Environmental Monitoring Advisory Board

Intervention to the Wek'èezhìi Land and Water Board

on

Diavik Diamond Mines' Water Licence W2015L2-0001 Amendment Proceeding

Natural Drainages

April 24, 2023

Contents

1. Introduction

EMAB has reviewed Diavik's Water Licence Amendment Application for Natural Drainages. The application is intended to allow Diavik to breach the collection ponds that surround the mine. These ponds collect runoff from the mine's operations so it can be directed to the North Inlet Water Treatment Plant. If the application is approved as is, runoff from the collection ponds will discharge directly to Lac de Gras.

Diavik presents the amendment as an opportunity to do progressive reclamation while monitoring the environmental effects of the direct discharges into Lac de Gras, verifying the results of modelling of runoff, and using the results to adaptively manage future reclamation work.

Diavik has presented an enormous amount of information in support of this application including:

- Modelling to predict water quality of discharges,
- A Surveillance Network Program approach to monitoring the discharges,
- Revised closure criteria to assess whether closure objectives to protect water quality and provide safe water for humans, wildlife and fish,
- Development of a Surface Water Action Level Framework to respond to effects of the discharge,
- A revised Aquatic Effects Monitoring Program that will monitor more extensive effects of the discharges,
- Requirements to allow pond breaching, and
- A risk assessment to support the approach.

EMAB's reviews have resulted in many specific comments and recommendations about the various components of the application, which are included in this intervention. Before speaking to the various components of the application, EMAB's intervention will address some broader issues raised by Diavik's application.

2. Overview of EMAB Concerns about Application

Diavik's application proposes some significant changes to its approach to closure with respect to water quality in Lac de Gras:

- Diavik claims that the discharge from collection ponds is not a waste as defined in the *Waters Act*, based on modelled predictions and its interpretation of the definition in the Act.
- Based on its claim that the discharge is not a waste, Diavik proposes that the discharge be managed with a Surface Water Action Level Framework instead of Effluent Quality Criteria or other regulatory mechanism.
    - Does not set limits on effluent concentrations
    - Accepts water quality that is up to 10 times the AEMP Benchmark level to flow from the collection pond breach to Lac de Gras
- Diavik proposes removing references to Drinking Water Guidelines and AEMP benchmarks in closure criteria for protection of human, wildlife and aquatic health.
    - Does not include contaminants of potential concern
    - Does not include sediment quality in the mixing zone

    - Does not consider sub-lethal effects
- Diavik does not address a number of the monitoring requirements that were part of the Collection Pond Decommissioning Plans.
    - Does not explicitly delineate the mixing zone for each discharge
    - Does not monitor the water quality at the outlet from the stream into the lake
    - Restricts sample collection to areas where water depth is greater than 5 meters.
- Lack of Consideration of Traditional Knowledge in the Application.

In EMAB's view the application is not acceptable as currently proposed.

2.1 Diavik approaches to Progressive Reclamation of Collection Ponds over time

Diavik's approach to collection pond discharges has changed significantly over time:

- In ICRP 4.0 Diavik proposed a one kilometer mixing zone around East Island.
- Following direction from the WLWB Diavik prepared ICRP 4.1, including more detailed modelling. It proposed mixing zones for the various catchment areas around East Island, ranging from 100 meters to 1800 meters. Reviewers commented that Diavik needed to justify the number and size of the proposed mixing zones.
- Diavik proposed a research-oriented approach to collection pond discharge in a Mixing Zone Discussion Paper in January 2021, updated and circulated for comment in February 2021. Diavik proposed a multi-year monitoring and research program collecting site runoff samples for chemical and toxicological analysis and, as well as controlled release of tested runoff water to Lac de Gras. The research would have delineated chemical and toxicological responses in the resulting mixing zones. This approach of doing research on the effects of the discharge on mixing zones was generally supported by reviewers.
- Instead of pursuing the research program. Diavik submitted a Water Licence Amendment Application for Progressive Reclamation in October 2021 that requested approval to breach all collection ponds and allow uncontrolled discharge from them directly into Lac de Gras. This would have been accompanied by monitoring of the effects of the discharge on the mixing zone in Lac de Gras and on aquatic life. Diavik called this an administrative change and did not provide any new technical information to support the amendment. During the proceeding, Diavik proposed including a Schedule to the Water Licence that would require a Decommissioning Plan to be submitted and reviewed for each pond before the breaching was approved. The WLWB included the description of the Decommissioning Plans as Section 3 in Schedule 8 of its recommended water licence for Progressive Reclamation.

2.2 Current Application to Breach Collection Ponds

The current amendment application for Natural Drainage submitted in November of 2022, is again asking for approval to breach all collection ponds and allow uncontrolled discharge to Lac de Gras.

Progressive Reclamation and Addressing Uncertainty about Water Quality

In the covering letter for its application Diavik acknowledges that:

> "many stakeholders continue to raise uncertainties related to the water quality conditions of the reclaimed site and that these questions may remain until we have obtained reliable performance and effects information from monitoring actual conditions that represent the

closed site. The approach to enable progressive reclamation in this Application will allow us to get a head start to closure performance monitoring, support the validation of planning to date and use new results to adaptively manage the next phases of our Reclamation work."

EMAB accepts the value of progressive reclamation and Diavik's statement about the value of collecting reliable performance and effects information from actual monitoring conditions. But Diavik's approach falls short of collecting the kind of information that would reassure stakeholders. In EMAB's view, Diavik should have included a research and monitoring program with controlled discharge applied to one or two collection ponds. The program should have included detailed data collection, verification of model predictions and an emphasis on learning that could be applied to adaptively manage the future breaching of other collection ponds. The value of progressively reclaiming the collection ponds is the opportunity to collect data on the discharges, the mixing zones and the effects on water quality and the health of aquatic life, wildlife and humans. This data would help address the uncertainties raised by stakeholders about quality of water being discharged into Lac de Gras.

EMAB observes that if Diavik had proposed its research program in March/April 2021 as originally proposed, and had submitted its amendment application with credible supporting documentation later in 2021, it is reasonable to expect that it could have been collecting monitoring data on the results of a controlled release in summer 2023, and possibly even in late summer of 2022. These monitoring results would have given stakeholders a much better understanding of the effects of discharging collection pond runoff into Lac de Gras, and on the accuracy of Diavik's modelling of the discharges.

EMAB also notes that Diavik's current water licence expires on December 31, 2025. The schedule that Diavik included as part of its application has Ponds 2 & 7 breached in 2023, Ponds 1 & 13 breached in 2025 and the remaining 7 ponds breached in 2026 or 2027. Monitoring of the collection ponds decommissioned in 2023 will inform the future decommissioning of collection ponds, which can be approved through Diavik's post-2025 water licence.

EMAB is proposing that any approval to allow breaching of collection ponds in the current amendment be limited to Ponds 2 & 7, with a focus on collection of a broad range of monitoring information including delineating the mixing zone, and the effects of the discharges on water quality, fish, plankton and benthic invertebrates within the mixing zone

Recommendation:

2.1 Limit any approval to Pond 2 and Pond 7, scheduled to be breached in 2023 so that monitoring data can inform the approach to breaching collection ponds during the closure water licence renewal.

3 Regulating Discharge from breached collection ponds

3.1 Is Discharge from breached collection ponds a waste?

Diavik's Natural Drainages Water LIcence Amendment Application does not include deposit of waste as an applicable criterion for the application. During the Technical Session on the application the company representative, Gord Macdonald, confirmed that its view is that closure runoff covered in the amendment does not meet the definition of waste in the *Waters Act* and Water Regulations and

stated that Diavik's application does not include consideration of a deposition of waste (page 81, transcript for Day 1, March 6, 2023).

Waste

> Definition from Land and Water Board Waste and Wastewater Management Policy:
> "waste" is defined as:
> (a) any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of the water to an extent that is detrimental to its use by people or by any animal, fish or plant, or
> (b) water that contains a substance in such a quantity or concentration, or that has been so treated, processed or changed, by heat or other means, that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water to the extent described in paragraph (a), and, without limiting the generality of the foregoing, includes
> (c) any substance or water that, for the purposes of the Canada Water Act, is deemed to be waste,
> (d) any substance or class of substances prescribed by regulations made under subparagraph 63(1)(b)(i),
> (e) water that contains any substance or class of substances in a quantity or concentration that is equal to or greater than a quantity or concentration prescribed in respect of that substance or class of substances by regulations made under subparagraph 63(1)(b)(ii), and
> (f) water that has been subjected to a treatment, process or change prescribed by regulations made under subparagraph 63(1)(b)(iii).

EMAB has reviewed Diavik's arguments that the runoff from breached collection ponds is not a waste as defined under the Waters Act and regulations. We have also reviewed the GNWT response to Information Request #2 from the Technical Session explaining why GNWT considers the runoff a waste. And EMAB has reviewed Diavik's submissions with its application. EMAB does not agree that the uncontrolled discharges from the breached collection ponds are not a waste. In our view Diavik has misinterpreted the definition of waste.

The basis for Diavik's view that the discharge from the breached collection ponds is not a waste is not clear to EMAB:

i) If Diavik's argument is that the discharge does not affect all of Lac de Gras, so is not a waste we would disagree with that interpretation of the definition. In our view, if the discharge could detrimentally affect the receiving waters where it enters them, then it is a waste (see definitions of Receiving Waters and Receiving Environment in Mackenzie Valley Land and Water Board Waste and Wastewater Management Policy). The GNWT response to IR#2 dated March 21, 2023 addresses this question in greater detail, and EMAB accepts GNWT's arguments.

ii) If Diavik's argument is that the discharge is not potentially harmful to aquatic life, humans or wildlife we note that Diavik's evidence for this application shows that water at all the breaches will be above some AEMP benchmarks and above levels that are safe for drinking water (see Table 1. Comparison of predicted concentrations of mine-impacted runoff to various benchmarks, in DDMI's response to February 24, 2023 IR). Diavik's proposed SWALF allows water quality to be at levels 10 times above AEMP benchmarks as it enters the

channel that flows into Lac de Gras. In our view this means the discharge is a waste. Again the GNWT response to IR#2 dated March 21, 2023 addresses this question in greater detail, and EMAB accepts GNWT's information and interpretation.

Diavik acknowledges that the discharged water is affected by the mine's operations through the placement of materials from the mine on the surface of the catchments and by runoff and seepage from mine facilities such as the waste rock piles and the Processed Kimberlite Containment area.

We observe that Diavik does not propose to sample water from the streams as it enters Lac de Gras, so as proposed there will not be data on the quality of the water entering the receiving waters, or any response actions linked to the quality of the water.

Recommendation:

3.1 The discharge from the breached collection ponds should be considered a waste as defined by the Waters Act and Diavik should sample water from the streams as it enters Lac de Gras.

3.2 Regulation of Discharge

The Land and Water Board Waste and Wastewater Management Policy states: "For proposed point-source effluents, the LWBs will typically include conditions that set out EQC for the final discharge point(s) to define the maximum allowable concentrations (e.g., mg/L), quantities (e.g., kg/year), or limits (e.g., pH range) of any contaminant or parameter of the effluent if the evidence before a Board indicates that it has the potential to adversely affect water quality in the receiving waters" (p.13).

With the understanding that the discharges from the breached collection ponds are a waste, EMAB's view is that these discharges must be regulated in some way. EMAB accepts that the WLWB may choose to regulate the discharge of waste through EQC's or some other mechanism for managing water quality. With Diavik's previous amendment application request the WLWB chose to use Decommissioning Plans to identify and regulate the discharges.

Diavik stated in its covering letter that "Diavik does not want to lose the good work completed by Intervenors and the WLWB during the previous Amendment" and "**To ensure continuity between these processes DDMI has included recommended Decommissioning Plan information for each Collection Pond within the FCRP**." Diavik further stated "the FCRP has been submitted so the option of providing a separate Decommissioning Plan to facilitate progressive works may soon become redundant once there is an approved FCRP for Diavik. To ensure continuity between these processes DDMI has included recommended Decommissioning Plan information for each Collection Pond within the FCRP."

EMAB does not agree that approval of the FCRP should provide a blanket approval of decommissioning of all collection ponds without the need for Decommissioning Plans.

In our assessment, Diavik has not provided all the information described in Schedule 8, Section 3 of the draft licence submitted with its application as required to approve breaching of collection ponds, including:

- Pond-specific closure criteria
- Identifying new or updated Closure Objectives and/or Closure Criteria being proposed, with rationale, including:

    - SW1 and SW2 criteria for the decommissioned catchment that include a list of contaminants of potential concern with rationale;
    - Consideration of new closure criteria and/or objective(s) to assess effects in the Receiving Environment, including sediment quality, with rationale; and
    - Consideration, with rationale, of a SW2 criterion to address extent of sublethal effects."
- Whether a controlled discharge may be an appropriate research activity prior to breaching a pond
- Description of the nature and extent of the mixing zone and predictions at 100 meters and the edge of the mixing zone
    - Note: EMAB understands that Diavik's modeling approach restricts its ability to make predictions of water quality at 100 meters from the point of discharge into Lac de Gras.
- Investigations to determine the potential impacts to aquatic life within the mixing zone
- Investigations, such as a plume delineation study, to understand the anticipated mixing
- Consideration of effects on cultural uses within the proposed mixing zones and monitoring to assess the potential effects of water quality on cultural uses
- A sampling plan to evaluate effects of reconnection on the Receiving Environment including:
    - Monitoring to confirm the size of the mixing zone and extent of sub-lethal effects
    - A sediment sampling plan
    - Benthics and fish sampling plan
- How it will learn from the ponds that are decommissioned earlier to adaptively manage decommissioning of ponds that come after.

We include an annotated version of the Decommissioning Plan description with EMAB's assessment of how Diavik has addressed each section as Attachment 1.

Recommendations:

3.2 Reject Diavik's argument that it has provided sufficient evidence in its proposed Final Closure and Reclamation Plan to meet the requirements set out in the Decommissioning Plan description, and remove references to approval of decommissioning of collection ponds through an approved Closure and Reclamation Plan in Part G(27)(e), G(28(g), G28(h), G(33), Part J(9) and J(10) of the draft licence.

3.3 Diavik should address all requirements set out in the Decommissioning Plan described in the Schedule 8, section 3 of the draft licence included with its amendment application, or provide a detailed justification for any requirements it is unable to provide.

In addition to this general description of inadequacies in meeting the requirements of the Decommissioning Plans we provide some broad comments here on how the Closure Criteria requirements in the plan have been addressed. More specific comments are included in the chapter on closure criteria.

Total Suspended Solids

For discharge from Collection Ponds, clear licence limits should be established now for parameters that are likely to be consistently relevant for all of the runoff locations and where effects are also consistently relevant. The proposed water quality limits in the licence only include pH and acute

toxicity, and SW2 criteria are established only for toxicity to aquatic organisms. Total Suspended Solids (TSS) is a significant contaminant of concern for all mine site runoff, especially as reclamation activities proceed. It is often one of the first indicators of problems with reclamation measure performance. Without modifications to standard toxicity testing, TSS is not likely to have much influence on results of lab toxicity tests and therefore is not addressed by the proposed licence limits. Nonetheless, it can have adverse effects on aquatic life and aquatic habitat (Slater Environmental Review of Diavik Water Licence Amendment Progressive Reclamation – Re-establishing Natural Drainages, 2023, p. 2).

In the Response to Comments and at the Technical Session regarding the proposed water quality limits in the licence, DDMI acknowledged an oversight with respect to TSS and acknowledged the need to address the oversight. However, the Response to Information Request appears to propose that TSS would only be addressed through the Surface Water Action Level Framework (SWALF), not by inclusion of an effluent standard as proposed for pH and acute toxicity (Part G, Clauses 36 and 37 of the Draft Water Licence). Like pH and acute toxicity, TSS should be directly regulated in the licence at least until such time as the consistent, ongoing erosion resistance of the closure landscape has been confirmed (Slater Environmental Review of Diavik Water Licence Amendment Progressive Reclamation – Re-establishing Natural Drainages, 2023, p. 3).

Recommendation:

3.4 In addition to effluent quality limits for pH and acute toxicity, the Water Licence should include limits for TSS. These should either be consistent with the MDMER, or if/when MDMER do not apply to the runoff, then CCME Guidelines should be used.

Contaminants of Potential Concern

Schedule 8 envisions SW2 criteria for all contaminants of potential concern in each catchment. In accordance with the WLWB's policy and guidance on waste management as presented at the Technical Session, closure criteria (i.e., standards that measure the success of selected activities in meeting closure objectives) could be addressed through various mechanisms including effluent quality criteria, management plans and adaptive management (Slater Environmental Review of Diavik Water Licence Amendment Progressive Reclamation – Re-establishing Natural Drainages, 2023, p. 2).

For many dissolved contaminants (e.g., metals, major ions), the concentrations and mixing zone characteristics mean that appropriate numerical criteria will vary between catchments. In these cases, developing SW2 closure criteria on an individual basis is an acceptable site-specific approach – but it has not been done in the current version of the FCRP. Many of these contaminants would also contribute to toxicity which is included as one of the proposed licence limits. DDMI's response to comments and Technical Session discussions indicate that they have no intention of introducing any additional numerical criteria for specific watersheds. The analysis presented in DDMI's March 28, 2023 Response to IR#7 confirms their opinion that no effluent criteria are necessary for other parameters in any of the Collection Pond catchments.

There was discussion at the Technical Session about the need for specific thresholds for a broader range of parameters, and where any such thresholds should be included (e.g., in the licence or the Surface Water Action Level Framework [SWALF]).

The March 28, 2023 Response to IR#7 provides DDMI's analysis of Parameters of Interest (POIs) and subsequently Parameters of Potential Concern (POPCs), and its rationale for excluding effluent quality criteria or closure criteria for any additional parameters at any locations. Based on this, DDMI argues that no additional parameters need to be addressed either in the licence or in the SWALF.

With respect to POIs, DDMI argues that petroleum hydrocarbons are not a POI because none are anticipated in the runoff post-closure due to closure related measures. However, there is uncertainty about performance of closure measures. Because these contaminants are present in some watersheds, there is potential for contamination to occur if closure measures are ineffective. Given that sediment monitoring indicates elevated hydrocarbon concentrations in some Collection Pond sediments, there appears to be potential for contamination at locations close to runoff streams. As a result, hydrocarbons should remain as a POI. DDMI also argues that monitoring of pH and TSS indicates that these parameters will not exceed relevant limits and therefore they are not POIs. While previous monitoring provides some indication of future performance there is outstanding uncertainty, especially for TSS in watersheds where further earthworks or land disturbance activities may occur. However, it is notable that the proposed licence already provides mechanism for management of pH and TSS (Slater Environmental Review of Diavik Water Licence Amendment Progressive Reclamation – Re-establishing Natural Drainages, 2023, p. 3).

With respect to POPC, DDMI describes four steps for identification:

1. Compare maximum predicted runoff concentrations to acute benchmarks, AEMP effects benchmarks, Federal Environmental Quality Guidelines (FEQG) and drinking water guidelines.
2. Compare maximum predicted runoff concentrations to baseline median runoff concentrations from the Environmental Assessment.
3. Compare 95th percentile predicted concentrations at the mixing zone boundary (Arc 1) to baseline normal range (ice-covered conditions).
4. Compare 95th percentile predicted concentrations at the mixing zone boundary with AEMP effects benchmarks.

Each of these steps sequentially removes POIs from further consideration as POPC and seems to move towards a definitive conclusion about whether EQC are required. The results, especially of the fourth step, are not surprising because they are consistent with the modelling results presented in FCRP Appendices X-20, X-21 and X-22. The modelling to support the closure plan predicts that there will be very few instances where POI concentrations at the mixing zone boundary will exceed AEMP benchmarks (Slater Environmental Review of Diavik Water Licence Amendment Progressive Reclamation – Re-establishing Natural Drainages, 2023, p. 4).

The first three steps in DDMI's evaluation demonstrate that the predicted post-closure conditions indicate that the mine site has potential to contribute measurable loading of certain contaminants from various locations – a condition that should be sufficient to say that parameters are POPC that warrant management and monitoring in order to ensure that unexpected effects do not occur.

As noted, DDMI describes a four-step process for identifying POPC. However, the process actually includes a fifth step that introduces a subjective element to the analysis. The output from the fourth step identifies POPCs that "may require EQC." In the Response to IR#7, DDMI ultimately concludes that

none of the parameters that screened through the four steps (copper silver, uranium and phosphorus) require EQC.

The analysis of POIs and POPC appears to indicate that the closed mine site will continue to contribute measurable loads of some contaminants. Management and monitoring of these substances would provide a foundation for a more proactive approach to management of any unexpected changes in water quality conditions.

Recommendation:

3.5 Provide clear regulatory requirements to establish and meet numerical thresholds for relevant contaminants of concern in all of the affected watersheds.

4 Use of Traditional Knowledge

The requirement for Diavik to develop a Traditional Knowledge Monitoring Plan (TKMP) has been acknowledged numerous times in discussions with the TK Panel going back as far as 2012 (TK Panel recommendation 1.17) and has been noted in reviews of ICRPs since at least 2018 (WLWB RFD for ICRP 4.0). In its decision on ICRP 4.1, the WLWB directed that Diavik include a TKMP in the Final Closure and Reclamation as Revision #8. Diavik has changed its approach to developing the TKMP a number of times, resulting in delays in developing the plan. The TKMP is an important component of Diavik's closure monitoring and it is disappointing that Diavik has not yet submitted it, leaving the monitoring and SWALF in this application without Traditional Knowledge (TK) components. Diavik is responsible for developing the TKMP and should have included it in its FCRP submission.

Diavik has not included any TK into the monitoring or triggers/actions in this application. When asked, Diavik representatives stated that a TKMP is being developed with Indigenous organizations, and that something like the Cultural Use Criteria developed for the PKMW project would likely fit well into an Action Response Framework (Transcript of WLA Technical Session, Day 1, page 123). Diavik also noted that the TK Monitoring would likely go on for much longer than the period proposed for monitoring under the SWALF (Transcript of WLA Technical Session, Day 1, page 217).

Diavik noted that it had received requests that the cultural use criteria apply to runoff (Transcript of WLA Technical Session, Day 1, page 236) but did not specify who made these requests. Diavik also stated that it expected that if water quality meets AEMP objectives, it also expects it would meet cultural criteria (Transcript of WLA Technical Session, Day 1, page 236 & 237). EMAB disagrees with this view; Diavik should explain and provide evidence to support its statement that cultural use criteria will be met by achieving AEMP benchmarks, showing a direct linkage between each of the cultural criteria and the AEMP benchmarks. In its decision on PK Management Plan Version 7.0 and Cultural Use Criteria, the WLWB decided that Diavik must provide "*A demonstration of how results of water quality monitoring for AEMP Effects Benchmarks compare to cultural use criteria to confirm the inference that meeting AEMP Effects Benchmarks will lead to meeting cultural use criteria.*" with each PKMW Modeling update (Decision #5, part ii).

In follow-up to Information Request #4 Diavik proposed considering inclusion of cultural use criteria as an Action Level 3 trigger. However monitoring of cultural criteria has not been described.

Recommendation

4.1 A condition should be included in any approval for Diavik to breach collection ponds that Diavik propose Traditional Knowledge monitoring of the collection ponds, discharge and effects on the receiving waters, and incorporate early warning triggers into the SWALF. If Diavik proposes that meeting AEMP Benchmarks also meets the cultural use criteria, then it must demonstrate a direct linkage between each of the cultural criteria and the AEMP benchmarks.

5 Water Quality Modelling

DDMI has modelled the hydrodynamics and water quality of Lac de Gras and the pit lakes A418, A154, and A21. The modelling makes predictions about post-closure drainage and pit lake development impacts on the long-term water quality in the receiving environment. It is important to note that there are several uncertainties associated with these predictions and modelling.

These uncertainties make it crucial that the modelling predictions are verified through rigorous testing and validation. This chapter outlines EMAB's detailed comments and recommendations on the methodology, data inputs, and assumptions used to develop these models, as well as comments on the results.

It is worth noting that the model does not describe the mixing zone as per Schedule 8 Section 3 of the draft licence. Diavik has stated that it provides predictions at locations that the mixing zone is expected to be within (Gord Macdonald, Technical Session Transcript, Day 1, p. 80; Sean Sinclair, Technical Session Transcript, Day 2, p. 61-68) ie. at or beyond the edge of the mixing zone. EMAB's review of Water Quality Modelling focuses on three main topics:

- Model Inputs: Baseline Water Quality Data.
- Mixing Zones.
- Source Term for PKC.

5.1 Model Inputs: Baseline Water Quality Data

The site water quality model used to predict effects of site runoff used a constant and "average" (median) background water quality condition for runoff based on sampling done at 8 streams in 1996 (none of which are on East Island). No details are provided and there is no discussion of this dataset in the submission (e.g., were conditions highly variable). This information is important to understand as it is a major input to the modeling that was done.

Recommendations:

5.1 Provide a table(s) of source term loads used in runoff modeling to assist with identifying what source terms are the most significant in each drainage.

5.2 Conduct runoff modeling using a more conservative background water quality source term (e.g., maximum or 95th percentile) and compare to predictions based on the median baseline water quality values.

5.2 Mixing Zones

It is not clear why the mixing zone cell must have water for the entire year for the predictive modeling. This requirement requires the extension of mixing zones beyond the 100 -200 m for C1, C5 and C13.

Recommendation:

5.3 DDMI should provide a rationale for why the mixing zone cell must have water for the entire year in order to conduct predictive modeling.

5.3 Source Term for PKC

The thickness of the predicted active layer for the PKC Facility was discussed at the Technical Session. DDMI confirmed at the Technical Session and in response to IR#6 that the estimate of 2.2 m active layer thickness was provided in a thermal analysis that is in ICRP v4.1, Appendix X-5, Sub-Appendix B. The Sub-Appendix is a 2013 memo from Golder Associated titled "Diavik PKC Facility Thermal and Seepage Analyses to Support the Revised Closure Concept." The closure concept at the time entailed a cover similar to that now proposed for the PKC Facility, so the analyses represent an appropriate physical configuration.

In the Response to IR#6 DDMI provided estimates of water quality in runoff from the PKC Facility after consideration of a 4 m active layer. It asserts, based on the 2013 analysis, that the PK would otherwise remain frozen and therefore no further modelling or consideration of water quality conditions is warranted, even though this modest increase in the amount of PK contributing to loading results in predicted concentrations up to 3.5 times greater.

There are remaining concerns about whether the analyses provide a conservative, up-to-date estimate of post-closure conditions, especially when considering the implications of climate change. The more recent thermal modelling for the NCRP also provides an example for comparison including consideration of material properties used in the analyses.

A memo from Core, provides comments and recommendations related to the climate change projections updated to support the FCRP. As noted in the memo, the FCRP analysis relied on the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5, 2013) because climate projections for the more recent 6th Assessment Report (AR6, 2021) have not been downscaled. Core identifies that "there is potential for predicted climate parameters to be different (potentially hotter temperatures) than under AR5." The thermal analysis for the PKC Facility was conducted before IPCC AR5 was available, and therefore relies on even older climate projections.

Recommendation:

5.4 The thermal analysis and related seepage and water quality predictions should be updated based on conservative, current projections of climate change.

The thermal analyses require the estimation of material properties, such as thermal conductivity and heat capacity, to predict temperature profiles over time. Table 3 in the 2013 Golder memo lists the properties of Type I rock fill used in the cover, with the source of these properties being Golder's earlier work in 2007. TetraTech conducted a thermal analysis in 2017 to support the NCRP cover design, and Table 7 of the report provides the thermal properties of Type I rock fill. The properties were determined indirectly from correlations with soil index properties and verified by comparing them to measurements

in test piles at Diavik and other locations in literature. Table 1 below compares the thermal properties of Type I rock fill used in the two analyses.

Table 1: Comparison between the thermal properties of Type I rock fill used in Golder 2013 and TetraTech 2017 analyses.

	Moisture Content (%)	Bulk Density (Mg/m3)	Thermal Conductivity (W/m-ºC)		Specific Heat (kJ/kgºC)	
			Frozen	Unfrozen	Frozen	Unfrozen
Golder 2013	5	1.9	1.9	1.6	0.89	1.05
TetraTech 2017	3	2.06	1.32	1.57	0.77	0.83

There are some substantial differences between the thermal properties used for Type I rock fill in the two analyses. It is not clear whether the differences reflect a better understanding of the properties for the later study, or if there is significant uncertainty about the actual properties. Nonetheless, the difference in material properties could have a significant influence on the predictions of temperature profiles and freeze/thaw characteristics. Therefore, it would be useful to understand whether the 2013 thermal model accurately portrays the conditions that have developed in the facility.

Recommendation:

5.5 Use existing conditions to validate whether the PKC Facility thermal model provides an accurate prediction of current thermal conditions in the Facility, and consider whether the model and its assumptions and inputs (e.g., material properties) should be refined.

Given the uncertainty in climate change projections, it is not clear why only the 50th percentile for the 2120 projections were used in the engineering designs.

Recommendation:

5.6 DDMI should also consider the 95th percentile to evaluate the upper end of the predicted modeling. It is important to measure the effectiveness of the designs if the impacts of climate change end up being on the upper end of the predictive modeling.

6 Closure Criteria

The closure objectives and criteria, as outlined in Appendix V, are crucial for the successful completion of the project. Each objective listed in Appendix V is accompanied by proposed closure criteria, which specify the specific conditions that must be met to achieve the objective. WLWB did not approve all of the proposed criteria in ICRP V4.1. EMAB has raised several concerns regarding the proposed closure criteria in Appendix V the FCRP V1.0, which will be elaborated on in this chapter.

This chapter will focus on closure objectives: SW1, SW2, and SW6, and discuss the issues surrounding their respective closure criteria. In addition to these objectives, we will also address general concerns that have been raised regarding the closure criteria as a whole.

6.1 Closure Objective SW1

The modeling predicts that water quality in Lac de Gras mixing zones may exceed drinking water standards; DDMI acknowledged in FCRP documents and at the Technical Session that people will likely drink water from Lac de Gras. The SWALF Action Level 3 is only triggered when water quality at the mixing zone boundary exceeds drinking water criteria, meaning that corrective measures will be taken after the water quality within the mixing zone has already exceeded drinking water guidelines. It is essential to consider the possible effects of consuming water from these mixing zones.

Recommendation:

6.1 DDMI should provide information about how it has addressed potential use of water in mixing zones for human consumption, and whether there may be long-term constraints on consumption in these areas.

While EMAB understands that the risk assessment (Appendix X-22) did not predict an exceedance of the criteria protective of potable water at ARC-1, this evaluation is based on modeled and not measured concentrations. Comparison with Drinking Water Guidelines should be added to the closure criteria for SW1-1 and the SWALF. EMAB is particularly concerned about long distances from the discharge point into Lac de Gras for some ARC-1 locations; water quality at the stream outlet could exceed Drinking Water Guidelines and still meet them at Arc-1.

Recommendation:

6.2 Drinking water quality guidelines should be added to the closure criteria for SW1-1.

DDMI has reduced the consideration of sediment impacts to PHC F3 in the closure criteria. However, the HHRA identifies potential risks to human health from sediment impacts of uranium and arsenic. Sediment monitoring, especially in future discharge areas should be added to the closure plan as closure criteria to meet Closure Objectives.

Recommendation:

6.3 Sediment monitoring, especially in future discharge areas should be added to the closure plan as closure criteria to meet Closure Objectives.

In Appendix VI-1 Section 3.1.4.4, The text indicates that 5 years of data will be used to determine achievement of SW1 and SW2 and that a weight of evidence approach will be applied. In its response to EMAB comment 29 on the Water Licence Amendment Application, Diavik said that the specifics of the weight of evidence approach will be described in the Performance Assessment Report. The WL Amendment and the FCRP would benefit from additional details regarding what will be considered in the weight of evidence approach as well as factors that will be considered to reduce or alter the monitoring requirements.

Recommendation:

6.4 Diavik should provide details of what will be included in the performance assessment reports for the WLA and in the FCRP. The information contained in the performance assessment reports should also be indicated to be subject to the WLWB approval.

6.2 Closure Objective SW2

Closure Objective SW2 requires that water quality from the mine site will not cause adverse effects on aquatic life or water uses in Lac de Gras or the Coppermine River. The proposed Closure Criteria address sublethal toxicity (SW2-1) and acute toxicity (SW2-2). Schedule 8 of the Draft Water Licence envisioned Closure Criteria for a broader range of relevant contaminants of potential concerns.

Diavik proposes the evaluation of sublethal toxicity using a single invertebrate species, Ceriodaphnia dubia, at a dilution ratio of 8:1. The rationale behind this dilution ratio is that it provides an indication of potential toxicity before reaching the 10:1 dilution expected at the mixing zone boundary. However, this means that sublethal toxicity may still occur in effluent streams and mixing zones while still meeting the Closure Criterion and therefore achieving the Closure Objective. Additionally, using a single species for evaluation means that potential sublethal effects on other species are not considered.

Recommendation:

6.5 Closure Criterion SW2-1 should be revised to address toxicity to a broader range of species. Typically testing would be completed on relevant sensitive fish, invertebrate and algae/aquatic plant species.

At the Technical Session DDMI explained how predicted background water quality loading may lead to concentrations close to AEMP benchmarks in post-closure conditions for some parameters due to conservative modelling assumptions. DDMI stated in Response to Information Request #1 that "this is an artifact of conservative modelling assumptions.", which may be a reasonable conclusion based on the modelling approach and assumptions about background water quality.

The issue of predicted background water quality loading raises questions about toxicity testing methods for evaluating the proposed closure criteria. Lab toxicity testing often uses dilution water with low contaminant concentrations, which may not represent the actual dilution water present in Lac de Gras. Therefore, the proposed toxicity testing at 8:1 dilution using lab water may underestimate the actual toxicity conditions present at the mixing zone boundaries in Lac de Gras.

Recommendation:

6.6 DDMI should consider whether toxicity testing protocols for evaluating achievement of closure criterion SW2-1 should be revised to require use of Lac de Gras water as dilution water for lab testing.

It is not clear why the criteria for SW2 is different than the criteria for M1. At the end of the mixing zone, the AEMP Benchmarks should apply. Meeting AEMP benchmarks at the mixing zone was part of the previous version of the ICRP V4.1. It is not clear why DDMI has removed this as a closure criterion.

Recommendation:

6.7 DDMI should add meeting the AEMP benchmarks to criteria SW2 and the SWALF as a criteria to be met at the mixing zone boundary.

Based on the figures provided in the response for information requests it appears that there is very little current/movement of water within each of the discharge areas for breeching ponds. With very little current speed in these shallow areas, one would expect sedimentation to occur. It is not clear why closure criteria for sediment have not been included in the FCRP or the SWALF.

Recommendation:

6.8 Monitoring of sediment quality and the potential impacts to aquatic life should be included in the FCRP and SWALF.

6.3 Closure Objective SW6

Closure Objective SW6 is stated as "ground surface designed to drain naturally following pre-development drainage patterns." The associated Closure Criteria address satisfactory completion of the design (SW6-1) and satisfactory performance of drainage networks (SW6-2). DDMI proposes annual monitoring at freshet for a period of five years to evaluate the performance and condition of the drainage network, and identify any need for maintenance or repair. This is a reasonable approach to evaluate initial performance and confirm initial achievement of the Closure Objective. However, the stability and performance of drainage networks is related to the size of hydrologic events that occur more than to the passage of time.

The proposed initial monitoring program makes sense because it includes monitoring at freshet when major flows are likely to occur. But, additional monitoring is needed to confirm performance after the initial period, and after any high flow events whether in the initial five years or in the long-term.

Recommendation:

6.9 The monitoring program should include inspections during the initial five-year period after any major storm events that may cause erosion or damage to conveyance channels or pond breaches. Once the initial five-year period has passed, periodic monitoring should likely continue at lower frequency, and event specific monitoring should be conducted after large events.

6.4 General Comments

In Appendix VI-1 Section 3.5.2.4 Comparison to Closure Criteria (North Inlet), the second paragraph refers to the AEMP Effects Benchmarks (FCRP Appendix V) as compliance criteria. The AEMP Effects Benchmarks do not seem to be present in Appendix V of the FCRP. References to the AEMP in Appendix V are present in other areas of the document (i.e., Section 3.6.2.4).

Recommendations:

6.10 DDMI should correct the references to the AEMP Criteria throughout Appendix V.

6.11 If AEMP benchmarks are determined not to be applicable, then they should be adjusted to site-specific criteria prior to closure. Adjusting closure criteria during closure and post-closure should be avoided.

7 SNP Monitoring Plan

EMAB views Diavik's proposed SNP Monitoring Plan for the discharges as a good start, but insufficient to meet the concerns of stakeholders or the approach set out in Section 3 of Schedule 8 of the draft licence. In our view monitoring in each catchment should begin with a plume delineation study to define the mixing zone. Monitoring should take place in four locations:

- As proposed by Diavik, at the dike breach to understand the discharge into receiving waters and the potential effects on aquatic life using the stream, and humans and wildlife that may drink from it.
- At the mouth of the stream where it enters Lac de Gras to understand the discharge into Lac de Gras and the potential effects on aquatic life using the stream, and humans and wildlife that may drink from it. This will be especially important during the period where it is difficult or impossible to safely sample further out in the lake, freshet in particular.
- At the edge of the mixing zone as defined by the plume delineation study, and no more than 100 meters from the mouth of the stream, to understand the effects of the discharge on the mixing zone.
- As proposed by Diavik, at the modeled Arc 1 to verify predictions from the water quality model. We note that ARC 1 and the mixing zone boundary are not equivalent.

EMAB notes that Diavik has provided information identifying the distance from the discharge into Lac de Gras to the modeled Arc 1 in Table 19 of FCRP Appendix X-21 (p. 70). Diavik's own estimates show that three of the 10 discharge points are well over the 100 meter maxing mixing zone target, with the rest being 100-200 meters away. EMAB has reviewed the maps of each catchment provided by Diavik at the Technical Sessions and estimates that none of the discharge points are less than 200 meters from Arc 1, and six are approximately 500 meters distant (see table below).

Pond	**Diavik Distance Estimate from stream mouth to Arc 1**	**EMAB Distance Estimate from stream mouth to Arc 1**
C1	480-520m	~500m
C2/C3	100-200m	~500m
C4	100-200m	~350m
C5	350-450m	~500m
C7	100-200m	~500m
C10	100-200m	~500m
C11	100-200m	~200m
C12	100-200m	~200m
C13	500-560m	~500m
Sump E21	100-200m	~200m

7.1 Runoff Monitoring: Sampling Methods

Sampling at the Mixing Zone Boundary (MZB) is proposed to be at fixed locations – either 100 m from shore or farther offshore to the 5 m depth contour. Diavik clarified at the Technical Sessions that the proposed sampling at the 5 m depth contour is due to logistical constraints (i.e., assumed 2 m ice thickness, sampling 2 m off the bottom and using a 1 m Kemmerer). Diavik also clarified at the Technical Sessions that the MZB sites are expected to be fully mixed but that *in situ* depth profile measurements will be collected.

It is our understanding that the MZB SNP stations would not be sampled under ice either because runoff will not be flowing, and therefore sampling is not required, or because conditions on the lake would be unsafe for sampling when runoff is flowing but ice remains on the lake. Assuming this is correct, then the presence of ice (and therefore the need to account for 2 m of ice depth) is not applicable to the selection of the precise location (i.e., minimum 5 m depth).

Other sampling methods (i.e., other than a 1 m vertical Kemmerer water sampler) could also be used for sampling these sites including but not limited to grab sampling (directly filling sample bottles) or use of a horizontal sampler or a peristaltic pump. These methods would allow for sampling of shallower depths.

In addition, if sites are not fully mixed it would be more appropriate to collect a depth-integrated sample for chemistry and toxicity testing, rather than sampling the upper 1 m of the water column as proposed.

It would be most appropriate to locate all MZB SNP stations at the 100 m distance from shore as proposed, or closer to shore if full mixing is achieved closer than 100 m from shore, rather than applying a minimum water depth. A plume survey would assist with delineating the dimensions of the plume and identifying the location of full mixing.

Recommendations:

7.1 Remove the 5 m depth constraint for establishing MZB stations and sample at 100 m distance from shore in all mixing zones (or closer if full mixing occurs closer to shore); change the sampling method if needed to sample shallower water depths.

7.2 Collect depth-integrated samples at the MZB stations rather than only a portion of the water column in the event that a site is not fully mixed.

7.3 Conduct a plume survey in each mixing zone to establish the size, dimensions, and location of full mixing. Review the proposed MZB sampling site locations based on the results of the plume survey and move stations as required and appropriate.

7.2 Runoff Monitoring: Discharge Monitoring and Model Verification

NSC previously submitted a technical comment in a review of the Diavik Licence Amendment Application - Progressive Reclamation – Re-Establishing Natural Drainages (NSC 2023) seeking clarification of what monitoring is proposed with respect to site runoff discharge. It was noted that Appendix VI-1 does not clearly indicate whether runoff discharge will be monitored at all sites post-breaching of the ponds or what methods would be employed - specifically measurement frequency.

DDMI responded: “Post-decommissioning surface runoff flow (discharge) will be monitored through presence/absence observations at the time of planned sampling.”

Clarification was provided by Diavik at the Technical Sessions that model validation would consist of verification of the predicted dilution factors at the MZB. Diavik noted this would involve comparing the concentrations from the runoff and MZB “plus background”. It is our understanding that there is no “background” water quality sampling planned in the lake to be used for this purpose.

EMAB also wants to note for the Board’s attention that the HHRA highlights the potential health risks associated with uranium and arsenic sediment impacts. To meet the Closure Objectives, sediment monitoring, particularly in discharge areas, should be included in the FCRP. The mixing zones and low flow/low current conditions, as well as ice cover, may also affect sediment deposition and should be monitored. EMAB strongly recommends monitoring of sediment impacts to ensure environmental safety.

Recommendations:

7.4 It is recommended that discharge of surface runoff be monitored regularly (e.g., daily discharge) if/as feasible to: (A) provide a means to monitor the overall flow conditions encountered each year (i.e., hydrograph, periods of flow, volume of runoff); (B) document the range of discharge conditions to assist with interpretation of monitoring results (e.g., was toxicity testing sampling or mixing zone sampling conducted during a relatively high or low discharge); and (C) to facilitate verification of modeling results, including verification of dilution, and allow for calculation of loadings from site runoff.

7.5 Model validation of dilution factors should compare water quality in the runoff directly to the water quality at the MZB (i.e., background conditions should not be added to the MZB measurements).

7.6 The predicted concentrations were below the drinking water guidelines, however, until such time that the model is validated and is accurately predicting concentrations at the end of the mixing zone, the comparison to drinking water guidelines should be completed as part of the closure monitoring.

7.7 DDMI should add Drinking Water Guidelines to the SWALF and monitor for them.

7.3 Runoff Monitoring: Discontinuation of SNP Stations

It is proposed to drop a SNP station if runoff cannot be sampled in two back-to-back years. The drainages are relatively small and flow may range from little flow in dry years to more flow in wet years.

Recommendation:

7.8 A decision to deactivate an SNP station should consider the hydrological conditions/climatological conditions encountered during initial monitoring relative to the range of flow conditions for each stream. If the period of monitoring did not capture relatively high flow conditions, the station should remain active.

7.4 Sampling Timing

Diavik indicated that after the completion of closure activities on site, monitoring for chemical and toxicity analysis will be reduced to twice annually. The WL amendment and FCRP should indicate that any proposed reduction in sampling frequency will be subject to board approval.

Mixing zones are proposed to be sampled once annually for two years following decommissioning. Given the uncertainty in the predictive modelling together with the uncertainty in the climate change models, two years of monitoring following decommissioning is likely insufficient.

Recommendation:

7.9 Triggers for stopping monitoring should be defined (i.e., no significant change for X years, for example) and the WL Amendment and FCRP should include wording to indicate that any change to the monitoring frequency and duration is subject to board approval.

7.5 Runoff Monitoring: Sampling Frequency

The appendices indicate a reduction of monitoring frequency for runoff from weekly for 1 year to monthly (quarterly for toxicity) and ultimately twice per year thereafter. This reduced sampling frequency may not be adequate to effectively characterize discharge and water quality in the drainages given that inter-annual variability may be considerable. In addition, site runoff is likely to be highly variable within the open-water season and quarterly sampling may be inadequate to fully characterize these source waters; sampling needs to capture periods of intermittent flow, which may be highly variable in time and for brief periods (i.e., days). More frequent sampling (weekly or biweekly sampling) may be required to capture a range of flow and water quality conditions for more than a 1-year period.

Recommendations:

7.10 Recommend a minimum of two years of weekly monitoring of SNP runoff sites; reductions in sampling frequency thereafter should be based on the results of the monitoring, including consideration of hydrological conditions encountered during the initial monitoring (i.e., wet or dry years/ range of flow conditions encountered during initial monitoring years) and variability of water quality conditions.

7.11 Identify the approach that will be taken to trigger sampling of the streams subject to infrequent/intermittent flows, including the time required to mobilize and complete toxicity/water quality sampling once flow is detected.

DDMI proposes once annual monitoring of water quality at the mixing zone boundary for a period of two years following completion of decommissioning of each Collection Pond. It proposes that sampling would continue if source water samples do not meet closure criteria, or if concentrations at the edge of the mixing zone exceed AEMP effects benchmarks. The modelling predicts that concentrations at mixing zone boundaries for many parameters and locations will be well below AEMP benchmarks. As a result, exceedance of AEMP benchmarks at the mixing zone boundary would, in most cases, be unlikely, and therefore the AEMP benchmarks at this location are not an effective threshold for making decisions about future monitoring. Instead, it makes sense to rely on comparison with predicted conditions and evaluation of trends to assess the need for continued monitoring.

Recommendation:

7.12 Increase monitoring frequency for water quality at the mixing zone boundary. Sampling conducted in the first two years at mixing zone boundaries should be compared with predicted concentrations from modelling and evaluation of trends, to assess whether the runoff and mixing conditions are consistent with expectations. If concentrations of any parameters are higher than predictions or trending upward, monitoring should continue.

DDMI proposes that frequency of monitoring of site runoff will be reduced to twice annually after completion of closure activities on the site. Monitoring of site runoff is an important mechanism for understanding performance of the closure landscape. At the very least, the post-closure monitoring program should be designed to understand the water quality conditions including seasonal variability, and conditions in various flow conditions. Twice annual monitoring is likely not sufficient to achieve this purpose. Understanding the variability will require monitoring at least during freshet (when flows and TSS are both likely to be high) after freshet (when modelling indicates that maximum effects are likely to occur – FCRP Closure and Post-Closure Monitoring Plan Section 3.1.4.3) during summer, and during fall (once open water flows have declined). For intermittent discharges, monitoring will need to focus on times when flows are likely to be present (e.g., storm events). This frequency of monitoring should be continued until results demonstrate that lower frequency can provide statistically representative understanding of variability.

Recommendation:

7.13 Increase post-closure monitoring frequency for surface runoff, with sampling of sufficient frequency to capture major hydrological periods and water quality variability. For intermittent flows, monitoring should focus on time periods when flow is likely to be present.

In the Response to Comments and at the Technical Session, DDMI asserted that any effects of the misclassified rock would already be measurable in downstream locations. However, it did not provide or refer to test work and/or analyses to confirm that the rock would have currently released sufficient acidity to consume its inherent neutralizing potential and that contaminants would have travelled to monitoring locations. In the absence of this type of information, there is remaining uncertainty about performance.

Recommendation:

7.14 DDMI should revise monitoring durations for catchments in which misclassified Type III rock was used for construction. Monitoring durations should be sufficient to detect any contamination that arises from potential ARD and metal leaching, based on predictions of the time for the specific materials to react and consume neutralizing materials.

7.6 Runoff Monitoring: Sites

It is proposed that runoff will be sampled for chemistry and toxicity at the breach locations. Monitoring of the streams should also be conducted near the mouths to determine if and how water quality changes along the length of the stream and prior to discharging to the lake.

Recommendation:

7.15 Recommend sampling runoff for water quality analysis at an additional site near the stream mouths to assess changes in water quality conditions.

7.7 Runoff and MZB Monitoring: Freshet

It is expected that due to safety considerations, sampling of the MZB SNP stations will not be feasible early in the spring when runoff begins to flow but the lake is still ice-covered. In the absence of the ability to monitor the mixing zone in these instances, an alternate sampling plan should be developed that can feasibly and safely be implemented. Sampling the runoff stream at the mouth (point of entry to the lake) as recommended in Section 2.1.5 (or an alternate site as/if needed) and/or in the nearshore area of the lake if safe/feasible is recommended.

Recommendations:

7.16 Develop an alternate sampling plan for scenarios in which the MZB stations cannot be sampled for safety reasons. Recommend sampling the mouth of the runoff stream (if regular sampling of these sites is not required) and/or the nearshore area of the lake as feasible.

7.17 Estimate concentrations using predicted dilution factors at the SNP MZB stations in the event the sites cannot be sampled for safety reasons.

7.8 Runoff Monitoring: Low Flow

It has been noted that due to the nature of the drainages and flow conditions, that runoff flow may be inadequate to facilitate collection of water samples for chemistry and/or toxicity testing during some periods. Though this constraint may apply to the entirety of some/all of the drainages, sampling should be attempted at alternate locations farther downstream in the event sampling cannot be completed at the proposed runoff SNP stations. If sampling cannot be completed at any site in the stream(s), sampling should be conducted in the nearshore of the lake near the point of entry of the runoff.

Recommendation:

7.18 Identify alternate sampling sites in runoff streams downstream of the breach locations to be sampled in the event of practical constraints on sampling at the proposed runoff SNP stations. Identify alternate sampling sites in the nearshore of the lake in the event that runoff cannot be sampled at any location in the runoff streams.

7.9 Mixing Zone Monitoring: Chlorophyll *a* and Sediment

The water quality parameters that will be monitored at the mixing zone stations do not include chlorophyll *a*. This parameter should be included to monitor for effects related to potential nutrient enrichment. This is particularly relevant as water quality modeling indicated total phosphorus (TP) is one of the parameters that is predicted to increase post-closure. It is also noted in Appendix VI-2 (p. 17) that biological uptake will reduce concentrations in the lake, particularly during the open-water season; a measure of algal abundance is needed to account for the effect of nutrients released in runoff.

Recommendation:

7.19 Add chlorophyll *a* to the list of water quality parameters to be monitored at the SNP Mixing Zone stations.

There are general concerns with the mixing zones and the mixing under low flow/low currents as well as ice cover. As this may affect deposition into sediments, EMAB is of the opinion that sediment impacts should be monitored.

Recommendation:

7.20 Diavik should monitor Sediment impacts in the mixing zone.

8 Surface Water Action Level Framework

Diavik has argued that the discharge from the collection ponds is not a waste, and so doesn't need to be regulated. As discussed in section 3 above, EMAB's view is that the discharge is a waste, and that it should be monitored and regulated. Based on the presentation provided by the WLWB in the technical session on March 6, 2023 and on the definition of waste provided in Section 1 of the Waters Act and Section 51 of the Mackenzie Valley Resource Management Act (MVRMA), EMAB's opinion is that DDMI was not successful in claiming that the discharge would not be considered a waste.

Diavik has stated it doesn't want EQC or a regulatory mixing zone based on the argument that the discharge is not a waste. Diavik has also stated that the SWALF approach may be more appropriate for regulation of a non-waste discharge.

EMAB does not view Diavik's proposed SWALF as an adequate approach to protecting water quality in the waters around East Island or the health of aquatic life, wildlife or humans. The premise of the SWALF is that discharge from the breached dams will be diluted sufficiently by the time it enters Lac de Gras that water quality will be protected, and the health of aquatic life, wildlife or humans will also be protected. EMAB's opinion is that the SWALF and associated SNP monitoring will not provide data or responses that allow Diavik to show the discharge is not having a negative impact.

Our concerns include:

- Focus is on water quality at breaches, and verifying the modeled predictions at the Arc 1 locations.
- Monitoring is too limited in frequency and locations, and because of this it may miss exceedances and other impacts that could negatively affect the health of aquatic life, wildlife or humans
- Duration of monitoring program may be too short to allow detection of impacts
- Triggers are not comprehensive; in particular AEMP Benchmarks are not included in closure criteria or triggers and responses
- Some triggers are not well defined and/or too lenient

Recommendation

8.1 DDMI should provide clarification of the intended use of the SWALF and the measurement of SW1 and SW2 if it is not intended for a waste discharge.

Diavik has said the SWALF criteria would be included in the water licence and be enforceable. EMAB has reviewed Diavik's draft water licence for this amendment and we were not able to find any reference to the SWALF. Is Diavik arguing that once the FCRP is approved, the FCRP will become the mechanism used to enforce the SWALF?

Recommendation

8.2 Diavik should explain how the SWALF will be included in its water licence and be enforceable.

The rest of this section will provide comments and recommendations on the triggers and actions set out in the SWALF. We are recommending many changes to inadequacies in the SWALF, **but we are not convinced that it will be an effective tool to measure whether closure objectives have been met, or to regulate discharges from the mine.**

EMAB has broken its comments into four main sections:

- Regulatory Approach
- Action Level Triggers and Responses
- Response Time
- Environmental Trade-off Study

8.1 Regulatory Approach

Diavik has said it will apply for each discharge stream to be a Final Discharge Point (FDP) under the MDMER (Technical Session Transcript, Day 1, p. 106). It is our understanding that this is not expected to affect the SWALF.

At a fundamental level, the proposed framework assumes that criteria are the problem, not measured conditions in mine closure projects. The focus should initially be on whether the closure plan is performing as expected, and investigations should be conducted if Action Level 1 triggers are exceeded. If the cause is not mine-related and is expected to continue, reconsideration of criteria may be necessary. If the cause is mine-related, appropriate mitigation measures should be developed and implemented. Only after implementing such measures and continued exceedance of criteria, should risk assessment be considered to adjust criteria as a response to a revised Action Level 2 trigger.

Recommendation:

8.3 Revise the SWALF to provide for investigation of causes of SW1-1 or SW1-2 exceedance, and consideration of maintenance/mitigation before revising closure criteria, potentially as a response to a revised Action Level 2.

The action level and response box for AL2A suggests to review the dilution factor at the mixing zone boundary. DDMI has indicated that this review may be necessary if their predictions/expectations are incorrect. The dilution within the mixing zone should be studied and known prior to breaching the ponds.

Recommendation:

8.4 The SWALF should indicate that no changes to the criteria will be made without approval from the Board. DDMI should also present the information for each discharge point where they determined the required dilution factor. This information should look not only at the average conditions, but also at the "worst case".

8.2 Action Level Triggers and Responses

These comments and recommendations take into account Diavik's response to IR#4 from the Technical Sessions.

The SWALF Action Levels do not compare water quality to predicted conditions, instead relying on benchmarks, criteria or toxicity. However, variance of water quality from predicted conditions is an important indicator that conditions may eventually lead to closure failure. Such comparisons could be made in Lac de Gras or individual catchments and would provide an early indicator of unexpected water quality conditions. The expected response to variance from predicted conditions would likely be less burdensome than for exceedances of benchmarks or criteria and would allow for early consideration of mine-related or non-mine-related causes.

Recommendation:

8.5 Revise the SWALF to include an Action Level trigger that is based on comparisons between actual and predicted conditions potentially considering predictions in both individual catchments (i.e., close to sources) and Lac de Gras.

8.2.1 Toxicological Testing

The closure objective for SW2 is "Surface runoff and seepage water quality that will not cause adverse effects on aquatic life or water uses in Lac de Gras or the Coppermine River. "A mixing zone is based on the understanding that somewhat elevated concentrations can occur in a small area of a receiving water body without significantly affecting the integrity of the water body as a whole. However, at the end of the mixing zone, water quality should meet water quality guidelines protective of aquatic species and the most sensitive use of the water. Water quality guidelines are derived to be "protective of all forms of aquatic life and all aspects of aquatic life cycles" with the goal to protect "all life stages during an indefinite exposure to water" (CCME, 2007). Guidelines are preferentially derived using the lowest observed effect level from a chronic study using a non-lethal endpoint for the most sensitive life stage of the most sensitive species. If a chronic lowest effect level isn't reported, then an Acute to chronic ratio (ACR) can be used (CCME. 2003) As such, federal guidance does not consider an IC50/EC50 to be appropriate as an indicator of no adverse effect to aquatic life.

The SWALF should clearly identify what toxicity tests are being completed as triggers. Currently the level of protection to aquatic life at the mixing zone boundary is not suitable to protect aquatic life in Lac De Gras.

The threshold of toxicity should be an IC20 and not an IC50. An IC50 would mean adverse impacts to 50% of the test organisms and is not an appropriate threshold to protect aquatic life. In addition, more than one species should be tested for chronic effects at the AL2A. Chronic testing of an invertebrate (C.dubia) and a fish (rainbow trout) should be completed at a minimum. Chemistry data should also be collected as part of the AL2A and compared with AEMP benchmarks to help identify the potential constituents causing the toxicity.

CCME, 2007. A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life 2007.

CCME, 2003. Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives.

Recommendation:

8.6 DDMI should change the Action Outcome of Toxicity impairment IC50 at the mixing zone boundary to Toxicity Impairment IC20 at the mixing zone boundary so as to meet their closure objectives.

DDMI indicated that meeting an IC20 at an 8 fold dilution would be predictive of meeting an IC50 at 100% at the end of the mixing zone. This may be true, but it would be dependent on the steepness of the dose response curve, and the dose response curve could change depending on the composition of the discharge. In addition, an IC50 at the end of the mixing zone is unacceptable. To meet their closure criteria there needs to be no adverse impact to aquatic life. An IC20 is typically used as a benchmark to indicate that although some impacts will be seen, it is unlikely to cause adverse effects to aquatic life. As such, the threshold criteria at the end of the mixing zone needs to be a criteria to which unacceptable impacts to aquatic life are not anticipated.

Recommendation:

8.7 EMAB recommends Diavik confirm the dilution required at the discharge point to the end of the mixing zone at each discharge point using information representing the worst-case scenario. The trigger level to the required dilution factor to meet the AEMP at the mixing zone boundary could then be applied (i.e.., DF * AEMP), along with no acute toxicity and no chronic toxicity at the IC20 for that dilution factor. If there is an exceedance, or toxicity is present, then if weather permits, sampling at the end of the mixing zone should be completed within 7 days. Water quality at the end of the mixing zone should meet the AEMP Benchmarks and there should be no chronic effects to at least an invertebrate (C. dubia) and a fish species (rainbow trout) at an IC20 level. If there is chronic toxicity, then mitigation measures need to be implemented and discharge to Lac de Gras stopped. If weather does not permit sampling at the end of the mixing zone, then sampling should occur as close to the mixing zone as possible or mitigation measures stopping discharge should be implemented, until such time a repeat of the testing at the discharge location can be completed with confirmatory sampling at the end of the mixing zone occurring within 7 days.

8.2.2 Justification for 10 X AEMP Benchmark Trigger

The basis for the Action Level 1 (AL1) trigger of 10 X AEMP benchmarks for aquatic life has not been provided in this section. DDMI should provide the basis and assumptions used in the setting of the action level, including ecological relevance. If DDMI is assuming that more than a 10X fold dilution will occur before ARC1 and therefore the 10X AEMP is a conservative trigger, then it is not clear why they are not setting the closure criteria to meeting the AEMP benchmarks at the MZB. Meeting an IC/EC50 at the MZB does not confer suitable protection for aquatic life and would not enable DDMI to meet their closure objective of no adverse effect to aquatic life.

Recommendation:

8.8 Once the dilution factor at each point of discharge is verified, with data, to be reliable, then DDMI should set a suitable protective early trigger level at each discharge point based on the assumption that the AEMP benchmarks will be met at 100 m, or at the end of the mixing zone (in most cases this will not be at ARC1). If AEMP benchmarks are not met at 100 meters, then chronic toxicity testing using multiple species should be the next action level with anything above an IC20 triggering another action level (i.e. stop releasing discharge to Lac de Gras).

8.2.3 AEMP Benchmarks in the Mixing Zone

The text indicates that "If SNP source water samples collected from the pond breach location did not meet closure criteria, or if concentrations at the edge of the mixing zone exceeded AEMP effects benchmarks then sampling would continue, and the surface water action level framework would be applied (see Section 3.1.4.4 and Figure 3-3)."

The surface water action level framework appears to apply criteria (AL 0/1) of 10X AEMP benchmarks and these appear to apply specifically to the runoff and not the mixing zone. It is unclear how these two actions interconnect as the framework does not apply the criterion of conditions being below AEMP benchmarks at the MZB.

Further, the framework does not include direct assessment of water quality conditions and comparisons to AEMP benchmarks in the mixing zone. Therefore, the framework lacks a mechanism to invoke an action in the event that water quality conditions are above benchmarks but rather relies entirely on results of toxicity testing of the mixing zone – which would only be tested in the event that site runoff exhibits toxicity.

Recommendations:

8.9 Diavik should add meeting the AEMP benchmarks to the SWALF as a criteria to be met at the mixing zone boundary

8.10 Describe how water quality monitoring results in the mixing zone will be incorporated into the SWALF and clarify what the actions would be in the event that AEMP benchmarks are not met at the MZB

8.2.4 Nutrients and Eutrophication:

The surface water action level framework (SWALF) Action Level AL1A - Runoff monitoring triggers for the aquatic environment (SW2) are:
(1) runoff > AEMP benchmarks for aquatic life; or,
(2) runoff exhibits sublethal toxicity.
The only trigger in the framework with respect to SW2 for the mixing zone monitoring is sublethal toxicity; there are no triggers for the MZB based on water quality for SW2.
The proposed framework is not appropriate for application to nutrients and the eutrophication pathway. Two key issues are:

- The trigger of 10 x the AEMP benchmark (in runoff) for TP would be 7.5 µg/L x 10 = 75 µg/L and for chlorophyll *a* would be 4.5 µg/L x 10 = 45 µg/L. These triggers are too high/insensitive and

represent eutrophic/hypereutrophic conditions. Triggers for TP and chlorophyll *a* need to be identified that are adequately sensitive; and

- The framework needs to explicitly consider chemistry at the MZB for the nutrient enrichment pathway - specifically, the program should monitor for effects on chlorophyll *a* in the lake and the framework should include a trigger for chlorophyll *a* at the MZB.

It is acknowledged that the loading of phosphorus to Lac de Gras is expected to decrease post-closure. However, nutrient inputs from pond drainages would occur over a shorter period (open-water season) than those from operation (i.e., from the North Inlet Water Treatment Plant [NIWTP]). Moreover, the receiving environments differ in terms of mixing and habitat conditions such as water depth. Therefore, effects of site runoff on nutrients in the mixing zones may be expected to differ from those observed near the NIWTP.

Recommendations:

8.11 Revise the surface water action level framework to include appropriate triggers for TP and chlorophyll *a*.

8.12 Add a trigger/response/action level for chlorophyll *a* in the mixing zone.

8.2.5 Proposed SWALF Revision Options

Diavik proposed some options for modifications to the SWALF in its response to IR#4. EMAB's responses are below. We observed that Diavik did not address the steps/timing/process for Investigation of Cause, and only addressed Cultural Use Criteria as one Action Level 3 trigger under the Human Health criteria, with no associated action.

Cultural Use Criteria as Part of SWALF

Recommendation

8.13 Diavik must ensure that the approved cultural use criteria are integrated into the SWALF, including at an early warning level. It must commit to expanding this aspect of the SWALF, as well as leaving room to incorporate any additional triggers that may result from development of the TK Monitoring Plan.

Separate SW1 and SW2 Frameworks in SWALF

DDMI is proposing to have the SWALF for humans, wildlife and aquatic life separated. This approach is supported and will add clarity to the process.

Recommendation:

8.14 Present SWALF separately for human health and wildlife and aquatic life as proposed in the Responses to Information Requests.

Early Warning Triggers

Both the assessment of SW1 and SW2 would benefit from an early warning trigger. Exceedance of this early warning trigger would then result in a completion of the risk assessment and examining causation and potential mitigation measures. Diavik has proposed an early warning trigger for SW1

Recommendation:

8.15 Implement a trigger level before the 10X AEMP or the SW1-1 and SW1-2 exceedance.

For the SW2, stopping the discharge of surface water run-off or seepage water should occur before adverse effects are expected. An IC50 as a trigger level would not confer sufficient protection to aquatic life.

Recommendation:

8.16 AL3A trigger should be changed to toxicological impairment defined as an IC20 (not an IC50).

Sampling Near Shore for Protection of Wildlife

It is not clear why measuring chemistry only at the mixing zone boundary makes sense for the protection of wildlife. Wildlife would be consuming water near the shore. As such, sampling in Lac De Gras near the discharge point should also be completed to determine if adverse effects are possible in the near shore waters where terrestrial wildlife could be expected to consume water.

Recommendation:

8.17 Identify monitoring locations in the bay where discharge is occurring at near shore locations and determine water quality.

Sampling at the mixing zone and at near shore areas should occur as Action Level 3 and compared with SW1-1 and drinking water guidelines (or AEMP).

Recommendation:

8.18 For Action Level 3 Triggers, water quality criteria should not exceed AEMP benchmarks or drinking water quality guidelines at the mixing zone boundary or near shore areas.

Adjusting AEMP Benchmarks

Action Response 1 indicates consideration of adjustment of the triggered parameters. It is not clear exactly what is meant by this but it appears that DDMI is suggesting that if there are exceedances of the 10X AEMP benchmark but no toxicity then the AEMP benchmark should be adjusted. This would require a very thorough investigation including looking at dose responses to numerous aquatic species. If DDMI does not think that the AEMP benchmarks are appropriate criteria, then the derivation of Site-Specific criteria should have been completed prior to this point, but should definitely be completed and approved prior to closure.

Recommendations:

8.19 If AEMP benchmarks are determined not to be applicable, then they should be adjusted to site-specific criteria prior to closure. Adjusting closure criteria during closure and post-closure should be avoided.

Proposed AEMP-related Triggers

DDMI added three triggers from AEMP monitoring, namely AEMP fish, AEMP plankton & benthic invertebrates and AEMP WQ.

- The critical effects or effects thresholds proposed by DDMI (i.e. 1.5 X or 50% lower or greater than an effects threshold) are much higher than what would be acceptable under the Environment Canada Metal Mining Technical Guidance for Environmental Effects Monitoring (EC 2012) (between 10% (condition) and 25% (all other metrics) difference), and for benthic invertebrates of 2 x standard deviation (SD). A 50% difference from reference concentrations does not result in no effect to aquatic life and therefore does not appear to be a suitable criteria. Diavik did not provide a rationale.
- It is also not clear what CES is being proposed. For example, for AEMP fish, Action 2 Trigger is stated to be Near Field (NF) mean is significantly different than reference conditions (RC) mean and magnitude >1.5X Critical Effects size (CES). It is not clear if this includes all the fish health components as specified in Appendix VI of the FCRP including reproduction, survival and condition, or what it is referencing.
- the criteria proposed to trigger an action level should be measurable, enforceable, with little or no interpretation needed and timely. The inclusion of the AEMP criteria for fish, plankton and benthic and WQ introduces ambiguity and interpretation that will make enforcement and compliance difficult. For example, the interpretation of the AEMP data relies on identifying outliers and removing data as "not representative".

Recommendation:

8.20 References to the AEMP fish and AEMP plankton & benthic should be removed and the effect level for AEMP WQ needs to be revised.

TSS Trigger

TSS - >15 mg/L average or 30 mg/L grab. The basis for this criterion is not presented. CCME indicates that there should be no more than an average increase of 5 mg/L from background levels for inputs that last between 24h and 30 d, or a maximum increase of 25 mg/L from background levels for an input that lasts less than 24 h. Given it is assumed the discharge will be longer than 24h and the median TSS for open water and ice cover is <1, can DDMI please justify a TSS<30 mg/L.

Recommendation:

8.21 DDMI should consider having a TSS criterion of 5-6 mg/L.

Remove Undefined Actions

The purpose of "confirming biological sampling locations" and "examining ecological significance" is unclear. These should all be defined in the study design and in the proposed monitoring programs.

Recommendation:

8.22 Remove reference to evaluating sampling locations and examining ecological significance.

Need for Sediment Criteria

Based on the figures provided in the response for information requests it appears that there is very little current/movement of water within each of the discharge areas for breeching ponds. With very little current speed in these shallow areas, one would expect sedimentation to occur. It is not clear why closure criteria for sediment have not been included in the FCRP or the SWALF.

Recommendation:

8.23 Add sediment quality monitoring and comparison to EQG for sediment to the SWALF in the mixing zones for each discharge point.

Reference: EC (Environment Canada), 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring.

Clarify Nearfield Mean Trigger

It is unclear what is meant practically by the "Nearfield mean" (NF). Only two sampling areas for fish are proposed for the nearfield area adjacent to drainages where collection pond breaches will occur; the third is proposed in the area adjacent to the North Inlet. An "effect" may be observed in one of the NF areas but not the others and applying a mean for all areas may mask this effect. How will Farfield (FF; i.e., matched "reference areas") data collected concurrently with the NF data be utilized in the proposed framework?

Recommendation:

8.24 Clarify what is meant by the nearfield mean for the fish component (Action Level 2 trigger). Recommend assessing this trigger for each individual NF area against the reference condition. Include a description of how FF data will be incorporated in the assessment.

As above, it is unclear what is meant practically by the "Nearfield mean". Would the mean be calculated from all NF sites collectively or would this apply to specific areas adjacent to collection pond breaches independently?

Recommendation:

8.25 Clarify what is meant by the nearfield mean for the plankton and benthic invertebrate components (Action Level 2 trigger). Recommend assessing this trigger for each individual NF area adjacent to the pond breaches against the reference condition. Include a description of how FF data will be incorporated in the assessment.

An Action Level 2 trigger for water quality is defined as "a Nearfield station greater than the normal range plus 50% of the effects threshold." It is unclear what is meant by the "effects threshold". If the

effects thresholds have not been defined for water quality, how will this trigger be assessed? Assuming they have not been defined, what trigger would be applied to cause an effects threshold to be defined?

It is unclear if the water quality trigger proposed for the Midfield area would apply to individual stations or to all stations combined. Since water quality will be monitored annually and benthic invertebrates and fish on a three-year rotation, it is unclear if the proposed water quality trigger would apply to any year or only the year(s) in which the biological sampling was conducted.

Recommendation:

8.26 Define "effects threshold" for water quality. If the effects thresholds have not been defined for water quality, describe how the Action Levels 2 and 3 triggers will be assessed. Assuming effects thresholds have not been defined, identify what trigger would be applied to cause an effects threshold to be defined.

8.27 Clarify if the water quality trigger proposed for the Midfield area would apply to individual stations or to all stations combined.

8.3 Response Time

The surface water action level framework identifies several assessment steps with an associated action. For aquatic life, these are:

- Action Level AL1A:
  - Trigger - runoff 10 × AEMP benchmarks for aquatic life;
  - Action - sub-lethal toxicity testing of runoff at 12.5% dilution;
- Action Level AL2A:
  - Trigger - sublethal toxicity observed in runoff at 12.5% dilution;
  - Action - sublethal toxicity testing of undiluted surface water from the mixing zone boundary (MZB);
- Action Level AL3A:
  - Trigger - sublethal toxicity observed at MZB;
  - Action - re-establish temporary water collection; conduct a special effects study on the extent of effects in Lac de Gras; toxicity identification evaluation; and, identification of mitigations.

The process is conceptually logical; however, in practice may be problematic to implement in some cases due to time lags associated with sampling, laboratory analysis, and subsequent implementation of actions (estimated to be on the order or 3-5 weeks depending on the trigger).

Time lags between initial runoff sampling and subsequent implementation of Action Level AL2A sampling (MZB sampling) could result in issues associated with changes in runoff quantity and/or quality between the sampling events. Time lags on the order of several or more weeks may also result in a scenario in which runoff to Lac de Gras ceases prior to implementation of MZB sampling and/or where sampling conditions become unsafe for sampling.

Recommendation:

8.28 Describe what the response and actions will be in the event that action AL1A (runoff toxicity) or AL2A is triggered (i.e., MZB sampling) but the runoff is no longer flowing, the quality

and/or quantity of runoff changes notably, and/or if actions can no longer be implemented due to lack of flow or safety considerations.

Both the assessment of SW1 and SW2 would benefit from an early warning trigger. Exceedance of this early warning trigger would then result in a completion of the risk assessment and examining causation and potential mitigation measures. The timelines for action, as the SWALF is currently presented in the FCRP, are too long and are constrained by site conditions (e.g., ice). Early warning levels have been added to the SW1-1 and SW1-2 in the proposed changes in the Responses to Information Requests, they should also be added to the SW2 framework. The addition of an early trigger is positive and will reduce some concerns regarding the timelines for the response framework.

Recommendations:

8.29 DDMI should consider replacing the Action Level 0/1 with an early warning trigger. A fundamental issue with the SWALF is that the first criteria is a level where impacts are expected and the timeframe to confirm and mitigate those effects for human, wildlife and aquatic life is either too long or uncertain. No mitigation measures are in place if that first level is exceeded until such time that additional testing can be safely completed or until a risk assessment can be completed. DDMI should add another "warning level" trigger that would commence action prior to concentrations being that where adverse effects could be expected. This applies to human health, wildlife and aquatic life. DDMI has proposed optional amendments to the SWALF in the response to Information Request (IR#4) which includes an early trigger. This concept should be captured in the final SWALF if it is to proceed.

8.30 EMAB recommends that an early warning trigger sign be used (such as a percentage of the SW1/SW2 criteria) to investigate the risk assessment and source investigation. DDMI has proposed an early warning trigger for SW1 that will help to alleviate concerns with timeframes. DDMI should also incorporate an early warning trigger for SW2 into the SWALF for aquatic life.

8.31 Diavik should implement a trigger level before the 10X AEMP or the SW1-1 and SW1-2 exceedance.

Given that the detailed risk assessment could take multiple months to complete, the frequency of monitoring should be increased to confirm the SW1-2 is not exceeded during the completion of the risk assessment.

Recommendation:

8.32 Monitoring water quality at the breach location as well as along the path to Lac de Gras should occur weekly at a minimum until such time that the risk assessment is completed, water quality returns for at least three sampling events to below the early warning trigger concentrations or the investigation of cause has identified an issue that has been mitigated and water quality has returned to conditions lower than the trigger.

8.4 Environmental Trade-off Study – potential to compromise closure goals

According to the proposed SWALF, if there is toxicity at the AL2A trigger, then this will trigger a AL3A response which will include re-establishing water collection, conducting additional studies to determine effects, toxicity evaluation and identifying mitigation measures. If no "practical" mitigation measures are

identified, then DDMI proposes the completion of an environmental trade-off study. DDMI should at least at a conceptual level indicate what would be considered in a trade-off study and that water treatment will be implemented.

It is not clear what "environmental trade-off study" entails and whether consideration of factors other than economics (such as traditional use) will be considered. The Closure Goals that "land and water that is physically and chemically stable and safe for people, wildlife and aquatic life" and "land and water that allows for traditional use" may not be met if the Environmental Trade Off Study indicates that natural drainage is the path to be followed.

Recommendation:

8.33 DDMI should provide at a conceptual level what would be involved in a trade-off study, who would be consulted, the timeframe and the decision process.

9 Pond Decommissioning

The progressive reclamation proposed by DDMI is focused on removal of the surface water management facilities that are present at the site, while mining and reclamation activities still remain to be completed. Typically, mining companies retain these types of facilities through closure phases to manage and provide contingencies for any sediment releases or surface water issues that may arise from the reclamation activities in upstream areas. As such, the proposed sequence of progressive reclamation is somewhat unconventional. However, DDMI has concluded that it is practical and has proposed a monitoring and response framework aimed at evaluating performance and water quality conditions after removal of the water management infrastructure.

Nonetheless, DDMI's February 24, 2023 Response to Information Request (Table 3) and responses at the Technical Session confirm that grading and re-vegetation activities will continue within most pond catchments after the proposed dates for breaching. Until grading is complete and vegetation established, there is ongoing potential for sediment release from disturbed areas.

Recommendation:

9.1 EMAB recommends that any change to the decommissioning schedule for individual ponds should be approved by the WLWB.

9.1 Decommissioning Decision-Making Process

The FCRP Closure and Post-Closure Monitoring Plan (Section 3.1.4.4) states that SNP monitoring will be used to make decisions about reconnecting drainages to Lac de Gras, and that "water quality will be required to meet closure criteria during a final sampling event immediately prior to reconnecting the closure drainages to Lac de Gras." Table 7 of Attachment 2 in the Monitoring Plan clarifies that the final sampling event will entail "at least three stations located evenly spaced around the Collection Pond shoreline." Because the proposed decommissioning of ponds will entail breaching the ponds leading to uncontrolled flow whenever water is present, it will be important to ensure that water quality is expected to remain suitable for discharge in a variety of flow conditions and throughout the year. As a

result, the decision to decommission ponds needs to consider data collected over a range of seasons and climatic conditions.

Recommendation:

9.2 Decommissioning should be prohibited until monitoring demonstrates that water quality has remained suitable in various flow conditions and throughout the year.

The following comments pertain to the monitoring prior to reconnection - collection pond:

• It is not clear if the water quality in each pond has to meet these requirements once, or if these requirements need to be demonstrated for multiple sampling events. It is noted that a number of the ponds (i.e.,2, 3, 5 etc.) have shown chronic toxicity in the updated SNP data (updated Appendix X-27), and that these results are variable. DDMI will need to demonstrate an understanding of variability.

• TPH < 3 mg /L. 3 mg/L of TPH would result in a sheen on the water. Atlantic RBCA has derived surface water guidelines for Modified TPH (fuel and lube oil) of 100 µg/L (0.1 mg/L) for the protection of aquatic life. It is not clear the basis of the 3 mg/L value.

• TSS<30 mg/L. The basis for this criterion is not presented. CCME indicates that there should be no more than an average increase of 5 mg/L from background levels for inputs that last between 24h and 30 d, or a maximum increase of 25 mg/L from background levels for an input that lasts less than 24 h. Given it is assumed the discharge will be longer than 24h and the median TSS for open water and ice cover is <1, Diavik should justify a TSS<30 mg/L.

• Toxicity testing for acute and chronic endpoints should include more than one test species.

Recommendations:

9.3 DDMI should specify that the decommissioning requirements need to be met for at least two sampling events completed at different times of the year (i.e., freshet and the fall), prior to submission to the inspector.

9.4 DDMI should provide rationale/basis for the 3 mg/L. for TPH. This value should be based on the protection of human health, wildlife and aquatic life.

9.5 DDMI should consider having a TSS criterion of 5-6 mg/L.

9.6 DDMI should add a fish species to the chronic toxicity testing

9.2 Evaluation of Sediment

FCRP Section 5.2.18 proposes that "Sediment remaining in the ponds will be tested for contamination and covered, if required." Section 5.2.8.3.2 makes a similar statement. The FCRP Monitoring Plan does not include any information about monitoring of sediment in Collection Ponds.

In the Response to Comments, DDMI noted that sediment sample results were included in Appendix X-27 (1273 pp). However, neither the FCRP nor the water licence application provide any analysis or interpretation of these data, or any details of how they are used. At the Technical Session, DDMI confirmed that it would make decisions about management of these materials as if they were sediments

in a waterbody, similar to the North Inlet, where the threshold for remediation (i.e., placement of a rock cover) proposed is 1,500 mg/kg of F3 hydrocarbons.

However, once the ponds are drained the sediments will be primarily in a terrestrial environment. In this case, they are more similar to contaminated soils. The thresholds proposed for remediation of contaminated soils at Diavik are described in FCRP Appendix V Table 3. These include standards for F1, F2, F3 and F4 hydrocarbons (respectively 210, 150, 300 and 2,800 mg/kg), based on CCME standards. The threshold for soil remediation for F3 hydrocarbons is five times lower than that for North Inlet sediments.

Recommendation:

9.7 DDMI should revise the thresholds and remediation plans for sediment in control pond areas to consider the material as contaminated soil rather than sediment that will remain submerged.

There was discussion at the Technical Session about the need for additional criteria to address other contaminants of concern for sediments in control ponds. DDMI argued that work done for the North Inlet confirmed that hydrocarbons were the only relevant contaminant of concern. However, the mechanism for sediment contamination and the source of contamination in the North Inlet (i.e., pumping of water from active mining areas) are likely not the same as those for contamination in the control pond sediments. As a result, the evaluation of the need for sediment remediation may need to consider a broader range of contaminants. For example, if there are sources of metal contamination in pond catchments, sediment should be evaluated for relevant metal contaminants.

Recommendation:

9.8 DDMI should conduct an analysis of contaminants of concern for Collection Pond sediments to consider a range of contaminants consistent with the potential sources and mechanisms of contamination for these materials.

9.3 Decommissioning Timing and Controlled Discharge

Given that future land disturbance is possible in some of the Collection Pond catchments, water quality conditions could change quickly, leading to a need to re-establish Collection Pond functionality – an action identified in the SWALF. If the ponds are breached, reestablishment will be difficult, especially at times when water quality conditions are most likely to deteriorate, due to high flow events. Temporarily keeping pond functionality in place (i.e., not breaching) while allowing controlled discharge of water that meets licence limits for discharge from Collection Ponds should be considered further. This would provide authorization for DDMI to proceed with discharge of clean runoff, while maintaining effective and proactive contingency facilities and capacity. Discharge of water in accordance with licence requirements could be undertaken using pumps, siphons or spillways, depending on specific situations.

In Section 5.2.8.3.2 of the FCRP, DDMI argues that approaches that maintain the integrity of collection pond containment are not practical: “DDMI has determined that it is not practical to create a controlled discharge that will accurately represent passive, diffuse and discontinuous post-closure discharge conditions.” As suggested, discharge using pumps, siphons or spillways will create discharge rates and timing that are somewhat different than discharge in a stream with no control pond. Nonetheless, discharge while retaining the pond dams in place would still entail discharge of water via stream channels, a condition that is much more similar to post-closure conditions. Discharge could be

undertaken as much as possible and practical in a way that is consistent with natural hydrographs. Such an approach would provide an opportunity to reduce the costs of pumping/treatment and consider the effects of direct discharge, while maintaining the ability to rapidly respond if water quality conditions deteriorate.

Recommendation:

9.9 Limit breaching of Surface Water Ponds until after completion of operations and closure-related earthworks and erosion control measures (e.g., re-vegetation) in the specific catchments while providing for controlled discharge of surface runoff that meets licence limits (for discharge from Collection Ponds), numerical closure criteria and thresholds in the SWALF.

9.4 Design Criteria

Appendix X-12, provides designs for the breaches of most Collection Ponds – all except Pond 3 which is to be addressed through design for the PKC Facility. The design basis assumes a design life of 100 years from the start of closure. The design criterion for floods is conveyance of peak flows from a 1:200-year 24-hour storm event.

The closure landscape at Diavik must perform adequately in perpetuity, not just for 100 years. As a result, facilities designed to convey 1:200-year events will, over the life of the project, certainly sustain some damage from events larger than the design events. If failure of any breach could lead to progressive erosion that may affect a mine waste storage facility, then more robust designs should be required.

In its Response to Comments, DDMI states that "upslope progression of erosion to mine waste facilities is unlikely given the distance between collection pond breaches and these facilities" referring to FCRP Appendix X-12 Sub-Appendix A, Table 1, Item 4. The referenced item addresses incremental consequences of failure and provides a design basis relating to erosion. However, it does not confirm that upslope progression of erosion near other structures was considered. Sub-Appendix D of Appendix X-12 provides a geomorphological assessment for the pond breaches and Task 2 characterizes terrain downstream of the breaches, but does not consider potential upstream progression. Figures in the Sub-Appendix confirm that some breaches are located within close proximity to the toes of other mine structures (e.g., Pond 4). DDMI has not provided evidence that upstream progression of erosion from pond breaches has been specifically addressed at relevant breach locations.

Recommendation:

9.10 DDMI should provide evidence for each proposed breach about the potential erosion that may result from failure during events larger than the design event. As part of this, it should consider whether that erosion is consistent with erosion rates in similar natural channels during similar events and whether progressive erosion at any of these locations could adversely affect mine waste storage facilities. Where erosion could affect mine waste storage facilities, more robust closure designs would be required. Where erosion greater than that expected in natural channels may occur, post-closure maintenance should be expected and required.

10 Closure AEMP

Diavik is still figuring out the transition from operational AEMP to closure AEMP. They anticipate that this shift from operational AEMP Version 6 to closure and post-closure AEMP will occur in 2025. Until then, DDMI proposes to continue with the current operational AEMP Program. The Closure and Post-Closure Plan states that the sampling process will commence in 2025, which is the expected start of closure. The comprehensive monitoring, which includes fish, invertebrates, and FF sites, will be conducted in 2025 and 2028. The frequency of sampling after that will be determined later. The Closure and Post-Closure AEMP Design Plan recommends the addition of two new sampling areas for Slimy Sculpin monitoring: NFC3, near the outflow from Pond 4, and NFC-6, near the outflows from Ponds 1, 5, 10, and 13. Additionally, new NF sites for other components have been suggested.

In the technical session presentation, Diavik mentioned that "the main driver of effects in the operational AEMP is North Inlet Water Treatment Plant (NIWTP) effluent discharge. However, in the closure and post-closure AEMP, focus will shift toward monitoring effects from closure activities and from the cessation of mining, including discontinuation of the NIWTP discharge. The main driver of effects in the closure and post-closure AEMP is the release of source water from post-closure discharge points around the East Island, and exchange of pit lake and North Inlet water with water in Lac de Gras. Other potential effect pathways include dust emissions and sediment releases."

EMAB has raised serious concerns about the Closure AEMP, including the period between collection pond decommissioning and Post-Closure monitoring, the need for mercury sculpin monitoring stations, and the lack of TK/cultural criteria. These issues have been addressed in the three main topics outlined in this chapter: Monitoring and Schedule, New NF Sampling Areas, and Implementation Timing.

10.1 Monitoring and Schedule

Diavik has clarified that fish sampling at the new sampling areas around East Island will not be done until 2025. Other aquatic environment components would be sampled in 2023 or 2024 at new sites where schedule permits. Diavik noted that only winter water quality would be sampled prior to breaching Ponds 2 and 7.

Recommendation:

10.1 Two years of pre-closure sampling at the new areas/sites is recommended to provide robust data for comparison. At a minimum, one round of monitoring at the new NFC should be completed for all components (water quality, plankton, sediment quality, invertebrates, fish, and metals in fish) prior to breaching of ponds. For water quality and plankton, the pre-closure sampling should include at least one summer and one winter sampling event.

10.2 New NF Sampling Areas

The Closure and Post-Closure AEMP Design Plan proposes to add new sites to address specific effects of the closure – including breaching of collection ponds. The water quality modeling predicts the greatest effects on water quality in runoff and Lac de Gras in the bay that will receive runoff from C3 (hereafter referred to as the "C3 bay"). No sampling sites have been included for this area.

Recommendation:

10.2 Sample all components in the C3 bay and collect a minimum of one year of pre-closure monitoring data to facilitate pre- vs. post-closure comparisons of conditions.

10.3 Implementation Timing

Appendix VI-2, the FCRP Closure and Post-Closure Aquatic Effects Monitoring Program Design Plan describes proposed AEMP monitoring for the closure and post-closure period. It "incorporates updates that account for changes to site drainage conditions on the East Island that will occur during closure and post-closure" (AEMP Design Plan, Section 4.4.1). Until then, DDMI proposes to continue with the operational AEMP Program. The operational AEMP Program is premised on a single discharge of water from the site, the North Inlet Water Treatment Plan (NIWTP) discharge. The Closure and Post-Closure Plan on the other hand, is premised on discharges from various catchments around East Island. DDMI plans to decommission some of the Collection Ponds as early as 2023, before the mine enters the closure and post-closure stage. FCRP Section 6.3.1.4 indicates that breaching of Collection Ponds 1,2,4,7,10,11,12, and 13 and Sump 21 may potentially occur as progressive reclamation. The AEMP for the operational period is not designed to monitor potential effects of the additional discharge locations.

Recommendation:

10.3 DDMI should be required to implement relevant parts of the Closure and Post-Closure AEMP Design Plan, including monitoring potential effects of the additional discharge locations, in association with any Collection Ponds that are decommissioned during the operational period.

11 Human Health and Environmental Risk Assessment

Introduction:

During the review of Appendix X-25 and relevant parts in Appendix V of the FCRP, as well as Appendix VI-1 of the WL Amendment application, several issues have been identified regarding the protection of aquatic life, wildlife, and human health. EMAB asked Arcadis to conduct an assessment to identify and address any significant concerns, deficiencies, or uncertainties, with a particular emphasis on the potential adverse effects of runoff quality on the health of aquatic, terrestrial, and human life.

The HHERA evaluated the risk to receptors after mine closure using predicted concentrations 10 years post-closure and reference conditions to understand the portion of risk from mine activities. However, it is unclear whether the reference locations are truly unimpacted, as they were only preliminarily compared to pre-mining surface water quality data. This raises concerns about relying on the reference conditions data to determine the potential contribution of mining activities to exposure and risk, and to determine the need for mitigation measures. It is crucial to select suitable reference locations to accurately interpret the risk and ensure appropriate measures are taken.

The human health risk assessment (HHRA) also assessed risks to Indigenous populations and recreational users of the site (such as hikers and hunters). The HHRA considered the use of the land for

camping, hunting and gathering food and the use of water for canoeing and fishing, as a source of drinking water and for bathing/swimming.

Interpretation of toxicity appears to be based on LC50 which would be concentrations by which 50 percent of organisms are adversely affected, i.e., 50 % of organisms are killed. This does not provide adequate protection to aquatic life to meet their closure objectives of no adverse effect to aquatic life.

DDMI has evaluated human health risks using a tiered approach considering exposure based on post-closure predicted concentrations and reference concentrations. This approach requires further justification. If an unacceptable risk is predicted based on post-closure concentrations, then the risk is unacceptable and requires consideration or management. Unacceptable risks are predicted for some parameters, in addition to uranium and arsenic which was indicated by DDMI.

DDMI has employed a tiered approach to assess human health risks by analyzing exposure through post-closure predicted concentrations and reference concentrations. However, this approach lacks adequate justification and requires further clarification. According to DDMI, if post-closure concentrations indicate an unacceptable risk, then it requires management or consideration. It has been indicated by DDMI that certain parameters, including uranium and arsenic, pose unacceptable risks. This highlights the need for more robust risk management procedures/strategies to ensure the safety of individuals in the area.

In addition, the interpretation of risk by DDMI for HQs above 1 is flawed as it appears the assumption was made that risk from HQ increases in linear fashion while in fact the magnitude of risk associated with HQs is dependent on concentration - response relationships. This could potentially greatly underestimate risk.

It is acknowledged by DDMI that uncertainty remains with the BLM and Windward models in that predicted concentrations e.g., of copper are lower than concentration in natural conditions of Lac de Gras which seems unrealistic. This seems to underestimate the input and end concentrations in Lac de Gras which potentially underestimates risk.

11.1 ERA uses inappropriate benchmarks

To better understand the potential risk posed by mining activities, reference conditions were used to represent natural concentrations in the region unaffected by the mine. However, the reliability of this reference data is in question due to concerns about its representativeness of unimpacted water quality. It is therefore crucial to carefully select suitable reference locations to interpret the potential contribution of mining activities to exposure and risk and to determine whether mitigation measures are necessary.

EMAB disagrees with the approach taken in deducting risk from reference locations to determine risk from the mine. It is not appropriate to identify an unacceptable risk solely based on whether the difference in risk from the mine exceeds an acceptable threshold. This fails to adequately consider the potential risks to human and ecological receptors.

Given that stakeholders have described considerable issues with dust, including having to brush dust off their clothing even at a distance from the mine, it is questionable whether reference locations/runoffs D and E truly represent unimpacted areas. To ensure the reliability of the reference data, it is recommended that it be compared with pre-mining activity data to confirm its unimpacted status.

Recommendation:

11.1 DDMI should provide comparison of water quality from current reference locations relied upon in the RA to pre-mining water quality to identify whether the reference locations relied upon in the RA are representative of unimpacted conditions.

11.2 DDMI's approach to the protection of aquatic life

The mixing zones proposed by DDMI remain too large. The actual mixing zone boundary should be the location at which chronic effects to aquatic life are not expected. Interpretation of toxicity appears to be based on LC50 which would be concentrations by which 50 percent of organisms are adversely affected, i.e., 50 % of organisms are killed. This does not provide adequate protection to aquatic life to meet their closure objectives of no adverse effect to aquatic life (Arcadis Review of Relevant parts of the HHERA and Appendix V & VI-1, 2023, p. 5, p. 6).

Recommendation:

11.2 It appears that DDMI's approach to the protection of aquatic life would not result in meeting their closure objective of no adverse impacts to aquatic life. Mixing zones need to be as small as possible and the end of the mixing zone should not result in chronic effects to aquatic life. Mixing zones need to be reduced and the action levels defined in the SWALF are not acceptable and need to be adjusted.

11.3 Sediment risk should include metals, not just PHC

DDMI has reduced the consideration of sediment impacts to PHC F3 in the closure criteria. However, the HHRA identifies potential risks to human health from sediment impacts of uranium and arsenic. Sediment monitoring, especially in future discharge areas should be added to the closure plan as closure criteria to meet Closure Objectives (Arcadis Review of Relevant parts of the HHERA and Appendix V & VI-1, 2023, p. 7).

It is not clear if the predictive modelling accounted for cumulative loading of metals to the environment. All metals that enter the receiving waters will either partition to sediment, remain in surface water or be taken up and accumulated in biota.

There are general concerns with the mixing zones and the mixing under low flow/low currents as well as ice cover. As this may affect deposition into sediments, EMAB is of the opinion that sediment impacts should be monitored. **See comments in Section 6 and recommendations 6.3 and 6.8.**

11.4 Calculation of unacceptable risk to human health

It is not supported to provide an interpretation of magnitude of risk based on a predicted Hazard Quotient (HQ) above 1. HQs cannot be linearly scaled to risk because the intercept, slope and shape of the dose-response relationship is not reflected in the point estimate HQ. Reliable comparisons can only be made through detailed understanding of the underlying concentration-response relationships, safety (application) factors, and uncertainties, none of which are conveyed by an HQ. DDMI should discuss all parameters where the HQ or Incremental Lifetime Cancer Risk (ILCR) are above the acceptable risk threshold and mining activity has contributed to exposure (Arcadis Review of Relevant parts of the HHERA and Appendix V & VI-1, 2023, p. 7).

Recommendation:

11.3 EMAB recommends that DDMI remove reference to low risk from an HQ of 5 in Table 19 of Appendix X-25.

EMAB agrees with providing an interpretation of risk based on contribution from the mine to background conditions, however, an unacceptable risk should not be identified only if the difference in the risk from the mine is greater than the acceptable risk threshold (Arcadis Review of Relevant parts of the HHERA and Appendix V & VI-1, 2023, p. 7).

Alberta Health's guidance emphasizes the importance of estimating the risk of adverse health effects that could arise from changes in environmental quality due to the proposed project alone, as well as the cumulative impact from other existing and planned projects, and ambient or baseline conditions in the region. By comparing the predicted risks with relevant protection goals, the overall effect of the project on human health can be assessed. On the other hand, BC's guidance states that any parameter with a measurable increase from baseline conditions due to project activities should be kept as a COPC and retained for assessment. Based on this information,

DDMI should consider re-evaluating potential risks to be those predicted to exceed acceptable risk thresholds, particularly in instances where mining activity has resulted in a potential increase in exposure. This would help ensure a more comprehensive and accurate assessment of the project's impact on human health.

Recommendation:

11.4 DDMI should revise the approach taken in the HHRA to identify and discuss all risks above background.

DDMI should discuss all parameters where the HQ or ILCR are above the acceptable risk threshold and mining activity has contributed to exposure.

Recommendation:

11.5 Diavik should provide additional discussion for all parameters where potential unacceptable risks are identified and the mine contributed to exposure.

11.5 Risk/uncertainty related to predicted concentrations

It is acknowledged by DDMI (Diavik response to EMAB comment # 100 on Diavik - Type A WL Amendment – Decommissioning) that uncertainty remains with the BC Biotic Ligand Model (BC BLM) and Windward models in that predicted concentrations e.g., of copper are lower than concentration in natural conditions of Lac de Gras which seems unrealistic. This seems to underestimate the input and end concentrations in Lac de Gras which potentially underestimates risk (Arcadis Review of Relevant parts of the HHERA and Appendix V & VI-1, 2023, p. 6, p. 7).

Recommendation:

11.6 DDMI should verify modelling results and once monitoring commences confirm with measured data whether the predictions are accurate. In particular, DDMI should verify BLM and

Windward modelling results, regarding the predictions of the copper concentrations, and once monitoring commences confirm with measured data whether the predictions are accurate.

Arsenic concentrations predicted are below the range for which the in vitro/in vivo validation are available and below the range used to develop the regression equation.

Recommendation:

11.7 DDMI should provide a discussion of the uncertainties associated with relying on a model for which the predicted concentrations of arsenic are outside the validation range.

In its response to EMAB's comment 91 on the WL Amendment, Diavik said "It is correct that the species-specific HQs for D. magna and rainbow trout were calculated using the acute lethality thresholds in Table 13 derived based on LC50s. These short-term copper benchmarks are conservatively derived due to species sensitivity and method for adjustment to toxicity modifying factors; as demonstrated in Figures 8 and 9, there are few invertebrate species more sensitive than D. magna, and few fish species more sensitive than rainbow trout. Moreover, the models applied tend to overstate toxicity potential for the environmental conditions of interest (as evidenced by the derivation of acute benchmarks close to the current CCME chronic freshwater guideline for soft water exposures, and close to background Lac de Gras conditions)."

DDMI's response is accepted, however, the reliance on literature models needs to be validated with site-specific toxicity testing to confirm the lack of acute lethality. Acute toxicity testing is being conducted as part of the AEMP monitoring.

Recommendation:

11.8 Confirm model prediction of no acute lethality with toxicity test results collected as part of monitoring programs.

11.6 Metals in Lake Trout

The HHERA indicates that the only COPC with measurements for Lake Trout is mercury. There are data available for other metals in Lake Trout. For example, Lake Trout muscle was analysed for a suite of metals in 2015 (Golder 2017) and 2018 (Golder 2019) as part of the Traditional Knowledge Study.

Recommendation:

11.9 Verify that the conclusions of the HHERA would not change with the use of actual Lake Trout metals data.

11.7 Slimy Sculpin Metals Data

Appendix C indicates that summary statistics for metals in Slimy Sculpin were calculated using near-field and mid-field data collected from 2007 to 2019. DDMI recently noted that the 2007 Slimy Sculpin metals dataset is anomalous as the laboratory analysis method differed from other years. This observation would warrant exclusion of the 2007 dataset, though it is noted that the 2007 data are believed to be "biased high" and therefore their inclusion may err on the side of being conservative in the HHERA. The 2016 data are also considered to be problematic due to inadvertent exclusion of sculpin livers in the analysis of metals in sculpin carcasses; in this case the dataset is expected to be biased on the low side.

Table C-39 presents the Reference Condition concentrations for Slimy Sculpin metals. These values may also be affected by inclusion of these two datasets. Additionally, derivation of Bioaccumulation Factors (BAF) presented in the HHERA may be affected as they reportedly include metals measured in Slimy Sculpin over the period of 2007-2019.

While exclusion of the 2007 and 2016 datasets from the HHERA may have little to no effect on the risk assessment conclusions, it would be prudent to assess whether any conclusions of the RA would change with exclusion of these data.

Recommendation:

11.10 Verify conclusions of the HHERA would not be affected by removal of the 2007 and 2016 slimy sculpin metals datasets.

11.8 Mercury in Lake Trout

It is unclear what data were used for mercury in Lake Trout in the HHERA. Table C-38: Summary Statistics for Small-Bodied and Large-Bodied Fish Tissue Concentrations Used in the ARA, WRA and HHRA for Post-Closure Conditions indicates that the Lake Trout mercury summary statistics were derived from a sample size of 250, however the text (p. 54) indicates that monitoring data from 2008-2018 were used. Based on Lake Trout mercury data provided to NSC by DDMI previously, this sample size appears to be in error and appears to include data prior to 2008 and possibly multiple measurements made on the same fish in 2008 and/or duplicate samples.

Could the specific dataset used for this task be clarified? For the 2008 data for which there are three sets of measurements, which dataset was used?

Recommendation:

11.11 Verify and clarify what specific mercury in Lake Trout datasets were used to define summary statistics to support the HHERA. Data sets should exclude replicate samples and analyses (e.g., 2008 dataset). Verify that the conclusions of the HHERA would not change with use of a corrected dataset (if applicable).

12 Specific Comments on Draft Licence

1. Part G, Clause 33 should be revised to clarify that authorization to discharge from components of the Collection Pond System is subject to other conditions of the licence, e.g., Part G, Clauses 36 and 37.

2. Part J, Clause 10 should be revised to clarify that authorization to discharge from components of the Collection Pond System is subject to other conditions of the licence, e.g., Part G, Clauses 36 and 37, Schedule 8, Part 3(e)(x).

3. Parts G(27)(e), G(28)(g), G(28)(h), G(33), Parts J(9) and J(10) should be modified by removing references to approval of decommissioning through the Closure and Reclamation Plan.

Attachments

1) Annotated version of Decommissioning Plan description (Schedule 8, part 3 of draft licence provided with Diavik's Water Licence Amendment Application) with EMAB's assessment of how Diavik has addressed each component
2) Arcadis Canada Review of Water Licence Amendment Application
3) Arcadis Canada table of comments and recommendations on Water Licence Amendment Application
4) North-South Consultants review of Water Licence Amendment Application
5) Slater Environmental review of Water LIcence Amendment Application