

## Johnson, Bill H (DNR)

---

**From:** Carlson, Erik (DNR)  
**Sent:** Tuesday, September 04, 2012 8:13 AM  
**To:** 'Fred Marinelli'  
**Cc:** David Blaha; Al Trippel; Deb McGovern; Houston Kempton; John L. Adams  
**Subject:** RE: GoldSim QA Update

Fred,  
Thank you for the update. PolyMet has decided to remove the passive treatment technologies from their modeled project and describe them as potential options for post-closure treatment if and when the PRBs/PSBs/constructed wetlands etc are able to replace mechanical treatment. I suggest not spending time on PRBs/PSB/constructed wetland model features in the QA/QC.  
-Erik

---

**From:** Fred Marinelli [<mailto:>]  
**Sent:** Friday, August 31, 2012 9:00 PM  
**To:** Carlson, Erik (DNR)  
**Cc:** David Blaha; Al Trippel; Deb McGovern; Houston Kempton; John L. Adams  
**Subject:** GoldSim QA Update

All,

Because the models are so complex, it has certainly been a process of two steps forward, one step back. Some aspects of the models are far more complex than needed and use algorithms that are difficult to understand despite the good documentation provided by Barr. Other parts of the models use simplifying assumptions and so called calibration factors that greatly change the model predictions relative to laboratory measured properties. While these aspects don't necessarily reduce the model validity, it creates a complex network of algorithms that are time-consuming to disentangle and prioritize.

Most of our effort has been on understanding the basic workings of the models and evaluating how the models generate chemical mass at waste rock stockpiles, the West Pit, and the Flotation Tailings Basin (FTB). During this process we have identified some issues that caused Barr to correct the model and provide revised versions for our review. In other cases, Barr provided explanations that resolved our initial concerns. In addition, Barr has identified and fixed some of the model code based on its own QA process, which is on-going and in parallel to our effort.

At this stage, there are good indications that the models are generating chemical mass in the Cat 1 Stockpile and the FTB using algorithms that are consistent with the agreed upon methods. In our spot checking, we have been able to reproduce the model chemical generation rates with independent (Mathcad) calculations using the same input parameters. We have raised a theoretical concern regarding how sulfur generation is modeled below bentonite-amended tailings and this issue is under discussion. We will perform a similar chemical generation analysis for the West Pit.

Much of the work for next week will be to track the generated chemical mass through PRBs, wetlands, groundwater, and in surface flow to the rivers. Our goal will be to develop independent calculations of mass flux to the points-of-evaluation and compare these with the GoldSim predictions.

In working with this model, we have seen instances of assumptions and mathematical approaches that could be interpreted as “conservative”, implying that the model might have a “tendency” to overestimate chemical concentrations at the points-of-evaluation. An example of this is not applying a calibration factor to sulfur release by the NorthMet tailings. There are however a few aspects of the model that might be interpreted as non-conservative. For example, a series of factors are used to reduce the LTVSMV sulfur generation rate by more than 95% compared to humidity cell measurements. While this may be reasonable, it opens the door to challenges from parties who were not intimately involved in the model development. If the reduction from humidity cell data were 90% rather than 95%, the predicted chemical concentrations in FTB seepage would be significantly increased.

Regards,

Fred

--

**Fred Marinelli**

Senior Groundwater Hydrologist

**Interralogic, Inc.**

4715 Innovation Dr., Ste. 110

Fort Collins, CO 80525

Phone: [REDACTED]

E-mail: [REDACTED]

Website: [www.interralogic.com](http://www.interralogic.com)