NRCan Comments on the Geochemical Characterization Program for the Mary River Project

Kate Cavallaro
Senior Environmental Assessment Officer
Environmental Assessment Division
External Relations
Science and Policy Integration
Natural Resources Canada

Dr. John Kwong
Senior Environmental Scientist
Mine Waste Management & Footprint Reduction (processing)
CANMET Mining
Minerals and Metals Sector
Natural Resources Canada

Natural Resources Canada | Ressources naturelles Canada

Canada

NRCan's Role in the Mary River Project

- The mandate of Natural Resources Canada (NRCan) is to develop, implement and deliver policies, programs, science and technology for the sustainable development and responsible use of Canada's mineral, energy and forestry resources.
- NRCan may have regulatory responsibilities in relation to the Mary River project as the department may issue a licence under the *Explosives Act.*
- NRCan provided advice and expertise to the NIRB to inform the Part 5 Environmental Review of the project.
- At the NWB's request, NRCan's expert is available to speak to the geochemical investigations and modeling associated with projecting pit lake water quality.

NRCan's Review

- NRCan first reviewed information related to the proponent's waste rock (geochemical) characterization program during the Part 5 Environmental Review of the Mary River project.

NRCan's observations (May 2012):

1. Encapsulation of deleterious ore (DO) among rocks with little neutralization potential (NP) in a waste rock dump may or may not be effective depending on the relative rates of sulphide oxidation and permafrost degradation; the option of segregating the DO in a separate pile for ready relocation to be submerged in the pit lake if necessary should perhaps be considered.
2. There is uncertainty regarding predictions of the eventual pit water quality; duration of post-closure should consider evolving trends rather than meeting water quality objectives for a fixed period of time.

NRCan's Review

- In a meeting on February 25, 2013 the proponent presented updates to its waste rock characterization program including:
  - Updates to technical information on the nature of the ore and status of waste rock characterization
  - Work completed on modelling of waste rock runoff and pit water quality
- NRCan's observations:
  - Mineralogical characterization should include textural information in addition to chemical composition and mineral identification.
  - A field test pile may be useful to complement the on-going laboratory test work to better reveal the weathering rate and processes under the site conditions and shed light on the scaling effects.

NRCan's Conclusions

- The 2012 sampling program has provided information to refine the estimates of potential acid generation from the pit wall and additional information on the composition and potential for acid generation of the hanging wall and footwall portions of the pitwall.
- However, there is still uncertainty with respect to the results of the humidity cell tests. For example, the slightly acidic pH (5.5) observed in the humidity cell tests could be related to water being in equilibrium with CO_2 in the atmosphere, meaning that there has been very little reaction between the test solids and percolating water in the humidity cells.
- There is an information gap regarding the detailed mineralogy of sulphides and NP minerals including their texture. Note that coarse sulphide grains often oxidize more slowly than fine-grained ones.
- Schistose rocks containing fine grained chlorite and biotite can retain more water and are more prone to physical degradation through the freeze-thaw process, thus promoting a higher weathering rate for any embedded sulphides, if present, than coarser crystalline rocks.

NRCan's Conclusions

NRCan has recommended that the proponent:

- Continue its waste rock characterization program in order to determine the detailed mineralogy and texture of the sulphides and NP minerals.
- Establish field test piles on site to better assess the weathering mechanisms and rates under the actual site conditions; the field testing would provide insight into larger scale waste rock oxidation over time.
- Incorporate, where possible, representative samples of the finer grained waste rock material (schists) in the field test. A field study to identify weathering products currently occurring in any exposed rocks may also shed light on the potential accumulation of acid sulphate minerals, which are often observed as temporary hosts of acidity in sulphide-rich rocks in the North.