Whitehorse - Tuesday, September 11, 2018

Session #4 - Waste Rock Storage and Covers

Time **345pm-405pm**

Topic **Forecasting long term water quality after closure: Boliden Aitik Cu mine, Sweden**

Abstract The Boliden Aitik Mine (Aitik) is located near Gällivare, northern Sweden. Since mining started in 1968, more than 500 Mt of waste rock have been deposited in waste rock storage facilities WRSFs. This paper focuses on an evaluation of the WRSFs completed as part of closure plan development to improve understanding for water quality after closure. Determination of long term water quantity and quality for the WRSFs, emanating as basal and toe seepage, was a key input for evaluating risk in in terms of managing impacts on the aquatic receiving environment for the site as a whole.

The evaluation was completed using a holistic approach that included consideration of site-specific hydrogeology, WRSF geochemistry, and unsaturated zone hydrology, as well as cover system and landform design and implementation. This paper describes the approach to utilizing current hydrogeological and geochemical conditions for assessing current contaminant load emanating from the WRSFs. On the basis of this assessment, coupled with implementing different closure management tools, and using various numerical and analytical modelling techniques, long-term estimates for WRSF loading were developed. For example, source terms for geochemical modelling were established based on a field-based geochemical assessment coupled with geochemical modelling using Geochemists Workbench. Numerical modelling was used to estimate long-term oxygen ingress and net percolation rates for closure conditions based on inputs obtained from seven years of in situ cover system monitoring and field testing.

The overarching findings of the study were that water quality from the WRSFs will improve over time as the closure cover system limits oxygen to the underlying waste rock, soluble stored load is flushed and sparingly soluble load is neutralized by available alkalinity. As stored acidity is flushed, the model predicts that pH will increase, and acidity loads will decrease, resulting in circum-neutral basal and toe seepage with associated low dissolved metals concentration; a condition that is characterized as occurring within approximately 50 years after cessation of operation and implementation of closure measures, and being indicative of long-term closure managed by the WRSF cover system and landform.

The approach described herein may be adopted for a wide variety of mine waste facilities. Fundamental to the evaluation is development of a conceptual model for both current and closure conditions. The conceptual model is then enhanced through the risk assessment process, which serves to identify and prioritize additional studies and work.

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Bio(s) Matt McKeown is an Engineer based in OKC's head office in Saskatoon. He has experience supervising and providing quality assurance and control services for construction of cover systems at scales ranging from field trial to full-scale implementation. He also has a range of experience in field investigations across Canada, Europe, South America, and Australasia.