring freshet	June 11	FEIS Volume 1 – Popular Summary
Average date for spring runoff peak	June 13	FEIS Volume 1 – Popular Summary

4.2 Key Results

The estimated maximum annual water input/output from each of various water management facilities under 1:100 dry precipitation conditions are summarized in Table 3.

Table 3: Estimated Maximum Annual Volumes from Mine Site Water Balance for 1:100 Dry Precipitation Years

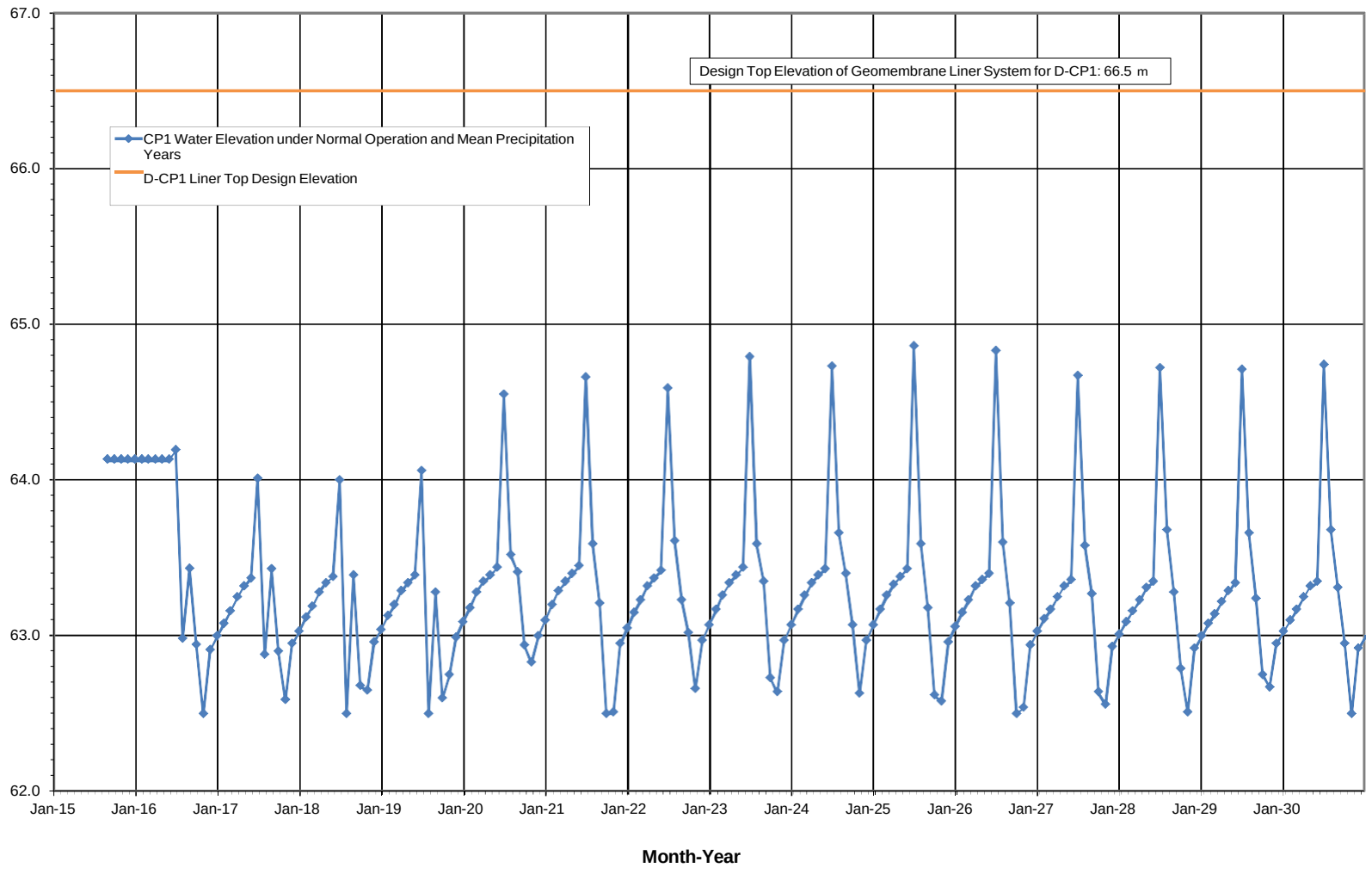
Item	Maximum Annual Water Volume (Mm^3)
Contact Water from CP1	0.430
Contact Water from CP2	0.003
Contact Water from CP3	0.037
Contact Water from CP4	0.034
Contact Water from CP5	0.101
Contact Water from CP6	0.032
Water Pumped from CP1 to WTP for Treatment	0.430
Treated Water from WTP to be Discharged to Outside Environment	0.362

The selected key results of the water balance for 1:100 dry precipitation years are provided in tables found in Appendix B. Note that the water balance assumes that each year during the mine operation would be a 1:100 dry precipitation year since we cannot predict which year would be a dry year during the mine operation.

Figure 3 presents the projected water elevation in CP1 water collection pond during mine operation under 1:100 dry precipitation years.

5.0 LIMITATIONS

This technical memorandum and its contents are intended for the sole use of Agnico Eagle Mines Limited and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Agnico Eagle Mines Limited, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are attached to this memo.



LEGEND

NOTES

STATUS

ISSUED FOR USE

CLIENT

AGNICO EAGLE

TETRA TECH EBA

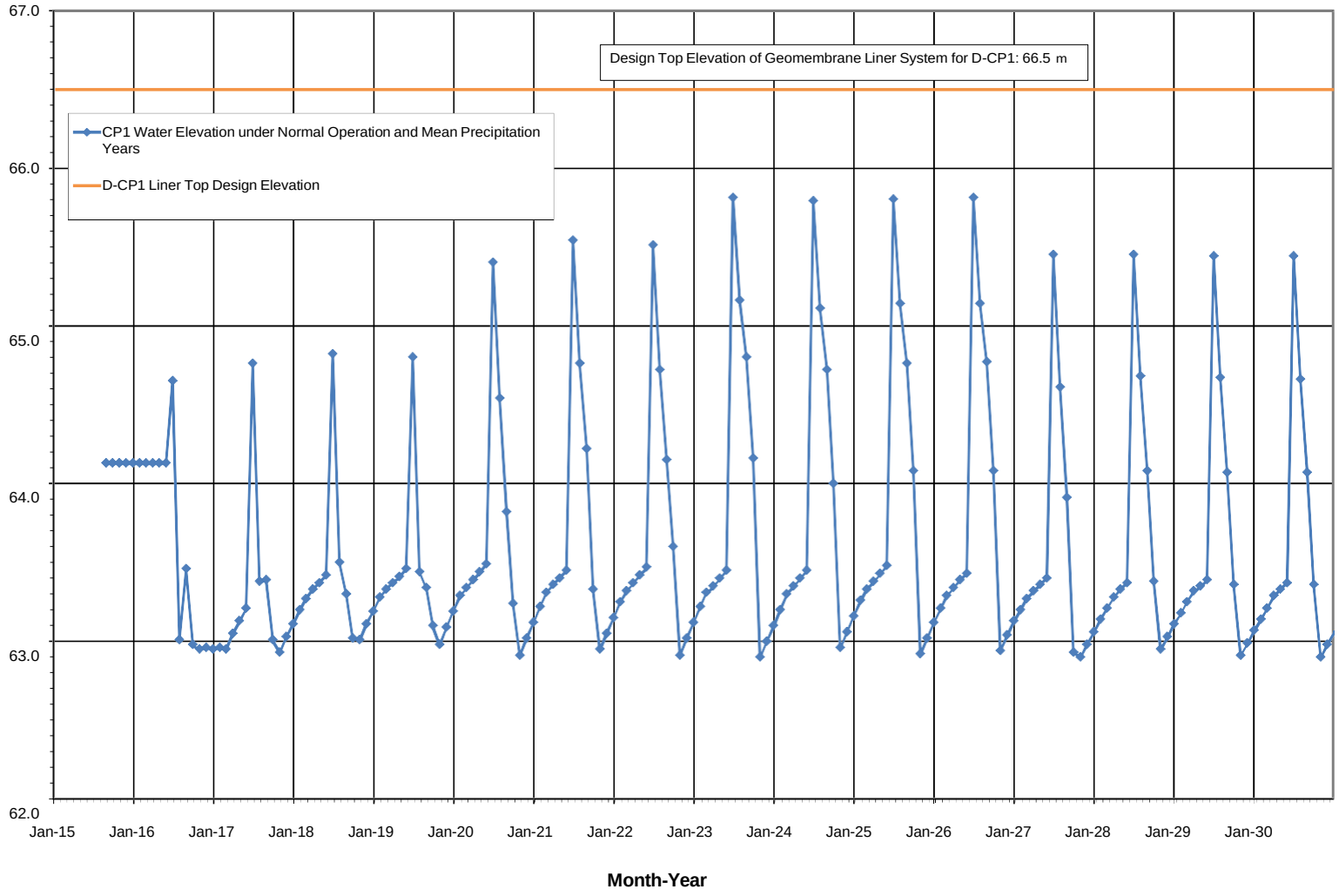
MELIADINE GOLD PROJECT, NU, CANADA

Projected Water Elevation in CP1 Water Collection Pond during Mine Operation under Mean Precipitation Years

PROJECT NO.	DWN	CKD	APVD	REV
704-ENG.EARC03000-01	VL/G	GZ	GZ	0

OFFICE	DATE
EBA-EDM	Oct. 1, 2015

Figure 1



LEGEND

NOTES

STATUS

CLIENT

AGNICO EAGLE

TETRA TECH EBA

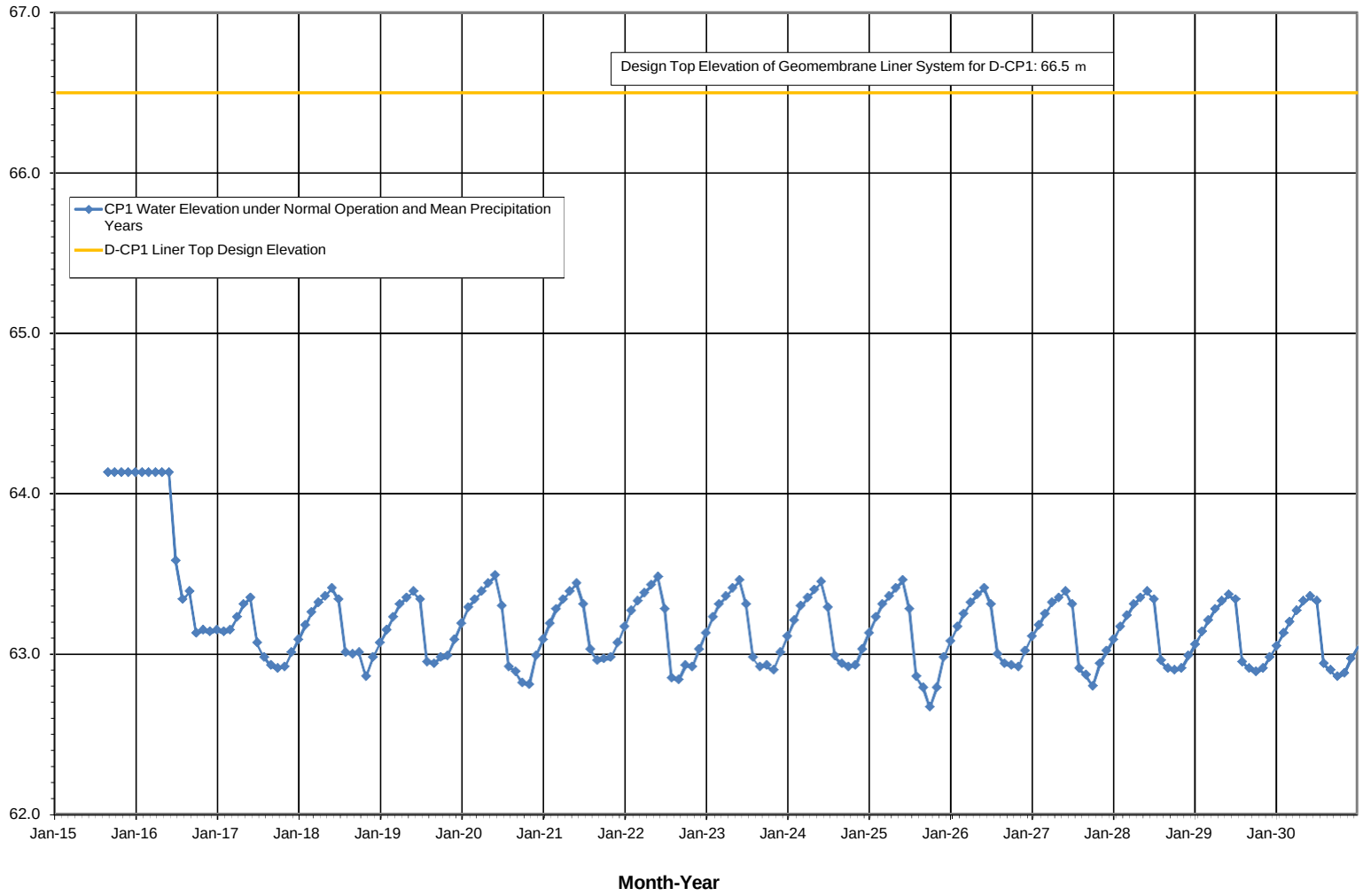
MELIADINE GOLD PROJECT, NU, CANADA

Projected Water Elevation in CP1 Water Collection Pond during Mine Operation under 1:100 Wet Precipitation Years

PROJECT NO.	DWN	CKD	APVD	REV
704-ENG.EARC03000-01	HX	GZ	GZ	0
OFFICE	DATE			

Figure 2

ISSUED FOR USE



LEGEND

NOTES

STATUS

ISSUED FOR USE

CLIENT

AGNICO EAGLE

TETRA TECH EBA

MELIADINE GOLD PROJECT, NU, CANADA

Projected Water Elevation in CP1 Water Collection Pond during Mine Operation under 1:100 Dry Precipitation Years

PROJECT NO.	DWN	CKD	APVD	REV
704-ENG.EARC03000-01	HX	GZ	GZ	0

OFFICE	DATE
EBA-EDM	Oct. 1, 2015

Figure 3

APPENDIX A

YEARLY WATER BALANCE SPREADSHEETS FOR WATER MANAGEMENT UNDER 1 : 100 WET PRECIPITATION YEARS

Mine Year	Calendar Year	Water Retained in Ore (Assumed 3% of Ore Mass)		Mill Make-up Water for Ore Processing		
				Fresh Water	Reclaim Water	Underflow (sludge) Water from WTP to Mill
		Estimated Water Retained in Ore from Tiriganiaq U/G	Estimated Water Retained in Ore from Open Pits	Fresh Water from Meliadine Lake to Mill for Ore Processing	Treated Water (after TSS Removal) from Water Treatment Plant (WTP) to Mill for Ore Processing	Underflow (sludge) Water from Water Treatment Plant (WTP) to Mill for Ore Processing
		m^3	m^3	m^3	m^3	
Yr -5	2015	0	0	0	0	0
Yr -4	2016	0	0	0	0	0
Yr -3	2017	0	0	0	0	0
Yr -2	2018	0	0	0	0	0
Yr -1	2019	6,071	0	27,127	1,568	1,300
Yr 1	2020	32,850	0	94,464	35,822	32,032
Yr 2	2021	32,850	0	94,278	34,110	33,930
Yr 3	2022	32,850	0	94,278	31,250	36,790
Yr 4	2023	33,576	20,690	155,742	74,074	38,324
Yr 5	2024	32,935	21,815	157,439	75,572	37,518
Yr 6	2025	29,023	25,727	157,129	75,492	37,908
Yr 7	2026	27,545	27,205	157,129	75,492	37,908
Yr 8	2027	27,225	12,394	111,918	52,980	30,862
Yr 9	2028	0	0	0	0	0

Water Treatment Plant											
		Inflow		Outflow							
				Treated Water					Underflow (Sludge) Water		
Mine Year	Calendar Year	Collected Contact Water to Water Treatment Plant (from Ore Pad Waste Rock/OB piles) (Year -5 only)	Water Pumped from CP1 (Drained Lake H17) to WTP for Treatment	Treated Water Pumped from WTP to Mill as Make-up Water	Treated Water Pumped from WTP to Prepare the Water for Road Dust Control and Emergency Ore Stockpile Freeze Control	Treated Water Pumped from WTP to Mined-out Pits (During Closure)	Treated Water Pumped from WTP to CP1 (Lake H17) (Year -5 only)	Remaining Treated Water Pumped/Flowing to Outside Environment	Sludge to CP1 (Drained Lake H17)	Sludge to Ditches near Overburden WRSF1 only in 2015	Sludge Water from WTP to Mill
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	4,556	0	0	0	0	4,437	(0)	0	118	0
Yr -4	2016	0	789,000	0	0	0	0	768,486	20,514	0	0
Yr -3	2017	0	927,000	0	0	0	0	902,898	24,102	0	0
Yr -2	2018	0	934,000	0	0	0	0	909,716	24,284	0	0
Yr -1	2019	0	920,000	1,568	459	0	0	894,053	22,620	0	1,300
Yr 1	2020	0	1,232,000	35,822	459	0	0	1,163,687	0	0	32,032
Yr 2	2021	0	1,305,000	34,110	459	0	0	1,236,501	0	0	33,930
Yr 3	2022	0	1,415,000	31,250	459	0	0	1,346,501	0	0	36,790
Yr 4	2023	0	1,474,000	74,074	459	0	0	1,361,143	0	0	38,324
Yr 5	2024	0	1,443,000	75,572	459	0	0	1,329,451	0	0	37,518
Yr 6	2025	0	1,458,000	75,492	459	0	0	1,344,141	0	0	37,908
Yr 7	2026	0	1,458,000	75,492	459	0	0	1,344,141	0	0	37,908
Yr 8	2027	0	1,247,000	52,980	459	0	0	1,161,139	1,560	0	30,862
Yr 9	2028	0	1,279,000	0	459	0	0	1,245,287	33,254	0	0
Yr 10	2029	0	1,284,000	0	0	0	0	1,250,616	33,384	0	0
Yr 11	2030	0	1,279,000	0	0	0	0	1,245,746	33,254	0	0

CP1 (Water Collection Pond Including Lake H17 and H6, Final Site Wide Contact Water Collection Pond)																							
		Inflow																				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Net Runoff/Runon Water from Surface Area of Industrial Pad for Camp and Mill Areas	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP1	Net Runoff/Runon Water from a Portion of WRSF2 Waste Rock Surface to CP1	TSF Tailings Surface Runoff Collected in CP1	TSF Waste Rock Cover Runoff Water Collected in CP1	Seepage Water through Tailings into CP1	Net Runoff/Runon from Landfill to CP1	Net Runoff/Runon Surface Water from Ore Stockpiles (OP1, OP2 and OP3) to CP1	Treated Sewage Water from Sewage Plant (SW) to CP1	Truck Wash Water from Wash Bay/Truckshop to CP1	Pre-Treated (Oil) Water from Landfarm/Biopile to CP1	Treated Water pumped from WTP to CP1 (Year -5 only)	Sludge from Water Treatment Plant to CP1	Water Pumped from CP4 to Partially Drained H13, then Flowing into CP1	Water Pumped from CP3 to Partially Drained H13, then Flowing into CP1	Water Pumped from CP2 to CP1	Water From Open Pit - Tiri_1000_02 to CP1 before YR-3	Water Pumped from CP5 to CP1	Water Pumped from CP6 to CP1	Water Pumped from CP1 to Water Treatment Plant for Treatment	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	9,390	14,552	0	0	0	0	0	0	0	0	139	0	0	0	4,437	0	0	0	0	0	0	0	0	28,518
Yr -4	2016	27,688	432,767	45,514	62,629	0	0	0	0	0	0	1,929	0	0	0	0	20,514	0	0	0	24,136	49,368	0	789,000	0
Yr -3	2017	20,157	389,965	48,769	87,861	0	0	0	0	0	3,371	2,216	49,058	0	3,237	0	24,102	0	0	14,147	0	292,930	0	927,000	0
Yr -2	2018	22,404	330,006	105,734	87,861	0	0	0	0	0	3,371	3,710	58,517	0	3,237	0	24,284	0	0	14,147	0	285,386	0	934,000	0
Yr -1	2019	23,366	308,592	93,102	87,861	10,531	0	0	0	0	3,371	9,862	58,517	2,429	3,237	0	22,620	0	0	14,147	0	282,105	0	920,000	0
Yr 1	2020	24,252	262,723	78,875	87,861	17,109	0	18,133	6,727	0	3,371	18,472	58,677	9,662	3,237	0	0	172,091	169,877	14,147	0	282,686	0	1,232,000	0
Yr 2	2021	25,124	259,895	68,272	87,861	21,331	0	15,147	9,346	0	5,777	26,090	58,517	9,636	3,237	0	0	117,147	169,877	14,147	0	415,654	0	1,305,000	0
Yr 3	2022	26,112	253,316	78,478	87,861	18,392	0	10,482	13,980	0	5,777	17,696	58,517	9,636	3,237	0	0	110,016	169,877	14,147	0	412,200	123,213	1,415,000	0
Yr 4	2023	28,636	234,184	73,053	87,861	20,313	0	33,471	19,133	0	5,777	21,831	58,517	9,636	3,237	0	0	114,677	155,855	14,147	0	461,138	131,770	1,474,000	0
Yr 5	2024	28,146	199,374	53,065	87,861	35,579	33,164	20,649	31,375	0	5,777	30,397	58,677	9,662	3,237	0	0	119,432	155,855	14,147	0	419,527	140,580	1,443,000	0
Yr 6	2025	28,661	190,836	49,834	87,861	36,047	32,821	24,346	36,931	0	5,777	36,526	58,517	9,636	3,237	0	0	120,143	159,184	14,147	0	419,608	141,427	1,458,000	0
Yr 7	2026	28,226	190,836	49,102	87,861	36,047	35,457	11,509	49,768	0	5,777	41,360	51,684	9,636	3,237	0	0	120,143	159,184	14,147	0	420,286	144,004	1,458,000	0
Yr 8	2027	21,924	190,836	77,504	87,861	36,047	37,679	8,576	52,701	0	5,777	25,102	51,684	0	3,237	0	1,560	120,143	159,184	14,147	0	203,121	146,057	1,247,000	0
Yr 9	2028	24,173	190,836	106,729	87,861	36,047	37,857	0	64,555	0	5,777	0	51,826	0	3,237	0	33,254	120,143	155,908	14,147	0	203,167	146,371	1,279,000	0
Yr 10	2029	24,195	190,836	106,837	87,861	36,047	37,453	0	64,555	0	5,777	0	51,684	0	3,237	0	33,384	120,143	155,908	14,147	0	203,063	146,371	1,284,000	0
Yr 11	2030	23,996	190,836	107,183	87,861	36,047	37,453	0	64,555	0	5,777	0	51,684	0	3,237	0	33,254	120,143	155,908	11,132	0	203,063	146,371	1,279,000	0

CP2 (Excavated Pond near LandFarm, Collecting Runoff from the Area Northeast of Industrial Pad Area)						
		Inflow			Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Water Pumped from CP2 to CP1	Water Flowing to CP1
		m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0
Yr -4	2016	0	0	0	0	0
Yr -3	2017	0	10,739	3,408	14,147	0
Yr -2	2018	0	10,739	3,408	14,147	0
Yr -1	2019	0	10,739	3,408	14,147	0
Yr 1	2020	0	10,739	3,408	14,147	0
Yr 2	2021	0	10,739	3,408	14,147	0
Yr 3	2022	0	10,739	3,408	14,147	0
Yr 4	2023	0	10,739	3,408	14,147	0
Yr 5	2024	0	10,739	3,408	14,147	0
Yr 6	2025	0	10,739	3,408	14,147	0
Yr 7	2026	0	10,739	3,408	14,147	0
Yr 8	2027	0	10,739	3,408	14,147	0
Yr 9	2028	0	10,739	3,408	14,147	0
Yr 10	2029	0	10,739	3,408	14,147	0
Yr 11	2030	327	10,739	2,521	0	11,132

CP3 (Close to Lake B28, Collecting Portion of Contact Water from Dry Stack TSF)									
		Inflow						Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	TSF Tailings Surface Runoff Collected in CP3	TSF Waste Rock Cover Runoff Water Collected in CP3	Seepage Water through Tailings into CP3	Water Pumped from CP3 to Site Area Ditch, then Flowing into CP1	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0	0	0
Yr 1	2020	0	101,788	17,638	42,295	8,156	0	169,877	0
Yr 2	2021	0	101,788	17,270	39,048	11,770	0	169,877	0
Yr 3	2022	0	101,788	17,196	35,093	15,800	0	169,877	0
Yr 4	2023	0	79,684	17,196	36,376	22,599	0	155,855	0
Yr 5	2024	0	79,684	17,017	23,408	35,746	0	155,855	0
Yr 6	2025	0	39,917	17,017	53,307	48,943	0	159,184	0
Yr 7	2026	0	39,917	17,017	32,652	69,598	0	159,184	0
Yr 8	2027	0	39,917	17,017	23,779	78,471	0	159,184	0
Yr 9	2028	0	39,917	17,017	0	98,973	0	155,908	0
Yr 10	2029	0	39,917	17,017	0	98,973	0	155,908	0
Yr 11	2030	0	39,917	17,017	0	98,973	0	155,908	0

CP4 (Close to Lake B8, Collecting Portion of Contact Water from WRSF1)							
		Inflow				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP4	Water Pumped/Flowing to Outside Environment	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0
Yr 1	2020	0	134,776	12,998	24,317	172,091	0
Yr 2	2021	0	52,392	12,998	51,757	117,147	0
Yr 3	2022	0	52,392	12,998	44,626	110,016	0
Yr 4	2023	0	52,392	12,998	49,287	114,677	0
Yr 5	2024	0	52,392	12,998	54,042	119,432	0
Yr 6	2025	0	52,392	12,998	54,754	120,143	0
Yr 7	2026	0	52,392	12,998	54,754	120,143	0
Yr 8	2027	0	52,392	12,998	54,754	120,143	0
Yr 9	2028	0	52,392	12,998	54,754	120,143	0
Yr 10	2029	0	52,392	12,998	54,754	120,143	0
Yr 11	2030	0	52,392	12,998	54,754	120,143	0

CP5 (Water Collection Pond in Drained Lake A54, Collecting Portion of Contact Water from WRSF1 and WRSF2 and Runoff Water Pumped from Two Open Pits)											
		Inflow							Outflow		
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground Surface with Vegetation	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP5	Net Runoff/Runon Water from Portion of WRSF2 Waste Rock Surface to CP5	Net Runoff/Runon Water from Other Disturbed Ground	Water Pumped from Tiri_1000_01 Open Pit to CP5	Water Pumped from Tiri_1000_02 Open Pit to CP5	Water Pumped to CP1(Collection Pond in Lake H17)	Water Flowing to Mined-out Tiri_1000_02 and Tiri_1000_01 Pits	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0	0	0	0
Yr -3	2017	0	196,977	0	0	71,816	0	24,136	292,930	0	0
Yr -2	2018	0	169,619	8,579	0	83,051	0	24,136	285,386	0	0
Yr -1	2019	0	160,847	14,071	0	83,051	0	24,136	282,105	0	0
Yr 1	2020	0	160,847	14,651	0	83,051	0	24,136	282,686	0	0
Yr 2	2021	0	136,476	25,070	0	83,051	146,920	24,136	415,654	0	0
Yr 3	2022	0	136,476	21,616	0	83,051	146,920	24,136	412,200	0	0
Yr 4	2023	0	136,476	23,873	0	83,051	146,920	70,816	461,138	0	0
Yr 5	2024	0	103,868	12,870	8,529	76,523	146,920	70,816	419,527	0	0
Yr 6	2025	0	103,868	13,040	8,441	76,523	146,920	70,816	419,608	0	0
Yr 7	2026	0	103,868	13,040	9,119	76,523	146,920	70,816	420,286	0	0
Yr 8	2027	0	103,868	13,040	9,691	76,523	0	0	203,121	0	0
Yr 9	2028	0	103,868	13,040	9,736	76,523	0	0	203,167	0	0
Yr 10	2029	0	103,868	13,040	9,632	76,523	0	0	203,063	0	0
Yr 11	2030	0	103,868	13,040	9,632	76,523	0	0	203,063	0	0

CP6 (Drained Lake H19, Collecting Contact Water from WRSF3)							
		Inflow				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Net Runoff/Runon Water from WRSF3 Waste Rock Surface	Water Pumped from CP6 to CP1	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0
Yr 1	2020	0	0	0	0	0	0
Yr 2	2021	0	0	0	0	0	0
Yr 3	2022	0	0	0	0	0	0
Yr 4	2023	0	76,658	15,888	39,224	131,770	0
Yr 5	2024	0	76,658	15,888	48,033	140,580	0
Yr 6	2025	0	76,658	15,888	48,880	141,427	0
Yr 7	2026	0	76,658	15,888	51,458	144,004	0
Yr 8	2027	0	76,658	15,888	53,510	146,057	0
Yr 9	2028	0	76,658	15,888	53,824	146,371	0
Yr 10	2029	0	76,658	15,888	53,824	146,371	0
Yr 11	2030	0	76,658	15,888	53,824	146,371	0

Open Pit - Tiri_1000_01 (Pit Operating from YR2021 to YR2026)								
Mine Year	Calendar Year	Inflow					Outflow	
		Net Runoff/Runon Water from Water Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Fresh water to Fill Mined-out Pit during Mine Closure	Treated Water Pumped-in to Fill Mined-out Pit during Mine Closure	Water Pumped to CP5 ((Lake A54)	Water Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0	0
Yr 1	2020	0	0	0	0	0	0	0
Yr 2	2021	0	22,662	124,258	0	0	146,920	0
Yr 3	2022	0	22,662	124,258	0	0	146,920	0
Yr 4	2023	0	22,662	124,258	0	0	146,920	0
Yr 5	2024	0	22,662	124,258	0	0	146,920	0
Yr 6	2025	0	22,662	124,258	0	0	146,920	0
Yr 7	2026	0	22,662	124,258	0	0	146,920	0
Yr 8	2027	3,757	22,662	113,080	3,003,700	0	0	0
Yr 9	2028	18,726	22,662	75,337	3,003,700	0	0	0
Yr 10	2029	28,707	22,662	50,056	3,003,700	0	0	0
Yr 11	2030	40,147	22,662	15,350	0	0	0	0

Open Pit - Tiri_1000_02 (Pit Operating from YR2023 to YR2026)									
		Inflow					Outflow		
Mine Year	Calendar Year	Net Runoff/Runon Water from Water Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Fresh water to Flood Mined-out Pit during Mine Closure	Treated Water Pumped-in to Flood Mined-out Pit during Mine Closure	Water Pumped to CP5 (Drained Lake A54)	Water Collected and Pumped to WTP (only in YR -5)	Water Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	2,354	2,201	0	0	0	4,556	0
Yr -4	2016	0	12,345	11,791	0	0	24,136	0	0
Yr -3	2017	0	12,345	11,791	0	0	24,136	0	0
Yr -2	2018	0	12,345	11,791	0	0	24,136	0	0
Yr -1	2019	0	12,345	11,791	0	0	24,136	0	0
Yr 1	2020	0	12,345	11,791	0	0	24,136	0	0
Yr 2	2021	0	12,345	11,791	0	0	24,136	0	0
Yr 3	2022	0	12,345	11,791	0	0	24,136	0	0
Yr 4	2023	0	32,138	38,678	0	0	70,816	0	0
Yr 5	2024	0	32,138	38,678	0	0	70,816	0	0
Yr 6	2025	0	32,138	38,678	0	0	70,816	0	0
Yr 7	2026	0	32,138	38,678	0	0	70,816	0	0
Yr 8	2027	1,264	32,138	35,047	716,500	0	0	0	0
Yr 9	2028	6,005	32,138	22,902	716,500	0	0	0	0
Yr 10	2029	8,984	32,138	15,028	716,500	0	0	0	0
Yr 11	2030	12,732	32,138	4,001	0	0	0	0	0

APPENDIX B

YEARLY WATER BALANCE SPREADSHEETS FOR WATER MANAGEMENT UNDER 1 : 100 DRY PRECIPITATION YEARS

Mine Year	Calendar Year	Water Retained in Ore (Assumed 3% of Ore Mass)		Mill Make-up Water for Ore Processing		
				Fresh Water	Reclaim Water	Underflow (sludge) Water from WTP to Mill
		Estimated Water Retained in Ore from Tiriganiaq U/G	Estimated Water Retained in Ore from Open Pits	Fresh Water from Meliadine Lake to Mill for Ore Processing	Treated Water (after TSS Removal) from Water Treatment Plant (WTP) to Mill for Ore Processing	Underflow (sludge) Water from Water Treatment Plant (WTP) to Mill for Ore Processing
		m^3	m^3	m^3	m^3	
Yr -5	2015	0	0	0	0	0
Yr -4	2016	0	0	0	0	0
Yr -3	2017	0	0	0	0	0
Yr -2	2018	0	0	0	0	0
Yr -1	2019	6,071	0	27,127	2,582	286
Yr 1	2020	32,850	0	94,464	59,404	8,450
Yr 2	2021	32,850	0	94,278	59,096	8,944
Yr 3	2022	32,850	0	94,278	56,418	11,622
Yr 4	2023	33,576	20,690	162,515	95,875	9,750
Yr 5	2024	32,935	21,815	165,353	95,504	9,672
Yr 6	2025	29,023	25,727	164,106	96,466	9,958
Yr 7	2026	27,545	27,205	165,106	95,570	9,854
Yr 8	2027	27,225	12,394	111,918	75,694	8,148
Yr 9	2028	0	0	0	0	0

Water Treatment Plant											
		Inflow		Outflow							
				Treated Water					Underflow (Sludge) Water		
Mine Year	Calendar Year	Collected Contact Water to Water Treatment Plant (from Ore Pad Waste Rock/OB piles) (Year -5 only)	Water Pumped from CP1 (Drained Lake H17) to WTP for Treatment	Treated Water Pumped from WTP to Mill as Make-up Water	Treated Water Pumped from WTP to Prepare the Water for Road Dust Control and Emergency Ore Stockpile Freeze Control	Treated Water Pumped from WTP to Mined-out Pits (During Closure)	Treated Water Pumped from WTP to CP1 (Lake H17) (Year -5 only)	Remaining Treated Water Pumped/Flowing to Outside Environment	Sludge to CP1 (Drained Lake H17)	Sludge to Ditches near Overburden WRSF1 only in 2015	Sludge Water from WTP to Mill
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	883	0	0	0	0	860	0	0	23	0
Yr -4	2016	0	243,000	0	0	0	0	236,682	6,318	0	0
Yr -3	2017	0	233,000	0	0	0	0	226,942	6,058	0	0
Yr -2	2018	0	238,000	0	0	0	0	231,812	6,188	0	0
Yr -1	2019	0	229,000	2,582	459	0	0	220,005	5,668	0	286
Yr 1	2020	0	318,000	59,586	459	0	0	249,687	0	0	8,268
Yr 2	2021	0	328,000	59,512	459	0	0	259,501	0	0	8,528
Yr 3	2022	0	430,000	56,860	459	0	0	361,501	0	0	11,180
Yr 4	2023	0	367,000	96,083	366	0	0	261,009	0	0	9,542
Yr 5	2024	0	363,000	95,738	366	0	0	257,458	0	0	9,438
Yr 6	2025	0	379,000	94,570	366	0	0	274,210	0	0	9,854
Yr 7	2026	0	369,000	95,830	366	0	0	263,210	0	0	9,594
Yr 8	2027	0	320,700	75,764	459	0	0	236,139	260	0	8,078
Yr 9	2028	0	331,700	0	459	0	0	322,617	8,624	0	0
Yr 10	2029	0	330,000	0	0	0	0	321,420	8,580	0	0
Yr 11	2030	0	327,200	0	0	0	0	318,693	8,507	0	0

CP1 (Water Collection Pond Including Lake H17 and H6, Final Site Wide Contact Water Collection Pond)																							
		Inflow																				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Net Runoff/Runon Water from Surface Area of Industrial Pad for Camp and Mill Areas	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP1	Net Runoff/Runon Water from a Portion of WRSF2 Waste Rock Surface to CP1	TSF Tailings Surface Runoff Collected in CP1	TSF Waste Rock Cover Runoff Water Collected in CP1	Seepage Water through Tailings into CP1	Net Runoff/Runon from Landfill to CP1	Net Runoff/Runon Surface Water from Ore Stockpiles (OP1, OP2 and OP3) to CP1	Treated Sewage Water from Sewage Plant (SW) to CP1	Truck Wash Water from Wash Bay/Truckshop to CP1	Pre-Treated (Oil) Water from Landfarm/Biopile to CP1	Treated Water pumped from WTP to CP1 (Year -5 only)	Sludge from Water Treatment Plant to CP1	Water Pumped from CP4 to Partially Drained H13, then Flowing into CP1	Water Pumped from CP3 to Partially Drained H13, then Flowing into CP1	Water Pumped from CP2 to CP1	Water From Open Pit - Tiri_1000_02 to CP1 before YR-3	Water Pumped from CP5 to CP1	Water Pumped from CP6 to CP1	Water Pumped from CP1 to Water Treatment Plant for Treatment	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	(1,847)	2,485	0	0	0	0	0	0	0	0	30	0	0	0	860	0	0	0	0	0	0	1,527
Yr -4	2016	(20,952)	81,521	14,169	15,724	0	0	0	0	0	0	257	0	0	0	0	6,318	0	0	0	5,286	27,069	0	243,000	0
Yr -3	2017	(8,126)	73,459	21,550	22,059	0	0	0	0	0	846	480	49,058	0	1,187	0	6,058	0	0	2,879	0	60,422	0	233,000	0
Yr -2	2018	(11,758)	62,164	34,671	22,059	0	0	0	0	0	846	479	58,517	0	1,187	0	6,188	0	0	2,879	0	59,320	0	238,000	0
Yr -1	2019	(10,359)	58,149	32,200	22,059	2,059	0	0	0	0	846	1,252	58,517	2,429	1,187	0	5,668	0	0	2,879	0	59,188	0	229,000	0
Yr 1	2020	(9,365)	49,490	34,065	22,059	3,908	0	4,553	1,689	0	846	2,079	58,677	9,662	1,187	0	0	34,206	36,269	2,879	0	59,783	0	318,000	0
Yr 2	2021	(11,470)	48,957	32,116	22,059	4,419	0	3,803	2,347	0	1,450	4,442	58,517	9,636	1,187	0	0	23,854	36,269	2,879	0	92,506	0	328,000	0
Yr 3	2022	(8,520)	47,718	35,857	22,059	2,766	0	2,632	3,510	0	1,450	3,279	58,517	9,636	1,187	0	0	19,844	36,269	2,879	0	90,564	97,810	430,000	0
Yr 4	2023	(10,486)	44,114	36,457	22,059	2,766	0	8,404	4,804	0	1,450	4,115	58,517	9,636	1,187	0	0	19,844	34,135	2,879	0	101,043	24,866	367,000	0
Yr 5	2024	(10,569)	37,557	31,101	22,059	7,273	5,277	5,185	7,877	0	1,450	6,371	58,677	9,662	1,187	0	0	24,180	34,135	2,879	0	93,999	26,005	363,000	0
Yr 6	2025	(8,351)	35,948	31,487	22,059	8,969	4,897	6,113	9,272	0	1,450	6,617	58,517	9,636	1,187	0	0	26,756	37,464	2,879	0	94,514	26,779	379,000	0
Yr 7	2026	(10,869)	35,948	30,216	22,059	8,969	6,828	2,890	12,495	0	1,450	6,767	51,684	9,636	1,187	0	0	26,756	37,464	2,879	0	95,011	29,219	369,000	0
Yr 8	2027	(9,119)	35,948	33,325	22,059	8,969	9,533	2,153	13,232	0	1,450	6,030	51,684	0	1,187	0	260	26,756	37,464	2,879	0	44,475	31,492	320,700	0
Yr 9	2028	(10,254)	35,948	41,631	22,059	8,969	9,710	0	16,208	0	1,450	0	51,826	0	1,187	0	8,624	26,756	36,641	2,879	0	44,520	31,806	331,700	0
Yr 10	2029	(10,092)	35,948	41,738	22,059	8,969	9,306	0	16,208	0	1,450	0	51,684	0	1,187	0	8,580	26,756	36,641	2,879	0	44,417	31,806	330,000	0
Yr 11	2030	(9,797)	35,948	41,908	22,059	8,969	9,306	0	16,208	0	1,450	0	51,684	0	1,187	0	8,507	26,756	36,641	(172)	0	44,417	31,806	327,200	0

CP2 (Excavated Pond near LandFarm, Collecting Runoff from the Area Northeast of Industrial Pad Area)						
		Inflow			Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Water Pumped from CP2 to CP1	Water Flowing to CP1
		m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0
Yr -4	2016	0	0	0	0	0
Yr -3	2017	0	2,023	856	2,879	0
Yr -2	2018	0	2,023	856	2,879	0
Yr -1	2019	0	2,023	856	2,879	0
Yr 1	2020	0	2,023	856	2,879	0
Yr 2	2021	0	2,023	856	2,879	0
Yr 3	2022	0	2,023	856	2,879	0
Yr 4	2023	0	2,023	856	2,879	0
Yr 5	2024	0	2,023	856	2,879	0
Yr 6	2025	0	2,023	856	2,879	0
Yr 7	2026	0	2,023	856	2,879	0
Yr 8	2027	0	2,023	856	2,879	0
Yr 9	2028	0	2,023	856	2,879	0
Yr 10	2029	0	2,023	856	2,879	0
Yr 11	2030	(373)	2,023	633	0	(172)

CP3 (Close to Lake B28, Collecting Portion of Contact Water from Dry Stack TSF)									
		Inflow						Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	TSF Tailings Surface Runoff Collected in CP3	TSF Waste Rock Cover Runoff Water Collected in CP3	Seepage Water through Tailings into CP3	Water Pumped from CP3 to Site Area Ditch, then Flowing into CP1	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0	0	0
Yr 1	2020	0	19,174	4,428	10,619	2,048	0	36,269	0
Yr 2	2021	0	19,174	4,336	9,804	2,955	0	36,269	0
Yr 3	2022	0	19,174	4,317	8,811	3,967	0	36,269	0
Yr 4	2023	0	15,010	4,318	9,133	5,674	0	34,135	0
Yr 5	2024	0	15,010	4,273	5,877	8,975	0	34,135	0
Yr 6	2025	0	7,519	4,273	13,384	12,288	0	37,464	0
Yr 7	2026	0	7,519	4,273	8,198	17,474	0	37,464	0
Yr 8	2027	0	7,519	4,273	5,970	19,702	0	37,464	0
Yr 9	2028	0	7,519	4,273	0	24,849	0	36,641	0
Yr 10	2029	0	7,519	4,273	0	24,849	0	36,641	0
Yr 11	2030	0	7,519	4,273	0	24,849	0	36,641	0

CP4 (Close to Lake B8, Collecting Portion of Contact Water from WRSF1)							
		Inflow				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP4	Water Pumped/Flowing to Outside Environment	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0
Yr 1	2020	0	25,388	3,263	5,554	34,206	0
Yr 2	2021	0	9,869	3,263	10,722	23,854	0
Yr 3	2022	0	9,869	3,263	6,711	19,844	0
Yr 4	2023	0	9,869	3,263	6,711	19,844	0
Yr 5	2024	0	9,869	3,263	11,048	24,180	0
Yr 6	2025	0	9,869	3,263	13,623	26,756	0
Yr 7	2026	0	9,869	3,263	13,623	26,756	0
Yr 8	2027	0	9,869	3,263	13,623	26,756	0
Yr 9	2028	0	9,869	3,263	13,623	26,756	0
Yr 10	2029	0	9,869	3,263	13,623	26,756	0
Yr 11	2030	0	9,869	3,263	13,623	26,756	0

CP5 (Water Collection Pond in Drained Lake A54, Collecting Portion of Contact Water from WRSF1 and WRSF2 and Runoff Water Pumped from Two Open Pits)											
		Inflow							Outflow		
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground Surface with Vegetation	Net Runoff/Runon Water from a Portion of WRSF1 Waste Rock Surface to CP5	Net Runoff/Runon Water from Portion of WRSF2 Waste Rock Surface to CP5	Net Runoff/Runon Water from Other Disturbed Ground	Water Pumped from Tiri_1000_01 Open Pit to CP5	Water Pumped from Tiri_1000_02 Open Pit to CP5	Water Pumped to CP1(Collection Pond in Lake H17)	Water Flowing to Mined-out Tiri_1000_02 and Tiri_1000_01 Pits	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0	0	0	0
Yr -3	2017	0	37,105	0	0	18,031	0	5,286	60,422	0	0
Yr -2	2018	0	31,952	1,231	0	20,852	0	5,286	59,320	0	0
Yr -1	2019	0	30,299	2,751	0	20,852	0	5,286	59,188	0	0
Yr 1	2020	0	30,299	3,346	0	20,852	0	5,286	59,783	0	0
Yr 2	2021	0	25,708	5,193	0	20,852	35,467	5,286	92,506	0	0
Yr 3	2022	0	25,708	3,251	0	20,852	35,467	5,286	90,564	0	0
Yr 4	2023	0	25,708	3,251	0	20,852	35,467	15,765	101,043	0	0
Yr 5	2024	0	19,566	2,631	1,357	19,213	35,467	15,765	93,999	0	0
Yr 6	2025	0	19,566	3,244	1,259	19,213	35,467	15,765	94,514	0	0
Yr 7	2026	0	19,566	3,244	1,756	19,213	35,467	15,765	95,011	0	0
Yr 8	2027	0	19,566	3,244	2,452	19,213	0	0	44,475	0	0
Yr 9	2028	0	19,566	3,244	2,497	19,213	0	0	44,520	0	0
Yr 10	2029	0	19,566	3,244	2,393	19,213	0	0	44,417	0	0
Yr 11	2030	0	19,566	3,244	2,393	19,213	0	0	44,417	0	0

CP6 (Drained Lake H19, Collecting Contact Water from WRSF3)							
		Inflow				Outflow	
Mine Year	Calendar Year	Net Runoff/Runon Water from Pond Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground	Net Runoff/Runon Water from WRSF3 Waste Rock Surface	Water Pumped from CP6 to CP1	Water Pumped/Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0
Yr 1	2020	0	0	0	0	0	0
Yr 2	2021	0	0	0	0	0	0
Yr 3	2022	0	0	0	0	0	0
Yr 4	2023	0	14,440	3,989	6,437	24,866	0
Yr 5	2024	0	14,440	3,989	7,575	26,005	0
Yr 6	2025	0	14,440	3,989	8,350	26,779	0
Yr 7	2026	0	14,440	3,989	10,790	29,219	0
Yr 8	2027	0	14,440	3,989	13,063	31,492	0
Yr 9	2028	0	14,440	3,989	13,377	31,806	0
Yr 10	2029	0	14,440	3,989	13,377	31,806	0
Yr 11	2030	0	14,440	3,989	13,377	31,806	0

Open Pit - Tiri_1000_01 (Pit Operating from YR2021 to YR2026)								
Mine Year	Calendar Year	Inflow					Outflow	
		Net Runoff/Runon Water from Water Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Fresh water to Fill Mined-out Pit during Mine Closure	Treated Water Pumped-in to Fill Mined-out Pit during Mine Closure	Water Pumped to CP5 ((Lake A54)	Water Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	0	0	0	0	0	0
Yr -4	2016	0	0	0	0	0	0	0
Yr -3	2017	0	0	0	0	0	0	0
Yr -2	2018	0	0	0	0	0	0	0
Yr -1	2019	0	0	0	0	0	0	0
Yr 1	2020	0	0	0	0	0	0	0
Yr 2	2021	0	4,269	31,198	0	0	35,467	0
Yr 3	2022	0	4,269	31,198	0	0	35,467	0
Yr 4	2023	0	4,269	31,198	0	0	35,467	0
Yr 5	2024	0	4,269	31,198	0	0	35,467	0
Yr 6	2025	0	4,269	31,198	0	0	35,467	0
Yr 7	2026	0	4,269	31,198	0	0	35,467	0
Yr 8	2027	(5,158)	4,269	28,455	3,115,900	0	0	0
Yr 9	2028	(20,000)	4,269	19,008	3,115,900	0	0	0
Yr 10	2029	(30,038)	4,269	12,747	3,115,900	0	0	0
Yr 11	2030	(45,682)	4,269	3,934	0	0	0	0

Open Pit - Tiri_1000_02 (Pit Operating from YR2023 to YR2026)									
		Inflow					Outflow		
Mine Year	Calendar Year	Net Runoff/Runon Water from Water Surface	Net Runoff/Runon Water from Natural Ground with Vegetation	Net Runoff/Runon Water from Other Disturbed Ground Surface	Fresh water to Flood Mined-out Pit during Mine Closure	Treated Water Pumped-in to Flood Mined-out Pit during Mine Closure	Water Pumped to CP5 (Drained Lake A54)	Water Collected and Pumped to WTP (only in YR -5)	Water Flowing to Outside Environment
		m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
Yr -5	2015	0	402	481	0	0	0	883	0
Yr -4	2016	0	2,326	2,960	0	0	5,286	0	0
Yr -3	2017	0	2,326	2,960	0	0	5,286	0	0
Yr -2	2018	0	2,326	2,960	0	0	5,286	0	0
Yr -1	2019	0	2,326	2,960	0	0	5,286	0	0
Yr 1	2020	0	2,326	2,960	0	0	5,286	0	0
Yr 2	2021	0	2,326	2,960	0	0	5,286	0	0
Yr 3	2022	0	2,326	2,960	0	0	5,286	0	0
Yr 4	2023	0	6,054	9,711	0	0	15,765	0	0
Yr 5	2024	0	6,054	9,711	0	0	15,765	0	0
Yr 6	2025	0	6,054	9,711	0	0	15,765	0	0
Yr 7	2026	0	6,054	9,711	0	0	15,765	0	0
Yr 8	2027	(1,595)	6,054	8,834	773,000	0	0	0	0
Yr 9	2028	(6,458)	6,054	5,789	773,000	0	0	0	0
Yr 10	2029	(9,714)	6,054	3,811	773,000	0	0	0	0
Yr 11	2030	(14,434)	6,054	1,113	0	0	0	0	0

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of Tetra Tech EBA’s Client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, Tetra Tech EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. Tetra Tech EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of testholes and/or soil/rock exposures. Stratigraphy is known only at the locations of the testhole or exposure. Actual geology and stratigraphy between testholes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. Tetra Tech EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

Tetra Tech EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.1 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Appendix C. Additional AEM Response to KIA-WL-09.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-09**
Re:	**Plume Delineation Model Assumptions**		

Comment made by Interested Party:

Please provide a discussion on the appropriateness of each input to the CORMIX model for review. This may impact the proposed end of pipe discharge criteria presented in Appendix H if inputs are not found to be sufficiently conservative.

Agnico Eagle's Response to Comment:

The mixing behaviour of mine effluent in the mixing zone (100 m radius from the outfall) of the diffuser was predicted using the Cornell Expert Mixing System (CORMIX) model (Doneker and Jirka 2007). CORMIX is one of the most extensively used models for predicting plume mixing and dilution of substances in surface waterbodies. This model has been used for conceptual design and analysis of effluent outfalls in other northern Canadian waterbodies. As CORMIX results are considered accurate to within ±50% (Doneker and Jirka 2007), the dilution ratios predicted by the model are divided by two, to ensure the most conservative results are presented.

A summary of model inputs is presented in Table 1, along with explanatory notes for the data or assumptions used for each input. The CORMIX model system assumes steady-state and generally uniform ambient conditions and effluent discharges. As natural systems are expected to vary, several model scenarios were developed to assess a range of possible ambient conditions and changes in effluent. In total, 72 simulations of the CORMIX model were developed from combinations of the following:

- Six possible concentrations of total dissolved solids (TDS) in the effluent:
  - 2400 mg/L, 1800 mg/L, 1200 mg/L, 600 mg/L, 300 mg/L, and 35 mg/L;
- Two possible effluent flow rates:
  - maximum (0.12 m^3/s), and average (0.047 m^3/s);
- Three possible ambient wind conditions:
  - average, maximum, and none (stagnant conditions); and
- Two possible angles of effluent discharge:
  - Perpendicular and parallel to lake current.

The lowest dilution rate (65x) was predicted using the maximum flow rate, near stagnant conditions. Under stagnant conditions, discharge orientation has a relatively small effect on mixing, compared to

non-stagnant conditions. Changes in effluent TDS have a relatively small effect on mixing compared to changes in effluent flow rate, lake velocity, and discharge orientation.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Effluent Data					
Temperature	°C	13.5			Observed temperatures in the waterbodies of the Meliadine peninsula are assumed to be representative of the range of temperatures expected at Contact Pond 1, and were therefore considered to characterize the mine effluent.
Total Dissolved Solids (TDS)	mg/L	2400, 1800, 1200, 600, 300, 35			Varying from ambient concentration (35 mg/L) to maximum allowable discharge concentration (2400 mg/L). This range captures all reasonably foreseeable conditions.
Total Suspended Solids (TSS)	mg/L	15			Conservatively assumed to be maximum allowable concentration from discharge (MMER 2002).
Density	kg/m^3	1001.2, 1000.7, 1000.3, 999.8, 999.6, 999.4			Calculated from temperature, TDS, and TSS, following method of Coles and Wells (2003).
Effluent Flowrate	m^3/s	Maximum = 0.12, Average = 0.047			Estimated maximum and average discharge rates from pipeline summary of water balance (June 2014 Mine Plan) for Meliadine Feasibility Study.
Concentration	%	100			Assumed 100% starting concentration. Used to evaluate dilution.
Ambient Geometry					
Average Depth	m	9			The diffuser is expected to be installed in Meliadine Lake to a depth of at least 9 m; this depth is supported by local bathymetry in the proposed diffuser location.
Depth at Discharge	m	9			
Ambient Velocity	m/s	0.18	0.45	0.005	Based on 3% of wind speed. The ratio of wind speed to lake currents can vary; however, assuming lake velocities equal to 3% of wind speed is considered reasonable (Wetzel 2001).
Wind Speed	m/s	6	15	0	Range of observed, open-water wind speed to represent average, maximum, and near stagnant conditions; from Environment Canada climate station Rankin Inlet A (Golder 2014). As effluent will only be released during open-water conditions, wind speeds observed during under-ice conditions were omitted.
Manning's Coefficient	-	0.015			A measure of the roughness of the lake bed. Assumed value; typical value for similar waterbodies.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Ambient Density Data					
Type	-	Freshwater			-
Temperature	°C	7.5			Average open water temperature (June to July) based on site monitoring data (Golder 2014).
Total Dissolved Solids (TDS)	mg/L	35			Median ambient concentration based on site monitoring data (Golder 2014).
Total Suspended Solids (TSS)	mg/L	3			
Density	kg/m^3	999.9			Calculated from temperature, TDS, and TSS, following method of Coles and Wells (2003).
Discharge Geometry					
Model	-	CORMIX2			-
Nearest Bank	-	Left			-
Distance to Nearest Bank	m	1000			Actual distance approximately 300 m, plume is not expected to be bank attached. A distance of 1000 m is used in model to ensure CORMIX does not model the plume as bank attached.
Port Spacing	m	6			Based on calculated plume width from preliminary modelling. Spacing used to ensure plumes do not interact.
Diffuser Length	m	30			Based on port spacing and number of ports.
Number of Ports	-	6			Based on preliminary modelling to ensure sufficient dilution and effluent velocity.
Vertical Angle	°	45			Common port angle (Doneker and Jirka 2007). The 45° angle of the port directs the plume upwards, reducing the mixing below port and erosion of lake bed.
Horizontal Angle	°	Coflow = 0, Crossflow = 90			Two possible angles of effluent discharge were evaluated: perpendicular and parallel to lake current. These angles were used to assess range of plume behavior under different lake current conditions.
Diffuser Alignment Angle	°	Coflow = 90, Crossflow = 0			
Relative Angle of Ports	°	90			Ports to be installed perpendicular to diffuser axis.
Port Diameter	m	0.051 (2 inches)			Used to ensure maximum effluent velocity does not exceed 10 m/s. This maximum velocity is used to ensure that the effluent plume does not cause lake bed erosion.

Table 1: Summary of Inputs to Plume Delineation Model with Detailed Explanation

Description		Scenario			Notes
		Open Water, Average Wind	Open Water, Max Wind	Open Water, Stagnant	
Port Height	m	1			A port height of approximately 1 m is recommended to ensure the plume does not erode or disturb lake bed sediments.

Of the ambient geometry inputs listed in Table 1, lake velocity (as derived from wind speed) has the largest effect on dilution of effluent or the plume mixing zone. The rate of effluent dilution at the edge of the mixing zone (100 m) generally increases with lake velocity, and thus windy conditions predict a higher dilution rate than near-stagnant conditions.

Effluent quality criteria (EQC) (i.e., the proposed end of pipe criteria presented in Appendix H of the Water Management Plan) were developed based on the minimum predicted dilution rate (65x) in the mixing zone. This minimum dilution is predicted under near-stagnant, open-water conditions using a lake velocity of 0.0005 m/s. The near-stagnant condition is generally assumed to only occur in under-ice conditions when wind effects on the lake velocity are blocked by ice cover. To apply conservatism to the development of EQCs, the near-stagnant condition was assumed for the open-water period.

Effluent will be discharged during the open-water period (i.e., June to September or October). Discharge is not planned during under-ice conditions, and thus under-ice modeling is considered not to be required. Instead, it can be assumed that lake turnover and mixing prior to ice formation would enhance mixing and dilute plume concentrations. Therefore, the near-stagnant, open-water predictions used to calculate the EQCs represent a conservative, reasonable case.

References:

Cole, T.M. and S.C. Wells. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6 - User Manual. Instruction Report EL-08-1, Prepared for U.S. Army Corps of Engineers, Washington, DC.

Doneker, R.L. and G.H. Jirka. 2007. *CORMIX User Manual*. U.S. Environmental Protection Agency: EPA-823-K-07-001, Washington, DC.

Golder (Golder Associates Ltd.), 2014. Final Environmental Impact Statement (FEIS) – Melidaine Gold Project, Volume 7.0 Freshwater Environment. Report number: Doc 314-1314280007 Ver. 0. April 2014.

Metal Mining Effluent Regulations (MMER). 2014. Minister of Justice. Government of Canada. SOR/2002-222.

Wetzel, RG. 2001. Limnology: Third Edition. Academic Press; New York.

Additional Response following 27 September 2015 Teleconference:

A teleconference meeting was held on 27 September 2015 between Agnico Eagle and Kivalliq Inuit Association (KIA) and their representatives to discuss the response to this information request (IR). The KIA indicated they would like additional information on how the ambient water temperature could affect density and thus mixing of the effluent in Meliadine Lake.

Ambient and effluent density was calculated based on temperature, total dissolved solids (TDS), and total suspended solids (TSS).

- The CORMIX model was run with an ambient density 999.9 kg/m^3 (based on a temperature of 7.5°C); if the temperature was decreased to 4°C, the calculated density would be 1000.0 kg/m^3.
    - These densities are similar, however CORMIX can be sensitive to differences between effluent and ambient density.
- The CORMIX model was run with effluent densities of 999.4 to 1001.2 kg/m^3 (based on TDS concentrations of 35 to 2400 mg/L).
- The difference between ambient and effluent density ranged from -0.5 to +1.2 kg/m^3.

The minimum dilution at 100 m used for water quality calculations was 65x, which is from the simulations under near-stagnant lake velocity and maximum effluent flow conditions. Under these simulations, a dilution of between 65x and 66x was determined for all simulated effluent densities. Under these conditions CORMIX is not sensitive to the difference between ambient and effluent density.

Since the range in effluent density for the various model scenarios is greater than the change in ambient density between water temperatures of 7.5°C and 4°C, and there were similar dilution factors for the other model scenarios, changing the ambient density to 1000.0 kg/m^3 (i.e., for colder water temperatures) would have little to no impact on the dilution factors or the conclusions.

Appendix D. Additional AEM Response to KIA-WL-10.

Interested Party:	**Kivalliq Inuit Association**	**IR No.:**	**KIA-WL-10**
Re:	**Quality Control Responses**		

Comment made by Interested Party:

AEM should provide a discussion on how data will be handled if the 20% RPD threshold is violated. Please provide a discussion on what criteria will be used to disqualify the inclusion of, for example: single parameters, discrete samples and sampling events.

Agnico Eagle's Response to Comment:

Validation of data collected through a monitoring program is a multiple step process. First there is the collection of quality control samples to detect potential contamination (done through analysis of travel and field blank samples) and to confirm within-site variability and field sampling (done through the analysis of duplicate samples); second, results for dissolved and total parameters are compared; third, data are reviewed for potential unusual values or outliers.

Quality Control Sample Review: Blank Samples

As described in the Aquatic Effects Monitoring Program (AEMP) Design Plan document, the field quality control (QC) program for water quality will include the collection and analysis of blank QC samples. Results from blank samples (travel and/or field blanks) will be considered notable if concentrations are greater than or equal to five times the corresponding detection limit (DL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency and takes into account the potential for reduced accuracy when concentrations approach or are below DLs (USEPA 2000; AENV 2006).

Results for notable parameters from the blanks will be evaluated to determine if:

- the result is limited to a field blank or if it is apparent in corresponding water samples;
- there was a consistent bias in the results for the parameter across all samples; and
- if the notable result was severe enough to warrant invalidating the affected data.

Quality Control Sample Review: Duplicate Samples

As described in the AEMP Design Plan document, the field QC program for water quality will also include the collection and analysis of duplicate QC samples. The threshold of 20 percent (%) or less relative percent difference (RPD) between duplicate samples has been selected to identify if results are considered acceptable. For each set of duplicate samples, RPDs will be calculated for each parameter and for the overall duplicate pair. The RPD value for a given parameter will be considered notable if:

- it is greater than 20%; and

- concentrations in one or both samples are greater than or equal to five times the DL.

The number of notable parameters will be compared to the total number of parameters analyzed to evaluate analytical precision. Analytical precision will be rated as follows:

- high, if less than 10% of the total number of parameters are notably different from one another;
- moderate, if 10% to 30% of the total number of parameters are notably different from one another; or
- low, if more than 30% of the total number of parameters are notably different from one another.

Total and Dissolved Comparison

Corresponding dissolved and total concentrations will be compared for each parameter (where both are measured) to determine if the dissolved values are greater than the total values. Where dissolved concentration values are more than the corresponding total concentration value, the results will be further evaluated through RPD values and values relative to five times the DL (5xDL). If the dissolved concentration value is more than the total concentration value, but the RPD between the dissolved and total concentration is less than 20%, the result will be accepted as valid. If the dissolved concentration value is more than the total concentration value, the RPD between the dissolved and total concentration is greater than 20%, and both (total and dissolved) concentrations are greater than 5xDL, the dissolved concentration will be considered notable.

For all notable results, the laboratory will be contacted to confirm the result; if the results are confirmed by the laboratory, the data will be further reviewed for other causes. If no other cause is identified, then the data will be considered valid for the total parameters, but the dissolved values will be qualified as having a dissolved to total RPD outside the acceptable range.

Data Validation

Data will be further validated with a two-step process. The first step will be a visual review of the data on a parameter basis using scatterplots to identify outliers from the overall dataset for that parameter. Data from the database will be exported, appropriately grouped, and plotted. Unusually high or low data values will be selected for further investigation. The second step of the process will involve data validation of the selected outlying data. The selected data will be invalidated on a case-by-case basis. Invalidated data will be retained in the database, but will be flagged indicated that the sample could be contaminated or results are designated as not correct due to an internal review of the data.

References

AENV (Alberta Environment). 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Edmonton, AB, Canada. 67 pp. ISBN: 0-7785-5081-8 (Print Edition); 0-7785-5082-6 (On-line Edition).

USEPA (United Sates Environmental Protection Agency). 2000. EPA Quality Manual for Environmental Programs. CIO 2105-P-01-0 (formerly 5360 A1).

Additional Information following 27 September 2015 Teleconference

A teleconference meeting was held on 27 September 2015 between Agnico Eagle and Kivalliq Inuit Association (KIA) and their representatives to discuss the response to this information request (IR). The KIA indicated they would like additional procedural information on how data will be screened and determined if they should be included or excluded from the annual dataset. This discussion and supplemental response is focussed on the QC process for the water quality program.

AEMP data will be collected and reported annually and then re-evaluated, as required and scheduled, as part of a study design re-evaluation. The KIA are interested primarily in the data validation process as related to the annual program. Since multi-year data may need to be considered in a re-evaluation study, no data will be thrown out. Rather, if data do not meet QC criteria for a particular year, they will be flagged (e.g., bad data – do not use, or use with caution) but maintained in the database.

QC: Blank Samples

As described in the initial response, notable results for a particular parameter will be flagged and then evaluated to determine if the result was limited to the blank sample, is apparent in corresponding field samples, is biased across all samples, or requires invalidating of data from the field samples (i.e., the samples from the affected stations).

Blank samples will be collected during every field program and there will be an initial screening of the blank results to identify any notable results. If any results in the blank sample are considered notable, a re-analysis of the analytical results will be requested. If the re-analysis confirms the original results, the results from all field samples collected during that field program will be screened to determine if there is bias in the samples, whether they are potentially contaminated, and if any data should be invalidated. At this point, notable results will be flagged only.

The screening process (of blank samples and corresponding field samples) will be repeated for each sample collection program. Invalidation of data, if necessary, will not be completed on samples from a single field program, but rather from all samples collected during the annual program.

QC: Duplicate Samples

As described in the initial response, results for duplicate samples will be considered notable if the values for a given parameter are more than 20% different between samples and the concentrations are greater than 5xDL; based on the number of notable parameters, the analytical precision will be rated as high, moderate, or low. Exceedance of the 20% criterion will not result in exclusion of the affected data from analysis. Rather, it triggers further investigation of data quality through the data validation process.

Duplicate samples will be collected during every field program at randomly assigned stations and the screening step will be completed to identify notable results. If a result is considered notable, a re-

analysis will be requested. If the re-analysis confirms the original result, the result from all field samples collected during that field program, within the same sampling area (e.g., Meliadine near-field, peninsula Lake B7), will be screened to determine if there is excessive variation in this parameter among other samples. At this point, notable results will be flagged only.

The screening process of duplicate samples will be repeated for each sample collection program. The invalidation of data, if necessary, will not be completed on samples from a single field program, but rather from all samples collected during the annual program.

Total and Dissolved Comparison

As described in the initial response, the reported concentration of dissolved parameters will be compared to the reported concentration of the total parameters. As described for the additional discussion on handling of blank and duplicate samples, this process will be completed for every field program, and for all samples collected during a field program. If notable results are identified, a re-analysis will be requested. In addition, there will be a review of the field sampling procedures, and if necessary the implementation of equipment cleaning (e.g., acid rinse prior to the next field program) and the collection of additional QC samples (e.g., equipment blank, split samples, additional duplicate samples).

Any dissolved concentrations that are considered notable (i.e., more than 20% higher than the total concentration and more than 5xDL) will be flagged but retained in the database. For all samples, the total concentration will be reported, but if the dissolved concentration is considered notably different from the total concentration, it will not be included in the annual report.

Data Validation

The final QC step of data handling is to evaluate results from all of the field samples to identify outliers or unusual results. Since the water quality program collects samples from Meliadine Lake and three peninsula lakes, and the background chemistry of these lakes is different, to evaluate for potential data outliers, the Meliadine Lake data will be grouped and evaluated separately from the peninsula lake data.

The screening process will be first conducted on results from a single field program and then again on all results collected for the annual program. Results must first be screened after each field program in the event that a re-analysis is required. The next step will be a visual review of the data to identify unusual or potential outlying data. Once all the data from the annual program is available, a visual and a quantitative approach (e.g., formal outlier analysis) to identify outliers will be completed.

As described in the AEMP design plan, the individual and grouped water quality results will be compared to baseline concentrations, aquatic life guidelines, and drinking water guidelines and the grouped data will be compared to the Low Action Level. Since results relative to the Action Levels can have consequences on operation of the mine, it is important that the data used in the evaluation are indicative of actual conditions and are not erroneous.

Through evaluation of the various QC samples, and the data validation process, it will be determined if single parameters, discrete samples, or entire sampling events need to be eliminated from the analysis and interpretation of the water quality data. Entire samples or data from entire sampling events would only be excluded from analysis if the data validation process identifies serious irregularities in sampling and laboratory analysis affecting most or all parameters or samples, indicating a strong potential for contamination or inaccurate data being reported. Appropriate QA and QC procedures will be followed during the execution of the program to reduce or eliminate the need to invalidate data, but if it is necessary to invalidate any data, full rationale for the decision will be provided.