

November 19, 2024

Wheeler River Project Environmental Impact Statement Review

Denison's Response to the CNSC's November 14, 2024 comment Round 5 IR-114

CNSC Round 5 IR-114 comment

1. Update EA commitment 8-47 to include a linkage to IR-114 to ensure that additional sampling for alkalinity and nitrate will be conducted prior to construction activities as supporting information for IR-114, as indicated by Denison in their Round 4 responses.
2. Provide an updated Table 8.2-13 for review incorporating the correct short- and long-term benchmark values of 0.00011 mg/L and 0.00004 mg/L respectively, for Cadmium.
3. Provide an update to the ERA risk conclusions to remove reference to utilizing an "induced hardness" scenario calculating a copper FEQG with effluent concentrations of hardness (i.e. 250 mg/L) rather than the maximum predicted receiving environment concentrations of hardness (i.e. 9 mg/L as per EIS Table 8.2-10) as rationale for risk to receptors.
4. Confirm, in light of this new information, with appropriate justification, whether the EA predictions and conclusions remain valid, and whether the proposed mitigation measures remain adequate.
5. Make a commitment to assess and minimize copper concentrations in effluent through the BATEA assessment during licensing.

Denison's response – to be considered in conjunction with the IR-114 responses provided to the CNSC on October 18, 2024 and November 13, 2024

1. *Note: commitment 8-47 was a commitment related to wetlands. Commitment 8-48 has been updated in commitments register version 4 as shown here in track changes:*

| ID (EIS Section-chronological number) | VC/KI (as applicable; related to mitigations) | Last Updated (register version) | Details of Commitment | EIS Section or IR/TRC | Project Phase | Commitment Tracker Method | Scope of Commitment |
|---------------------------------------|---|---------------------------------|--|-------------------------------------|-----------------------|---|------------------------|
| | | | methylmercury, and other relevant COPCs such as lead, arsenic, and cadmium as part of the constituents monitored in fish throughout all project phases. | | | | |
| 8-45 | Water Quality / Project Description | 1 | Denison is committed to investigating BATEA and working with the province and CNSC to ensure discharge concentrations of all constituents including uranium are protective of the aquatic environment. | IR-18 | All phases | Engineering Design; EMS; EA Follow-up Program | Regulatory Requirement |
| 8-46 | Wetlands / Fish Habitat | 1 | To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota. | IR-101, Appendix 8-F | All phases | Engineering Design; EMS; EA Follow-up Program | FUP Requirement |
| 8-47 | Wetlands/Fish Habitat | 1 | Wherever possible, wetlands will be avoided through Project design and instituting proper buffers. | IR-101, Section 8.3.5, Appendix 8-F | All phases | Engineering Design | Regulatory Requirement |
| 8-48 | Water Quality | 4 5 | Denison <u>is in agreement</u> that regular water quality data collection should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). Sampling will be conducted monthly during the open water period and twice under ice <u>and will include analysis for alkalinity and nitrate</u> . Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data. | IR-107, IR-114 | Prior to Construction | EA Follow-up | FUP Commitment |
| | | | Denison has committed to a pre-operational ESM study and will conduct that study in accordance with | | | | |

2. Excerpt of Final EIS (October 2024) Table 8.2-13 for the CNSC’s review of cadmium screening criteria:

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water

| Constituent | Unit | Kratchkowsky Lake (LA-7) | Whitefish Lake North (LA-6) | Whitefish Lake Middle (LA-5 North) | Whitefish Lake South (LA-5 South) | McGowan Lake (LA-1) | Icelandic River | Russell Lake Inlet | Short-term Benchmark | | | Long-term Benchmark | | |
|--------------------|------|--------------------------|-----------------------------|------------------------------------|-----------------------------------|---------------------|-----------------|--------------------|----------------------|-----------|-------|---------------------|-----------|-------|
| | | | | | | | | | Value | Reference | Notes | Value | Reference | Notes |
| Alkalinity | mg/L | NE | NE | 12.4 | 12.4 | NE | NE | NE | | | | | | |
| Aluminum | mg/L | 0.01766 | 0.01616 | 0.01835 | 0.02226 | 0.01500 | 0.01499 | 0.01614 | | | | 0.1 | SEQG/CCME | (1) |
| Ammonia (as N) | mg/L | 0.01463 | 0.01463 | 0.05232 | 0.05215 | 0.03978 | 0.0395 | 0.03368 | | | | 5.74 | SEQG/CCME | (2) |
| Un-ionized Ammonia | mg/L | 0.000086 | 0.000086 | 0.0000309 | 0.0000308 | 0.0000235 | 0.0000233 | 0.0000199 | | | | 0.019 | SEQG/CCME | |
| Arsenic | mg/L | 0.00012 | 0.00011 | 0.00015 | 0.00015 | 0.00013 | 0.00013 | 0.00012 | | | | 0.005 | SEQG/CCME | |
| Cadmium | mg/L | 0.000024 | 0.000023 | 0.00004 | 0.000039 | 0.000033 | 0.000033 | 0.00003 | 0.00011 | CCME | (3) | 0.00004 | SEQG/CCME | |

(3) Cadmium criteria based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L [95th percentile of LA-5 and LA-6]).

3. and 4.

Baseline conditions for the Wheeler River include a background hardness of 5.26 mg/L, DOC of 2.24 mg/L, and pH of 6.61 (95th percentile of LA-5 and LA-6). Using ECCO's Biotic Ligand Model for copper, the calculated HC₅ is below 0.0002 mg/L, however, 0.0002 mg/L is considered by the FEQG to be the lowest concentration routinely measured and therefore replaces the calculated HC₅ value for this water chemistry. Therefore, at baseline conditions the FEQG is 0.0002 mg/L. Table 3-1, Table 3-3, and Table 3-5 of the ERA (Appendix 10-A) were updated to include the copper FEQG of 0.0002 mg/L as the screening criterion.

As identified in Section 5.3.1.1 of the ERA (Appendix 10-A), toxicity reference values (TRVs) for copper were obtained from the USEPA Ecotoxicology Database (ECOTOX) for aquatic organisms. The selected TRVs were 20% Effect Concentrations (i.e., EC₂₀ values), which are concentrations at which only 20% of the test organisms respond. The TRVs are shown in Table IR-114-1 below. Where the TRVs derived from ECOTOX were lower than the CCME guideline the CCME guideline was selected.

Table IR-114-1: Copper Toxicity Reference Values Used for Aquatic Organisms in the ERA

| COPC | Biotic Group | TRV | Unit | Rationale | Data Source |
|--------|-----------------------|--------|------|---|--------------|
| Copper | Forage fish | 0.002 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=237) | ECOTOX |
| | Predator fish | 0.003 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=89) | ECOTOX |
| | Zooplankton | 0.002 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=117) | ECOTOX; CCME |
| | Benthic invertebrates | 0.002 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=264) | ECOTOX; CCME |
| | Phytoplankton | 0.0092 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=101) | ECOTOX |
| | Aquatic plants | 0.038 | mg/L | 5th percentile of estimated chronic EC ₂₀ distribution (n=28) | ECOTOX |

As requested in IR-114, the TRVs have been re-evaluated using the FEQG and the BLM. The BLM was run based on baseline site-specific conditions. The test species and concentrations identified as used to generate the BLM were evaluated to develop TRVs for the applicable biotic groups. The most restrictive effect concentration for each biotic group was identified. The test endpoint was either an EC₁₀ or an IC₁₀. Based on the protocol identified in Table 5-11 of the ERA, the EC₁₀ (or IC₁₀) was multiplied by 2 to obtain an EC₂₀, which was then utilized as the TRV. A summary of the TRVs for baseline conditions is identified in Table IR-114-2.

Considering that while the facility is in operation it is expected that hardness in the receiving environment will increase to approximately 9 mg/L and pH will increase to approximately 7, the BLM was re-run under updated site conditions and the TRVs were re-evaluated based on the test species and concentrations used to generate the BLM. The copper TRVs under site conditions are presented in Table IR-114-3.

Table IR-114-2: Copper Toxicity Reference Values from Baseline Conditions BLM

| COPC | Biotic Group | TRV | Unit | Rationale | Data Source |
|--------|-----------------------|--------|------|--|-------------|
| Copper | Forage fish | 0.0052 | mg/L | Fathead minnow, growth (IC ₁₀ = 0.0026 mg/L) | FEQG BLM |
| | Predator fish | 0.0008 | mg/L | White sturgeon, growth (EC ₁₀ = 0.0004 mg/L) | FEQG BLM |
| | Zooplankton | 0.0009 | mg/L | Daphnia magna, reproduction (EC ₁₀ = 0.0004 mg/L) | FEQG BLM |
| | Benthic invertebrates | 0.0004 | mg/L | Pond snail, growth (EC ₁₀ = 0.0002 mg/L) | FEQG BLM |
| | Phytoplankton | 0.0091 | mg/L | Rotifer, intrinsic (EC ₁₀ = 0.0046 mg/L) | FEQG BLM |
| | Aquatic plants | 0.0212 | mg/L | Duckweed, root length (EC ₁₀ = 0.01 mg/L) | FEQG BLM |

Notes:

BLM based on hardness of 5.26 mg/L, DOC of 2.24 mg/L, pH of 6.61, temperature of 13°C.
TRV is an EC₂₀, adjusted from an EC₁₀ or IC₁₀.

Table IR-114-3: Copper Toxicity Reference Values from Site Conditions BLM

| COPC | Biotic Group | TRV | Unit | Rationale | Data Source |
|---------------|-----------------------|-------|------|---|-------------|
| Copper | Forage fish | 0.01 | mg/L | Fathead minnow, growth (IC ₁₀ = 0.005 mg/L) | FEQG BLM |
| | Predator fish | 0.002 | mg/L | White sturgeon, growth (EC ₁₀ = 0.001 mg/L) | FEQG BLM |
| | Zooplankton | 0.002 | mg/L | Daphnia magna, reproduction (EC ₁₀ = 0.001 mg/L) | FEQG BLM |
| | Benthic invertebrates | 0.001 | mg/L | Pond snail, growth (EC ₁₀ = 0.0005 mg/L) | FEQG BLM |
| | Phytoplankton | 0.017 | mg/L | Rotifer, intrinsic (EC ₁₀ = 0.009 mg/L) | FEQG BLM |
| | Aquatic plants | 0.015 | mg/L | Duckweed, root length (EC ₁₀ = 0.008 mg/L) | FEQG BLM |

Notes:

BLM based on hardness of 9 mg/L, DOC of 2.24 mg/L, pH of 7, temperature of 13°C.
TRV is an EC₂₀, adjusted from an EC₁₀ or IC₁₀.

The hazard quotients (HQs) for aquatic organisms were re-evaluated using both sets of TRVs, baseline conditions and site conditions during operation where hardness and pH are increased (Table IR-114-4). Consistent with Section 5.4.1 of the ERA (Appendix 10-A) an HQ less than or equal to 1 suggests low risk to the ecological receptor, and an HQ above 1 needs further investigation to determine if adverse effects are possible. Conservatively using baseline conditions, HQs for all aquatic organisms are less than 1 with the exception of predator fish in Whitefish Lake, and benthic invertebrates at all locations where HQs are slightly above 1. As such, further consideration was given to changes in site conditions when the facility is in operation. Using more realistic site conditions for hardness and pH, HQs for all aquatic organisms are less than 1 at all downstream locations, indicating no adverse effects to aquatic organisms from facility related copper. It is relevant to consider all aspects of the receiving environment and this includes induced hardness and pH since the scenario being evaluated only occurs during periods of effluent discharge. This approach is used in other jurisdictions (e.g., water licences in northern Canada issued through local water boards) and therefore the concept of induced hardness is not unique.

The copper predictions in the ERA are considered conservative based on the following assumptions:

- Baseline concentrations of copper are predominantly below the detection limit, indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The effluent predictions in the ERA are based on available information from test studies at the time the ERA was prepared. Denison will be refining the effluent quality through the BATEA assessment and licensing process.
- Based on the effluent quality and quantity released to Whitefish Lake, the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ. This is a conservative assumption.
- Once the facility is operational, site conditions will change which includes increased hardness and pH; therefore, the predicated HQs under baseline conditions are considered conservative and overestimate risk.

Denison is in the process of collecting additional baseline water quality data which will be used in future ERA iterations to reconsider the baseline copper concentration in the Wheeler River. The ERA is a living document that will continue to be updated at defined intervals and will integrate new data when it is available. Denison has also committed to an ongoing environmental monitoring program which will be used to determine if there are any adverse effects to aquatic organisms from copper and other constituents of potential concern.

Table IR-114-4: Re-Evaluated Hazard Quotients for Copper in Aquatic Organisms

| Location | Maximum Copper Concentration in Water (mg/L) | Hazard Quotients (unitless) – Baseline Conditions | | | | | | Hazard Quotients (unitless) – Site Operation Conditions | | | | | |
|--|--|---|---------------|-------------|----------------------|---------------|----------------|---|---------------|-------------|----------------------|---------------|----------------|
| | | Forage Fish | Predator Fish | Zooplankton | Benthic Invertebrate | Phytoplankton | Aquatic Plants | Forage Fish | Predator Fish | Zooplankton | Benthic Invertebrate | Phytoplankton | Aquatic Plants |
| Kratchkowsky Lake (reference) ¹ | 6.22E-04 | 0.12 | 0.80 | 0.70 | 1.49 | 0.07 | 0.03 | 0.12 | 0.80 | 0.70 | 1.49 | 0.07 | 0.03 |
| Whitefish Lake North | 6.20E-04 | 0.12 | 0.80 | 0.70 | 1.49 | 0.07 | 0.03 | 0.06 | 0.34 | 0.30 | 0.63 | 0.04 | 0.04 |
| Whitefish Lake Middle | 8.22E-04 | 0.16 | 1.06 | 0.93 | 1.97 | 0.09 | 0.04 | 0.08 | 0.46 | 0.40 | 0.84 | 0.05 | 0.05 |
| Whitefish Lake South | 8.17E-04 | 0.16 | 1.05 | 0.92 | 1.96 | 0.09 | 0.04 | 0.08 | 0.45 | 0.40 | 0.83 | 0.05 | 0.05 |
| McGowan Lake | 7.50E-04 | 0.14 | 0.97 | 0.85 | 1.80 | 0.08 | 0.04 | 0.07 | 0.42 | 0.37 | 0.76 | 0.04 | 0.05 |
| Icelander River | 7.49E-04 | 0.14 | 0.97 | 0.84 | 1.80 | 0.08 | 0.04 | 0.07 | 0.42 | 0.37 | 0.76 | 0.04 | 0.05 |
| Russell Lake Inlet | 7.17E-04 | 0.14 | 0.92 | 0.81 | 1.72 | 0.08 | 0.03 | 0.14 | 0.92 | 0.81 | 0.73 | 0.08 | 0.03 |

Note:

Bold and shaded value indicates hazard quotient greater than 1.

¹ Kratchkowsky Lake is a reference lake located upstream of the effluent discharge point, and as such, the site operation conditions were the same as baseline conditions.

In the Aquatic Environment section of the EIS (Section 8), the effects assessment is completed for aquatic VCs. To address the CNSC's concerns and to recognize the Cu FEQG in consideration of hardness of 9 mg/L, pH of 7, and DOC of 2.24 the BLM is 0.0005 mg/L and the following updates have been made:

- Section 8.2 Water Quality – long-term copper guideline presented is FEQG 0.0002 mg/L under background conditions in the nearfield model and 0.0005 mg/L under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 in regional surface water quality results and discussion.
- Section 8.3 Fish and Fish Habitat – with the inclusion of Cu FEQG under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 and some exceedances of this guideline in water quality section, the assessment for benthic invertebrates recognizes this slight increased risk by updating the magnitude for the characteristics ratings in relation to water quality from low to moderate.
- Section 8.5 Fish Health - with the inclusion of Cu FEQG under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 and some exceedances of this guideline in water quality section, the assessment for fish health recognizes this slight increased risk by updating the magnitude for the characteristics ratings in relation to water quality from low to moderate.

Overall, we have updated Section 8 to recognize that while some additional risk to sensitive receptors is possible in consideration of the Cu FEQG without hardness mediation, the overall conclusions are unchanged. The residual effects of the Project are not expected to result in a change to the viability and persistence of aquatic VCs and associated KIs and were, therefore, predicted to be not significant.

The ERA was conservative in a number of ways in relation to copper, including:

- baseline concentrations of copper in water are predominantly below the detection limit (<0.0002 mg/L), indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The IMPACT model predicts how constituents travel through the environment and concentrations of constituents change as a result of interactions with natural flows and lake sediments. The Kds applied in the model have largely over predicted the baseline sediment copper concentrations throughout the lakes demonstrating that the model and model inputs are conservative.
- in the EIS, copper concentrations in effluent represented an upper bound; Denison is confident the actual effluent quality will be within the range of what was assessed and specifically, lower than what was used in the EIS, and the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ.

Monitoring programs will be implemented to assess the environmental performance of the Project relative to the predictive assessment that has been completed in support of the EA process. Such monitoring is needed since there is always some level of uncertainty associated with EA predictions. Effluent, water, and sediment sampling will be completed to verify the accuracy of the effects and effectiveness of proposed mitigation measures. Copper is included in planned monitoring as it is a deleterious substance under MDMER and must be monitored in effluent per MDMER Schedule 4 and is included in trace metal analysis for water and sediment samples. As such, there are no changes needed to the monitoring proposed in the EIS.

As part of commitment 8-48, Denison is collecting baseline water quality data which includes a lower detection limit for metals including copper. Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data. The following, recent information is provided as background context for the CNSC's review of this IR response:

- Initial 2024 results in Whitefish Lake show that copper is typically less than the new, lower detection limit of 0.00007 mg/L.
- We also note that information provided by Denison to the CNSC (November 1, 2024 Nagel to Gorzkowski) shows that copper in effluent is expected to be 0.0042 mg/L which is 5 times lower than the copper concentration in effluent used in the EIS (0.022 mg/L).

5. A new commitment (8-53) has been added to commitment register version 4 as shown here in track changes:



| ID (EIS Section-chronological number) | VC/KI (as applicable; related to mitigations) | Last Updated (register version) | Details of Commitment | EIS Section or IR/TRC | Project Phase | Commitment Tracker Method | Scope of Commitment |
|---------------------------------------|---|---------------------------------|---|-----------------------|--------------------|---------------------------|------------------------|
| 8-53 | Water Quality | 4 | Denison will assess and minimize copper concentrations in effluent through the BATEFA assessment during licensing | IR-114 (Nov 2024) | Prior to Operation | EMS: EA Follow-up | Regulatory Requirement |