Whitehorse - Tuesday, September 11, 2018

Session #2 - Water Management at Closure

Time **1045am-1105am**

Topic **The impact of climate change on mine waste management by water and saturated covers**

Abstract Historically, tailings have been deposited in above or underground impoundments. For reactive sulfidic tailings, common remedial strategies are used to limit sulfide oxidation and consequent metal mobilization. Significant progress in mine waste management strategy has been made during the last 25 years with the development of water covers, which minimize oxygen ingress to the submerged waste thereby preventing or significantly reducing acid rock drainage/metal leaching. Water covers minimize or eliminate long-term effluent treatment and management requirements, limit environmental impacts and facilitate site closure in shorter time frames of 10 to 20 years rather than 100 or more years for dry covers. Water covers are widely accepted by the Canadian mining industry and are typically provided by disposal of mine waste in man-made impoundments or in natural water bodies such as isolated, low productivity head water lakes. There are, however, long-term dam stability concerns for man-made impoundments and negative perception of the use of natural water bodies for mine waste disposal. This concern can be addressed by eliminating or minimizing the water cover height while still maintaining waste saturation conditions (saturated covers). The mining industry is already advancing in this direction by proposing saturated covers as water cover alternatives at sites where water covers are not feasible or not desired. Saturated covers are field implemented for metals leaching/acid-rock drainage controls at different tailings management facilities. The first objective was the development of test methods and protocols for the evaluation of performance of saturated covers in comparison to the conventional water covers in terms of acid generation and metal mobility controls. The evaluation of water and saturated covers resilience due to climate change-mediated changes on contaminant transport behavior will be studied using tailings from mines sites where water and saturated covers are implemented. Tailings samples containing base metals (Faro, Wolverine), precious metals (Mount Nansen) and radioactive metals (Rio Algom) from different mine sites in Yukon and in Ontario will be studied. Mineral characterization and metals speciation by sequential extraction will be performed at CanmetMINING. Changes in water levels may influence rates of O2 infiltration into the tailings, and therefore affect oxidation reactions. Water levels will be varied to test the possible effects of increased rainfall due to climate change on the nutrient-driven weathering of the tailings. Experiments will be carried out to evaluate the contaminant transport behavior of metals from the tailings under water cover and saturated covers conditions. The results will indicate if dissolution mechanisms such as pyrite oxidation or/and the growth of sulfur-oxidizing bacteria may occurred. Mineral characterization and microbial enumerations will be conducted after the experiments. The role of cold climatic conditions on oxidation and metal mobility in reactive mine waste under water and saturated cover alternatives will be studied using these tailings at the Yukon Research Centre.

Presenter(s) Nicolas Reynier (CanmetMINING, NRCan)

Bio(s) Nicolas is a Research Scientist specialized in Actinides Hydrometallurgy at CanmetMINING. His field of research are the reprocessing of radioactive wastes and the environmental remediation. He is adjunct professor at Laval and INRS Universities. His current research focuses on the development of process for REE recovery from ore and uranium tailings, and actinides separation by ion exchange.