



JAY PROJECT

Water and Fish

EA1314--01

INDEPENDENT ENVIRONMENTAL
MONITORING AGENCY



SEPTEMBER 16, 2015

OUTLINE

- Surface Water and Minewater Management
- Lac du Sauvage Fish Monitoring
- Impacts on Fish Habitat from Dust Deposition
- Jay Project Impacts on AEMP Reference Lakes
- Effluent Toxicity to Zooplankton within Mixing Zone
- Assessment of Taxonomic Change in Plankton

SURFACE WATER AND MINEWATER MANAGEMENT

■ ISSUE

- Developer is to “*describe and evaluate contingent water treatment alternatives that may be required prior to discharge of effluent into the environment during all project phases with an analysis of:*
 - *use of existing Lynx and Misery pits;*
 - *mechanical water treatment options; and*
 - *other water treatment options.*”

SURFACE WATER AND MINEWATER MANAGEMENT

■ DEVELOPER'S CONCLUSIONS

- Stratification (meromixis): results in hydrologic separation of clean surface water suitable for discharge into Lac du Sauvage and “dirty” water that will remain in pit lake bottom

■ AGENCY'S CONCLUSION

- Implementation of one or more adaptive management strategies requires enough lead time and early indicators of success or failure, to provide adequate protection to Lac du Sauvage

SURFACE WATER AND MINEWATER MANAGEMENT

■ EVIDENCE AND RATIONALE

- DDEC : **if minewater is acutely toxic** , no water will be discharged from the Misery Pit to Lac du Sauvage
- Monitoring data would be used to assess the need for adaptive management strategies but no specific triggers for early warning or actions were identified, no lead times identified for contingencies

SURFACE WATER AND MINEWATER MANAGEMENT

- **AGENCY RECOMMENDATION**
- **Measure:** Develop and submit to the Wek'eezhii Land and Water Board for approval, a revised Water Management Plan for the Jay Project within two years of starting Jay de-watering . The Plan shall include:
 - Specific surface and minewater management contingencies including capacities

SURFACE WATER AND MINEWATER MANAGEMENT

- AGENCY RECOMMENDATION
- **Measure:** (continued)
 - Lead time for each contingency option
 - Detailed monitoring of water quality and quantity enables early detection of success or failure
 - Associated adaptive management trigger thresholds for implementation of contingencies.

LAC DU SAVUAGE FISH MONITORING

■ ISSUE

- Developer is proposing to rely solely on small-bodied benthic fish (likely sculpin) as the only fish for monitoring of Lac du Sauvage

■ DEVELOPER'S CONCLUSIONS

- Developer believes that environmental impacts will be identified in small-bodied fish before they are detected in top predators

LAC DU SAVUAGE FISH MONITORING

■ AGENCY'S CONCLUSIONS

- Fish at the upper trophic levels (trout , burbot) bioaccumulate contaminants over their life. Contaminant loading may be masked by the short life spans of sculpin (up to 10 years) and may remain undetected in older trout, burbot and other VEC fish species

LAC DU SAVUAGE FISH MONITORING

■ EVIDENCE AND RATIONALE

- Large, older lake trout in pristine lakes can accumulate mercury in their flesh and internal organs that are above Health Canada guidelines
- Ekati Diamond Mine Aquatic Response Framework Ver. 1.1 includes “tissue metal concentrations’ as a variable included within the Framework. It is important to have a consistent and transparent mechanism to address aboriginal communities’ concerns

LAC DU SAVUAGE FISH MONITORING

- **AGENCY RECOMMENDATION**
- **Measure:** Incorporate non-lethal testing of large-bodied fish within
Lac du Sauvage in
any Aquatic Effects
Monitoring Program
for the Jay Project



IMPACTS ON FISH HABITAT FROM DUST DEPOSITION

■ ISSUE

- DAR focus on impacts of dust on water quality rather than effects on fish eggs

■ DEVELOPER'S CONCLUSIONS

- Will not be enough dust produced to pose a threat of sedimentation impacts on fish shoals
- Wave action will sweep sediment from fish habitat within dust deposition zone

IMPACTS ON FISH HABITAT FROM DUST DEPOSITION

■ AGENCY'S CONCLUSIONS

- DDEC has not sufficiently demonstrated that dust generated through operations (e.g., use of haul roads, blasting) will not negatively impact trout spawning shoals located in the vicinity of the Jay pit

IMPACTS ON FISH HABITAT FROM DUST DEPOSITION

■ EVIDENCE AND RATIONALE

- DDEC predicts dust produced in the Jay pit to reach a maximum deposition rate of 5.12 mg/dm²/day at the pit perimeter
- Research found an accumulation of sediment over lake whitefish spawning beds in the range of 0.3 to 1.4 mg/dm² significantly reduced egg survival

IMPACTS ON FISH HABITAT FROM DUST DEPOSITION

■ EVIDENCE AND RATIONALE

- High-quality shoals in Lac du Sauvage are 2-6 m deep, while wave heights range from 0.3 - 0.7 m
- Wave-wash over Lac du Sauvage spawning shoals not expected to reach the shoals under most conditions.
- No information in the DAR or supporting documents showing where Lac du Sauvage currents are in relation to shoal locations ; nor the physical properties of limnological waves in the Arctic.

IMPACTS ON FISH HABITAT FROM DUST DEPOSITION

- **AGENCY RECOMMENDATIONS**
- **Measure:** Develop and submit to the Wek'eezhii Land and Water Board the results of a model of depth of wave turbulence below the surface in Lac du Sauvage in areas likely to be affected by dust deposition from the Jay Project

JAY PROJECT IMPACTS ON AEMP REFERENCE LAKES

■ ISSUE

- Counts Lake is a reference lake used in the Aquatic Effects Monitoring Program ; DDEC predicts an increase of TSS due to dust deposition
- Reference lakes should not receive contaminants, either water-borne or wind-borne

■ DEVELOPER'S CONCLUSIONS

- DAR is silent on this issue

JAY PROJECT IMPACTS ON AEMP REFERENCE LAKES

■ AGENCY'S CONCLUSIONS

- Jay Project should not disrupt the integrity of the current AEMP that is designed to identify environmental changes

JAY PROJECT IMPACTS ON AEMP REFERENCE LAKES

■ EVIDENCE AND RATIONALE

- Current reference lakes (Vulture, Nanuq and Counts) should not be impacted in any way by new projects at Ekati
- Jay Project would not put Counts Lake waters anywhere near the current Ekati water license limits, but it would increase TSS above historic levels for Counts.
- No suitable reference lakes proposed for the Jay Project AEMP; Jay Project impacts on Counts Lake not considered.

JAY PROJECT IMPACTS ON AEMP REFERENCE LAKES

- **AGENCY RECOMMENDATION**
- **Measure:** Before construction begins, evaluate the Jay Project impacts on Counts Lake as an AEMP reference lake and identify alternative lakes which could be used as reference lakes in the AEMP, or a means of continuing to use Counts should that be a better option, for the Jay Project

EFFLUENT TOXICITY TO ZOOPLANTON

■ ISSUE

- Predicted Jay effluent quality may be acutely toxic to cladocera, important zooplankton that is a food source for fish

■ DEVELOPER'S CONCLUSIONS

- DDEC commits that there will not be **acute** toxicity to any test organisms from Jay effluent

EFFLUENT TOXICITY TO ZOOPLANKTON

■ AGENCY'S CONCLUSIONS

- Effluent discharged at the diffuser in Lac du Sauvage should not be acutely toxic to phytoplankton, zooplankton or benthic aquatic organisms

EFFLUENT TOXICITY TO ZOOPLANTON

■ EVIDENCE AND RATIONALE

- Toxicity tests on *Daphnia* were undertaken using warmer water (18-20°C) than in Lac du Sauvage (11-15°C)
- DDEC did not acknowledge this methodological question
- Under the *Fisheries Act*, acute toxicity is not permissible at end-of-pipe discharge point

EFFLUENT TOXICITY TO ZOOPLANKTON

- **AGENCY RECOMMENDATIONS**
- **Measure:** Evaluate the likelihood of acute toxicity to zooplankton occurring in the proposed mixing zone. DDEC should commit to review all future chronic and acute toxicity testing to ensure comparability of results to natural conditions in the receiving environment.

ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON



ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON

■ ISSUE

- Effluent from the Jay Project may cause a shift in dominance to larger or spiny species of zooplankton that may be inedible by juvenile fish in Lac du Sauvage .

■ DEVELOPER'S CONCLUSIONS

- Zooplankton changes are not predicted to result in adverse effects to lower trophic communities or fish health

ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON

■ AGENCY'S CONCLUSIONS

- DAR does not recognize that significant shifts in plankton community structure can adversely affect fish health through poor nutrition. Shifts in zooplankton communities caused by either phytoplankton changes or water quality degradation can impact fish nutrition, especially of younger age classes

ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON

■ EVIDENCE AND RATIONALE

- Total phosphorus is predicted to increase to just above the trigger range (4 to 10 $\mu\text{g/L}$) that could tip Lac du Sauvage from oligotrophic to mesotrophic.
- Phytoplankton biomass would then increase but potential for taxonomic shifts which could alter the proportion of edible vs inedible phytoplankton species. Result: reduced zooplankton food supply.

ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON

■ EVIDENCE AND RATIONALE

- The current AEMP has already demonstrated significant declines in zooplankton communities immediately downstream of the Ekati mine that DDEC attributes to nutrification.

ASSESSMENT OF TAXONOMIC CHANGE IN PLANKTON

- **AGENCY RECOMMENDATIONS**
- **Measure:** Incorporate annual assessments of plankton community changes in any Jay Project AEMP to determine impacts on fish in Lac du Sauvage. Differential impacts to various fish species and age classes must be considered.

THANK YOU



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