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August 30, 2022 File: MV2019L2-0004

Lisa Tran
De Beers Canada Inc.
Suite 300 – 1601 Airport Road NE
Calgary AB T2E 4Y9 Sent by email

Dear Lisa Tran,

Re: Aquatic Effects Monitoring Program (AEMP) Design Plan Version 1.2 (V 1.2) – Revisions Required – De Beers Canada Inc. – Mining and Milling – Snap Lake Mine, NT

The Mackenzie Valley Land and Water Board (Board) met on August 25, 2022 and considered the Aquatic Effects Monitoring Program (AEMP) Design Plan Version 1.2 (V 1.2)[1] submitted by De Beers Canada Inc. (De Beers) on April 12, 2022 as required by Water Licence (Licence) MV2019L2-0004 and the Board's direction in its November 24, 2021 Decision Letter.[2]

The Board requires that De Beers revise the AEMP Design Plan V 1.2 as detailed in the Board's Reasons for Decision (attached).

The Board directs De Beers to submit the AEMP Design Plan Version 1.3 after the Board considers the closure criterion on fish tissue described in the Final Closure and Reclamation Plan Version 1.2. De Beers shall submit the AEMP Design Plan V 1.3 in accordance with the Land and Water Boards' *Document Submission Standards*[3] and *Standard Outline for Management Plans*.[4]

The revised AEMP Design Plan V 1.3 will be considered approved when De Beers receives written confirmation of conformity from the Board.

[1] See MVLWB Online Registry [www.mvlwb.com] for De Beers - Snap Lake - AEMP Design Plan V1.2 - Apr12_22.pdf.
[2] See MVLWB Online Registry for De Beers - Snap Lake - AEMP v1.1 and 2020 Aquatic Effects Re-evaluation Report - Nov25_21.pdf.
[3] See MVLWB Policies and Guidelines webpage for MVLWB *Document Submission Standards*.
[4] See MVLWB Policies and Guidelines webpage for MVLWB *Standard Outline for Management Plans*.

The Board notes that De Beers may implement the AEMP Design Plan V 1.2, except for the large-bodied fish health/fish tissue components, including its schedule.

Please direct questions or concerns regarding this letter to Shelagh Montgomery in writing.

Yours sincerely,

Mavis Cli-Michaud
Chair, Mackenzie Valley Land and Water Board

BCC'd to: De Beers Snap Lake Distribution List
Jamie Steele – Inspector, GNWT-ENR

Attached: Reasons for Decision

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Reasons for Decision

Issued pursuant to section 72.25 of the *Mackenzie Valley Resource Management Act* (MVRMA)

Aquatic Effects Monitoring Program (AEMP) Design Plan Version 1.2	
File Number	MV2019L2-0004
Company	De Beers Canada Inc.
Project	Snap Lake Mine
Location	Snap Lake, NT
Activity	Mining and Milling
Date of Decision	August 25, 2022

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On August 25, 2022, the Mackenzie Valley Land and Water Board (MVLWB or Board) met and considered the AEMP Design Plan Version 1.2 made by De Beers Canada Inc. (De Beers) to the Board on April 1, 2022 for Water Licence (Licence) MV2019L2-0004 for the Snap Lake mine. After reviewing the AEMP Design Plan Version 1.2 and the evidence gathered during the regulatory review, the Board has made the following decisions:

1) To require revisions to Version 1.2 of the AEMP Design Plan which De Beers must submit as Version 1.3 of the Design Plan;
2) To direct De Beers to resubmit Version 1.3 of the Design Plan after the Board has considered the closure criterion on fish tissue described in the Final Closure and Reclamation Plan Version 1.2; and
3) To approve the response framework except for the large-bodied fish health/tissue component of the AEMP including its AEMP schedule.

These Reasons for Decision set out the Board's regulatory process and rationale for decisions regarding the AEMP Design Plan. A summary of the AEMP Design Plan and the main issues identified during the review is provided in sections 1.0 and 2.0 below, followed by an outline of the regulatory process for the Applications in section 3.0. The Board's decisions and supporting rationale are set out in section 4.0 for the AEMP Design Plan V 1.2.

1.0 Summary of AEMP Design Plan

On April 1, 2022, De Beers submitted the AEMP Design Plan Version 1.2.[1] AEMP Design Plan Version 1.2 is submitted to address the November 24, 2021 Board directives on the response framework and timeline.

In making its decision and preparing these Reasons for Decision, the Board has reviewed and considered:

1) The AEMP Design Plan Version 1.2;
2) The evidence and submissions received by the Board from De Beers; and
3) The comments and recommendations, evidence, and submissions received by the Board from reviewers during the regulatory proceeding.

2.0 Main Issues Raised During the Regulatory Review

These Reasons for Decision focus primarily on the following key issues raised during the regulatory review:

- Key Questions on Water Quality Trends
- Water Safe to Drink
- Fish Safe to Eat
- Toxicological Impairment
    - Water Quality – Toxicological Impairment

[1] See MVLWB Online Registry [www.mvlwb.com] for De Beers - Snap Lake - AEMP Design Plan V1.2 - Apr12_22.pdf.

    - Toxicity (Ecological Function Maintained)
    - Sediment Quality
    - Plankton
    - Fish Health
    - Fish Tissue
- Summary of Commitments and Recommended Directives

Issues that were resolved to the Board's satisfaction during the review are not addressed in detail in these Reasons.

3.0 Regulatory Process

On April 1, 2022, De Beers submitted AEMP Design Plan version 1.2 to address the Board directives on the response framework and timeline. On April 12, 2022, the AEMP Design Plan V 1.2 was circulated for public review on the Online Review System (ORS). By May 6, 2022, comments and recommendations were received from Board staff and the following Parties:

- Environment and Climate Change Canada;
- GNWT-ENR; and
- Snap Lake Environmental Monitoring Agency (SLEMA).

De Beers responded by May 27, 2022.

On August 25, 2022, the Board met to make decisions regarding the AEMP Design Plan V 1.2. These decisions and related reasons are described in sections 4.0 below.

4.0 Decision – AEMP Design Plan V 1.2

The Board has determined that AEMP Design Plan V 1.2 should be approved, with revisions required. The Board's determinations and reasons for this decision are set out below.

4.1 Key Questions on Water Quality Trends

During the review, SLEMA commented that the water quality key questions in the AEMP did not align with the proposed closure criteria. SLEMA recommended "are water quality concentrations in Snap Lake trending upward with a potential to exceed the AEMP benchmark?" and including a discussion on the possibility that water quality concentrations exceed the AEMP benchmarks in less the 100 years. (SLEMA-2). In response, De Beers indicated that the closure criteria details are addressed in the FCRP, and did not propose changes to the key questions.

The Board agrees with SLEMA that alignment with SW3 is necessary because the AEMP is supporting the FCRP to demonstrate that closure criteria are met. The Board has decided that the wording of key question 3 could remain as is, but that **the Board requires De Beers to update Table 6.3-5 to incorporate the assessment of upward trends and the potential to exceed the AEMP Benchmarks in 100 years as part of the Overview of Analysis Approach.**

4.2 Water Safe to Drink

De Beers proposed for the drinking water high action level to require laboratory results to be confirmed if triggered. During the review, GNWT recommended the requirement to confirm the laboratory results to trigger the high action level be removed because the confirmation would delay response actions (GNWT-4). GNWT was also of the opinion that the sampling program has high standards and quality assurance therefore, the confirmation is not necessary. In response, De Beers disagreed with the recommendation and noted that confirmed laboratory results are needed to prevent anomalous results or outliers triggering the action level. De Beers also noted that the action levels are set well below the drinking water quality guidelines, therefore, there would be sufficient time to respond after the confirmation. The Board agrees with De Beers that confirmation sampling is reasonable and would provide early warning given that the action levels are set below the drinking water guidelines.

SLEMA recommended trends analysis to be included for drinking water action levels to provide concept of change over time and provide early warning (SLEMA-8). In response, De Beers disagreed with the recommendation and noted that thresholds for all action levels are well below the health-based drinking water guidelines, which are conservative and will provide early warning for drinking water concerns. The Board agrees with De Beers that the proposed action level for water safe to drink is conservative and will provide early warning. It is also worth noting that De Beers is required to assess trends over time as part of the AEMP data analysis, therefore any potential changes to concentrations over time would be detected, even the changes do not result in action level exceedances.

The Board has decided to accept the drinking water action level proposed by De Beers.

In the concordance table, De Beers indicated that microcystin (which is a toxin that can be produced by certain types of algae) was removed from nutrient enrichment and moved to the drinking water component as committed to during the Closure Workshop. In the drinking water section, De Beers indicated that if a low action level is triggered under nutrient enrichment, then microcystin sampling will be initiated. During the review, it was noted that Table 16.4-1 has not been modified to specify that microcystin is assessed under Water Safe to Drink. In addition, Section 16.5 does not connect to the drinking water program or specify whether the microcystin results will be assessed by comparison to the Health Canada drinking water quality guideline. In response, De Beers indicated that no changes are required in the drinking water action levels. De Beers indicated the microcystin will be assessed against the Canadian health-based drinking water quality guidelines.

The Board agrees with De Beers that no changes are required in the drinking water action levels, but the Board is of the opinion that the microcystin assessment method needs to be reflected in Table 16.4-1 as a footnote and/or Section 16.5 as a response action. The Board is of the opinion that microcystin criteria being addressed in the drinking water action level should be reflected under the Drinking Water is Safe section, not only in the concordance table. **The Board hereby requires De Beers to specify under the drinking water is safe action level section that microcystin concentrations will be assessed against the Health Canada drinking water quality guideline, reflect in section 16.5 that microcystin sampling will be initiated in response to a low action level trigger for nutrient enrichment.**

4.3 Fish Safe to Eat

In AEMP Design Plan V 1.2, De Beers propose the following action levels for fish safe to eat:

Action Level	Proposed Fish Safe to Eat Statements
Low	Fish taste and/or texture not acceptable AND Evidence from one or more AEMP components that the change in fish taste and/or texture can be linked to the Mine (as demonstrated by Action Level triggers for Water Quality, Sediment Quality, or Fish Health
Moderate	Metals in edible fish tissue(d) above 75% of upper limit of regional reference normal range in a direction that is indicative of a risk to humans from consumption AND Effects are supported by consistent effects in Fish Tissue Chemistry (i.e., same metal[s] is/are elevated in small-bodied fish tissue chemistry)
High	Confirmed Moderate Action Level Trigger AND The human health risk assessment initiated under the Moderate Action Level identify a potential risk that triggers the High Action Level

During the review, GNWT made recommendations to the low and moderation action levels for Fish Safe to Eat component (GNWT – 2, 3). For the low action level GNWT commented that it was unclear why fish tissue was excluded from the action level statement and suggested:

1. The triggering statements be linked with “OR” instead of “AND” operator; and
2. The requirement to trigger other AEMP components including water quality, sediment quality, or fish health be removed; or revise this requirement to be linked with an “OR” operator.

In response, De Beers indicated that fish health also includes fish tissue, therefore GNWT’s recommendation #1 is not necessary. De Beers disagreed with GNWT’s recommendation #2 because they are of the opinion that a qualitative requirement “Fish taste and/or texture not acceptable” should not

trigger an action level, and it should be linked with another AEMP components, which are quantitative to ensure the effects are mine related.

The Board notes that AEMP Design Plan V 1.2, under low action level for Fish Safe to Eat does include "The Metals in Edible Fish Tissue Action Level is based on a comparison of metal concentrations in fish from Snap Lake to normal ranges of metal concentrations in fish from the reference lake in any given sampling year.", which is consistent with De Beers' response that fish health is to also include fish tissue. The Board is of the opinion that De Beers should clarify that the action level includes fish health as well as fish tissue because those are separate AEMP components. **The Board requires De Beers to revise the low action level statement "Evidence from one or more AEMP components that the change in fish taste and/or texture can be linked to the Mine (as demonstrated by Action Level triggers for Water Quality, Sediment Quality, or Fish Health)." to specify fish tissue as well.**

The Board acknowledges that qualitative observation of one individual may represent an overly conservative action level trigger. The Board is of the opinion that the proposed low action level is adequate and that it is unnecessary to require "OR" operator between the two requirements for the low action level.

GNWT also commented on the moderate action level (GNWT-3) and was of the opinion that the statement implies that tissues metals need to be elevated in both small- and large-bodied fish for the statement to trigger. GNWT provided literature review that demonstrated that the same metals may not be elevated in the same manner in different sized fish as it can vary depending on trophic level. GNWT recommended the following:

1. A statistical analysis be conducted to demonstrate that there is a positive correlation greater than 0.8 for the analysis for metals of potential concerns in fish tissue; and
2. The action level statements be linked with "OR" instead of "AND" operator.

In response, De Beers stated that GNWT's recommendation #2 would result in a dysfunctional response framework because the consistency with other AEMP components need to be connected to another statement. De Beers explained that the correlation analysis is not necessary because De Beers is not expecting the same metals to be elevated in small- and large-bodied fish in order to trigger the action level. Instead, De Beers is planning on assessing whether the concentration trends are similar or opposite in different sized/trophic level fish.

The Board is of the opinion that De Beers' response is adequate and De Beers' proposed moderate action level is appropriate. The Board does not believe a positive correlation greater than 0.8 is needed to demonstrate consistency in this situation. Small-bodied fish may demonstrate effects before large-bodied fish; therefore, their responses may not be identical at the same time.

4.4 Toxicological Impairment

4.4.1 Water Quality

De Beers proposed the following moderate action level for water quality in V 1.2 of the AEMP Design Plan:

Action Level	Proposed Water Quality Action Level Statement
Moderate	Concentration above the AEMP Benchmark at the edge of the mixing zone (i.e., existing or new zone boundary stations) in two consecutive sampling events AND Concentration greater than normal range(b), supported by an increasing temporal trend in Snap Lake

During the review, GNWT commented that the moderate action level where concentration exceeds AEMP benchmark implies that 5% of the species is adversely affected based on CCME guidelines (GNWT-7). GNWT was of the opinion that adverse effects in 5% species is unacceptable. In addition, the action level is assessed with averaged concentration of all the mixing zone stations, instead of individual stations. GNWT recommended that any AEMP benchmark exceedance should trigger this action level, instead of being based on the average concentration. In response, De Beers disagreed with GNWT's recommendation. De Beers are of the opinion that a single exceedance of an AEMP benchmark in the mixing zone does not lead to chronic effects in Snap Lake. De Beers also noted that a single exceedance could be from an anomaly or outlier, which is not appropriate for triggering a moderate action level. De Beers believes that there is conservatism built in the AEMP benchmarks.

The Board agrees with De Beers that there is conservatism built into the derivation of the AEMP benchmarks. The Board notes GNWT is concerned that "Concentrations higher than the AEMP benchmarks will cause adverse effects in more than 5% of the species, within the area so affected." The Board agrees that 5% of species affected within the mixing zone does not equate to the entire of Snap Lake being affected. As indicated by De Beers, a low action level would be triggered in the situation described by GNWT. The Board is of the opinion De Beers' proposed moderate action level for water quality – toxicological impairment is adequate.

4.4.2 Toxicity

De Beers proposed the following action levels for toxicity in V 1.2 of the AEMP Design Plan:

Action Level	Proposed Toxicity Statements
Low	IC25 for three brood reproduction with C. dubia of ≤100%, present in results at the edge of the mixing zone at more than one station (i.e., existing or new mixing zone boundary stations

Moderate	Confirmed IC50 for three-brood reproduction with C. dubia of ≤50%, present in results at the edge of the mixing zone at more than one station (i.e., existing or new mixing zone boundary stations)
High	Confirmed LC50 for survival with C. dubia of ≤100%, present in results at the edge of the mixing zone at more than one station (i.e., existing or new mixing zone boundary stations) AND Confirmed Action Level for fish health, and the mean fish health endpoint is beyond the regional reference normal range

During the review, GNWT commented on the toxicity action levels (GNWT-9, 10, 11). GNWT commented that the alga (*Pseudokirchneriella subcapitata*) chronic toxicity is assessed annually, and should be included in the low action level (GNWT-10). In response, De Beers explained that the alga was intentionally excluded from the response framework because it is not a sensitive species. C*eriodaphnia dubia*, an aquatic invertebrate was selected instead because of its sensitivity.

The Board is of the opinion that algal chronic toxicity test required under Licence MV2019L2-0004 is sufficient. No concerns were raised on this action level in Version 1.1 of the AEMP Design Plan. The Board is of the opinion that the agal test can remain as a chronic toxicity test under the Licence and AEMP and does not need to be included in the response framework.

For the moderate action level, GNWT recommended the toxicity test be conducted with 100% lake water that is undiluted water sample from the edge of the mixing zone, instead of 50% diluted sample (GNWT-11). In response, De Beers indicated that the escalation from low action level of IC25 (inhibitory concentration causing 25% reduction of growth effects) with 100% lake water to moderate action level IC50 (concentration causing 50% reduction of growth effects) with 50% diluted lake water is appropriate, and below the significant threshold.

The Board disagrees with GNWT's recommendation, and is of the opinion the moderate action level proposed by De Beers is adequate. The Board notes De Beers has removed the linkage to fish health for the moderate action level in AEMP Design Plan V 1.2, which is a more conservative trigger than V 1.1.

For the high action level, GNWT commented that LC50, which is concentration causing 50% lethality at the mixing zone is unacceptable (GNWT-9), and recommended a series of alternative statements in its comments. In response, De Beer indicated that the escalation from low (IC25), moderate (IC50) to high (LC50) action levels is appropriate, and progressed towards significant threshold. De Beers also commented that the high action level should be based on consistent effects in fish health as well, instead of simply replying on laboratory results. De Beers was of the opinion that the suggested alternatives provided by GNWT do not provide sufficient degree of separation between moderate and high action level.

The Board agrees with De Beers that the statements in high action level can be linked with AND so that laboratory results alone do not triggering a high action level.

The Board is of the opinion that De Beers' proposed high action level statement on LC50 of *C. dubia* is appropriate for the following reasons:

1. *C. dubia* is a sensitive species, so lethality to this species would still be considered conservative for a high action level;
2. The escalation from a IC50 to LC50 is appropriate from moderate to high action level;
3. The Licence requires the effluent to not be acutely toxic, but the receiving environment could affect the chemistry and toxicity;
4. Lethal to *C. dubia* is below the significance threshold, which is:

Inadequate food for
fish in Snap Lake
OR
Fish in Snap Lake unable to
survive, grow, or reproduce
OR
Sustained absence
of a fish species

Therefore, the Board has accepted De Beers' proposed high action level statements for toxicity.

4.4.3 Sediment Quality

De Beers proposed the following action levels for sediment quality in V 1.2 of the AEMP Design Plan:

Action Level	**Proposed Sediment Quality Statements**
Low	Mean concentration above 75% of ISQG in Snap Lake AND Concentration greater than normal range AND Link to Mine(d) demonstrated by spatial or temporal trend, or water quality results
Moderate	Mean Concentration above 75% of PEL in Snap Lake
High	Mean Concentration above 90% of PEL in Snap Lake

During the review, GNWT commented on the sediment action levels (GNWT-13, 14). GNWT commented that all the sediment action levels are assessed with lake-wide mean, which may allow for concentrations for individual monitoring stations to be higher than guidelines. GNWT recommended assessing the average concentrations of SNP locations only, instead of lake-wide concentrations (GNWT-13). In response, De Beers noted that the proposed low action level is the same as the previously approved

versions of the AEMP Design Plan. De Beers also noted that ISQG, which is the Canadian interim sediment quality guidelines are conservative and no effects on benthic invertebrates are expected.

The Board is of the opinion De Beers adequately addressed GNWT's comment. The Board agrees with De Beers in that they have not sought changes to the previously approved low action level. The Board notes that De Beers has removed the linkages to toxicity for benthic invertebrates in moderate and high action levels, which resulted in more conservative action levels. The Board is of the opinion that Probably Effects Levels (PEL) are appropriate at the moderate and high action levels for sediment quality.

GNWT also recommend the low action level statements should be linked with "OR", instead of "AND" operators (GNWT-14). In response, De Beers disagreed because the statements alone would be too sensitive for low action level exceedance, therefore, all three statements should be met for triggering a low action level. The Board agrees with De Beers.

Therefore, the Board has accepted the proposed action levels for sediment quality.

4.4.4 Plankton

During the review, GNWT commented that De Beers has not proposed to monitor for plankton in the northwest arm of Snap Lake (GNWT-15). Instead, De Beers has proposed to initiate monitoring for plankton based on water quality data in the northwest arm. GNWT expressed concerns with the lack of plankton monitoring in the northwest arm because this part of the lake has not been subjected to discharge before and that water quality would not capture non-point source losses. GNWT recommended the following:

1. Include plankton monitoring;
2. Clarify whether water quality in the northwest arm would trigger the plankton sampling;
3. Provide rationale for not proposing plankton monitoring; and
4. Discuss the timeline of plankton monitoring would assess changes over time.

In response, De Beers indicated capturing non-point sources losses is not sufficient reasoning to monitor for plankton. De Beers was of the opinion that triggering plankton monitoring based on water quality is sufficient. The plankton monitoring in northwest arm would be triggered based on water quality in the northwest arm, as opposed to lake-wide. De Beers also clarified that plankton data would be assessed for changes over time by visual comparison in the reference lake, and consider year-to-year variation based on previous monitoring.

The Board is of the opinion De Beers adequately addressed GNWT's comment and their proposed response action to initiate plankton sampling in the northeast arm of Snap Lake based on water quality triggering a low action level is appropriate.

4.4.5 Fish Health

De Beers proposed the following action levels for fish health in V 1.2 of the AEMP Design Plan:

Action Level	Proposed Fish Health Statements
Low	A statistically significant difference (P<0.1) in fish health endpoints(c) or fish tissue chemistry parameters compared to the reference lake (Lake 13) AND Change is in direction, and of magnitude(d), that is indicative of an impairment to fish health
Moderate	Confirmed(e) Low Action Level AND Mean(a) fish health endpoint or fish tissue parameter outside the regional reference normal range in a direction that is indicative of an impairment to fish health AND Effect on the fish health or fish tissue chemistry is supported by consistent effects in one or more other AEMP components
High	Confirmed(e) Moderate Action Level trigger for two or more fish health endpoints(f) in small-bodied fish or large-bodied fish(g) or one or more fish tissue chemistry parameters AND Effects exceed site-specific benchmarks(h) for fish tissue parameters, and are supported by a toxicological impairment response pattern in fish health

During the review, GNWT commented on the moderate and high action levels for fish health (GNWT-20, 21). GNWT noted that the proposed moderate action level still includes a statement requiring consistent effects in one or more of the other AEMP components. GNWT was of the opinion that the second statement, which is an absence of the same change in the reference lake, is sufficient to trigger a moderate action level. GNWT recommended removing the requirement for consistent effects in other AMEP components. In response, De Beers indicated that while requirement for consistent effects in other AEMP component was removed for other AEMP component action levels, they maintained that this requirement is appropriate for fish health. De Beers was of the opinion that this was defended at the 2022 Closure Workshop.

The Board notes that the Board previously stated that the proposed moderate action level was not conservative enough in Version 1.1 of the AEMP Design Plan.[2] However, after discussions at the 2022 Closure Workshop, clarification was provided that "consistent effects in one or more AEMP components" means that if changes in other AEMP component(s) of a consistent type are observed, e.g., increase in a certain parameter in water or sediment chemistry, a decrease in benthic invertebrates or plankton biomass, but that a consistent effect does not require a trigger in any action levels in other components. The Board is of the opinion that if there are effects on fish health, it would be detected in other exposure or biological components. Therefore, it is reasonable to include a statement linking to other AEMP components for a moderate action level.

The Board notes that consistent effect is not well defined for the fish health component currently, however, De Beers could better define consistent effects in the AEMP Annual Report after a low action level is triggered, and De Beers need to monitor for the confirmation program. **The Board hereby directs De Beers to include in section 16.5 Response Actions that once a low action level is triggered for fish health, De Beers shall define "consistent effect" based on the cause of the effects in the AEMP Annual Report. This would enable clear assessment of whether moderate action level is triggered in the following field season.**

The Board has accepted the proposed fish health action levels.

4.4.6 Fish Tissue

A few issues were identified during the review including closure criteria on fish tissue, large- and small-bodied fish tissue sampling, and fish size-mercury concentration adjustment method. The fish tissue program is closely linked to the FCRP because De Beers has proposed closure criteria based on fish tissue. Although the closure criteria should be discussed in the FCRP, there are implications on the fish tissue program in the AEMP.

During the 2022 Closure Workshop, De Beers committed to revising the closure criteria to include trend analysis for all other metals in fish tissue in addition to comparing mercury concentrations to the Health Canada consumption guideline.

In V 1.2 of the AEMP Design Plan, De Beers included the following closure criteria on fish tissue:

> Fish tissue metal concentrations are below Health Canada guidelines (0.5 mg/kg) as defined in the approved AEMP Design Plan and there is no increasing trend as demonstrated by comparing the Closure and Post closure monitoring data to the Operations, Care and Maintenance and Closure data. Fish tissue monitoring will occur once in Closure and once after the initiation of the Post-closure period (between Post-closure Year 4 and 6).

[2]

During the review, De Beers was asked whether only mercury is being assessed and whether it is sampled in both small- and large-bodied fish (MVLWB-4). In response, De Beers confirmed that only mercury has been proposed for the closure criteria and that details of the closure criteria are described in the FCRP.

The Board notes that there is only one Health Canada guideline for the consumption of fish, which is for mercury (0.5 mg/kg). De Beers did not include trend analysis for the full metal suite in the closure criteria as discussed during the 2022 Closure Workshop. No justifications have been provided for excluding trend analysis for all other metals in fish tissue. De Beers was also asked whether the closure criterion applies to small- and large-bodied fish (MVLWB-4), but De Beers did not directly address this comment and noted that the details pertaining to closure criteria are provided in the FCRP. The closure criterion on fish tissue has implications on the AEMP schedule, and parameters analyzed in fish tissue. The Board has decided that fish tissue component for large-bodied fish and AEMP schedule for large-bodied fish health/fish tissue chemistry should not be approved at this time for the following reasons:

1. De Beers' closure criteria on fish tissue only assess trends for mercury. De Beers has proposed to exclude historical mercury data (MVLWB-25) and has only proposed to sample large-bodied once during closure in 2024 and once in post-closure in 2023 (MVLWB-5, 14). Without the historical data and only two data points for large-bodied fish, a trend cannot be analyzed (statistically or otherwise);
2. De Beers has only proposed to sample for mercury in large-bodied fish tissue in the AEMP (MVLWB-21), which does not reflect the discussion held at the 2022 Closure Workshop where De Beers committed to analyzing the full metal suite and conducting trend analyses for all metal concentrations for closure criteria on fish tissue;
3. Once the closure criterion for fish tissue is met, the AEMP program will cease. This implies that if closure criteria for mercury is met, the AEMP program would cease even if there were action level exceedances for other metals in fish tissue; and
4. De Beers has not clearly articulated the fish size-mercury adjustment method (MVLWB-23, 24). Board staff acknowledge that the practice is standard, but De Beers' sample size is small, making it unclear if the proposed adjustment is beneficial or appropriate. De Beers should provide clarifications on when and how the adjustment will be applied to the dataset.

The Board is of the opinion that the proposed small-bodied fish health/tissue program is adequate and can be approved. However, the Board has decided to not approve the large-bodied fish health/tissue component until the outstanding concerns on closure criterion on fish tissue is resolved, and the AEMP reflects the approved criterion. De Beers has submitted V 1.2 of the FCRP, which is currently under review. **The Board will consider the closure criterion on fish tissue in the FCRP, and then direct De Beers to revise the AEMP's large-bodied fish health/tissue component and schedule accordingly.**

4.5 Summary of Commitments

During the review, De Beers made commitments to revise the AEMP Design Plan, which has been summarized in Table 1. The Board hereby directs De Beers to reflect this commitments in Version 1.3 of the AEMP Design Plan.

Table 1 Summary of Commitments

ID	Commitments	Review Comment Reference
1.	Update footnote (a) to clarify that the threshold of a Low Action Level for water quality (toxicological impairment) is based on an average concentration above 75% of an AEMP benchmark at any of the mixing zones where discharge is occurring.	GNWT-5
2.	Correct the following footnotes in Table 16.4-2: the (i) in the high action level will be removed. Footnote (e) and (f) will be added to moderate action level, and footnote (f) and (g) will be added to high action level in Table 16.4-2.	GNWT-12, 26
3.	Revise the text regarding low action level assessment in section 16.4.3.3 to “The Low Action Level would be triggered if the whole lake mean concentration was greater than 75% of the ISQG (or a similarly conservative benchmark), was above the normal range, and was linked to the Mine.”	GNWT-13
4.	Clarify that the water quality effects that would trigger plankton monitoring in the northwest arm, and edit the text to "i.e., if an effect on water quality that triggers the Low Action Level is observed in the northwest arm, and is attributed to the new northwest arm discharge".	GNWT-15
5.	Adjust the size of layering of symbol in figure 5.4-1 to display the plankton monitoring location.	GNWT-25
6.	Move the sentence regarding the fish tissue chemistry criteria effect size to a separate bullet to clarify which statement references the Environment Canada 2012 document.	GNWT-27
7.	Update the following: 1). section 6.3.1 to reflect that "Once discharge to the current mixing zone has stopped, sampling will continue but at a different frequency at SNP 02-20d and SNP 02-20e, and SNP 02-20f”.and 2). to footnote (a) to “After discharge to the existing mixing zone stops, the deep station at the existing mixing zone (i.e., SNP 02-20e) will be monitored at the same depths and frequency as AEMP stations beyond the mixing zone; UG samples will continue to be collected at SNP 02-20e, SNP 02-20d and SNP 02-20f.”	GNWT-28
8.	Clarify that in the text that De Beers is “comparing the Closure and Post-closure monitoring data to the Operations, Care and Maintenance and Closure (Post-closure only) data”. This will avoid text being interpreted as closure data being compared to closure data.	MVLWB-6
9.	Update Figure 5.4-1 regarding station SNAP23 to correspond to information provided in Table 5.4-1 and text on p. 50 (Section 6 Water Quality).	MVLWB-7
10.	Update Figure 5.4-1 to correctly reflect planned toxicity monitoring at SNAP15.	MVLWB-8

ID	Commitments	Review Comment Reference
11.	Correct symbol for SNP 02-20d, update Figure 5.4-1 to correspond to information provided in Table 5.4-1 and text on p. 50 (Section 6 Water Quality) in V1.3.	MVLWB-10
12.	Add locations for SNP 02-20h, SNP 02-20i, SNP 02-20j, and SNP 02, update Figure 5.4-1 to correspond to information provided in Table 5.4-1 and text on p. 50 (Section 6 Water Quality).	MVLWB-11
13.	Update Figure 5.4-2 to add in a note stating “Fish tissue and fish health monitoring only in Lake 13.”.	MVLWB-12
14.	Adjust the size and layering of symbols of Figures 5.4-1 and 5.4.3.	MVLWB-13
15.	Remove Lake 13 from the Large-Bodied Fish Health and Fish Tissue Chemistry location column in Table 5.5-1.	MVLWB-15
16.	Adjust units (µg/L or mg/m3) in the AEMP Design Plan for Closure and Post-closure Version 1.3 to make them consistent between Table 9.2-2 and Tables 16.4-2 and 16.4-3.	MVLWB-17
17.	Correct the upper bound value for phytoplankton in Table 9.2-2 to 2.72 as shown in Figure 16.4-1 (b) in AEMP Design Plan for Closure and Post-closure Version 1.2.	MVLWB-18
18.	Shade the normal range mean for phytoplankton of 290 µg/L in AEMP Design Plan for Closure and Post-closure Version1.3.	MVLWB-19
19.	Clarify that the analysis of tissue chemistry from Lake Trout captured during the Fish Tasting program will be conducted to link the traditional knowledge to the quantitative AEMP assessment.	MVLWB-26
20.	Adjust Table 16.4-1 to show the division between the moderate and high Action Level Criteria.	MVLWB-27
21.	Update the Sediment Quality moderate and high action levels to specify that parameters without CCME guidelines will be assessed against available guidelines from other Canadian jurisdictions (e.g., provincial guidelines) or literature-based effect thresholds.	MVLWB-29
22.	Adjust the symbol in front of zooplankton biomass from "<;" to “>;" in Table 16.4-5.	MVLWB-30
23.	Change the "AND" operator to an "OR" operator in the Moderate Action Level for the Plankton Community (Nutrient Enrichment).	MVLWB-31
24.	Correct the cover page and headers to display the correct name of the AEMP Design Plan for Closure and Post-closure.	SLEMA-1
25.	Add that early post-closure should be within 2 years of decommissioning the water treatment plant.	SLEMA-7
26.	Add: 1. AEMP target analytical methods to Table 6.3-4 as an additional column, consistent with the approach for sediment (Table 7.2-1); and 2. an explanation to Section 6.3.4 in the AEMP Design Plan for Closure and Post-closure Version 1.3 indicating that equivalent or improved analytical methods relative to the target analytical methods may be used for the analysis of water quality samples.	SLEMA-9

5.0 Conclusion

The Board has approved the response framework except for the large-bodied fish health/tissue component and the associated AEMP schedule.

The Board requires De Beers to revise the AEMP Design Plan V 1.2 as detailed in these Reasons for Decision.

The Board will direct De Beers to submit the AEMP Design Plan Version 1.3 once the Board has considered the closure criteria on fish tissue described in the Final Closure and Reclamation Plan Version 1.2.

SIGNATURE

Mavis Cli-Michaud, Chair
Mackenzie Valley Land and Water Board

August 30, 2022

Date