Experimental evaluation of subaqueous disposal of acid generating rocks of the Meguma Supergroup, southern Nova Scotia

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Municipal and regional development in Halifax and southern Nova Scotia involves the disturbance and excavation of sulphide rich bedrock and produces large quantities of waste rock material. This material poses a high risk potential for acid rock drainage (ARD), a commonly known geoenvironmental issue in Nova Scotia. An economically feasible disposal technique and management option would be to discard acid generating waste rock in natural lake waters and coastal marine settings. This concept is based on the premise that acid generation is chemically suppressed in low oxygen conditions under water cover. Subaqueous disposal of mine tailings is presently a standard practice employed by the mining industry, but this method has yet been evaluated with regards to sulphidic slates of the Meguma Supergroup.

We have evaluated the subaqueous disposal of sulphide-bearing slates in seawater compared to fresh water in laboratory experiments. Polished thin sections were prepared from a drill core sample from the Meguma Supergroup near the Halifax International Airport. The experiment was conducted using distilled water, seawater from the Northwest Arm, and freshwater from Lake Banook in Dartmouth. One thin section was submerged in 500 mL of each of the three water samples at a depth of 32 cm in graduated cylinders exposed to the atmosphere at room temperature (~21°C). Mineral surfaces were observed microscopically under reflected light for tarnished regions, which were used as an indication of sulphide mineral oxidation. Preliminary results at six days show that the rate of sulphide oxidation is higher in seawater compared to freshwater and distilled water. These results will be discussed in terms of the differences in the chemistry of the solutions.