BIOLOGICAL TREATMENT OF ACID MINE DRAINAGE AT THE ISLAND COPPER MINE PIT LAKE: RESULTS FROM AN ENCLOSURE STUDY[1]

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Abstract. The Island Copper Mine near Port Hardy, British Columbia, closed in 1996. The open pit was flooded with seawater by temporarily connecting the pit with adjacent Rupert Inlet. The flooding channel was then closed and the lake was then capped with freshwater piped from the Marble River to create a stable meromictic lake. Waste rock dumps generate Acid Mine Drainage (AMD) with elevated cadmium, copper and zinc that drains to the pit lake. The lake receives some 3M m^3/year of AMD (Zn 3 mg/L) directly on the surface and an additional 1M m^3/year of AMD (Zn 8 mg/L) injected at depth. Biologically mediated metal removal in the surface layer has been optimized through the surface application of a 6N:1P (by weight) liquid fertilizer. Concentrations of dissolved metals in the surface layer have been low (Zn <0.2 mg/L) since year round fertilization of the lake began in 2001. The treated water drains slowly through a porous, and mostly submarine, shoreline fill to the marine receiving environment of Rupert Inlet.

A pilot test facility was recently constructed in the pit lake to assure the effectiveness of AMD treatment for Island Copper in the long term. The test facility included two 90 m diameter floating rings supporting an 11 m deep polyethylene barrier curtain, head tanks, pipe works, valves and a control system to manipulate the chemistry in the two enclosures. By manipulating the flow of feed water from two distinct AMD sources into the enclosures, we tested two very different approaches to treating water in the pit lake. We present results from this experiment and discuss their use in the design of a novel full-scale AMD treatment system for Island Copper.

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