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Comments: Additional Comment on PHREEQC Modeling

As noted in my original comments (Maest, 2020), some PHREEQE input files were released on the USDA Forest Service website on October 19, 2020, nine days before the end of the comment period.1 Given the short amount of time available to evaluate the files, I ran one input file: Stibnite DRSF GW Under DRSF_OTM_HF Flats Cover [ndash] 5%Infiltration_Ave_v0.2, which I assume is for groundwater under the Hangar Flats DRSF over time, eventually with a cover. I initially ran the file using the wateq4f.dat database and found that PHREEQC stopped running after only three of 80 simulations in the input file, due to errors related to lack of finding selected phases and elements in the database. When I reran the file using the minteqv4.dat database, the file ran through the 80 simulations, even though it had many error messages related to not finding phases, exceeding maximum iterations, numerical method failing with the chosen set of convergence parameters, and other errors.

The minteqv4.dat database does include antimony and several of the selected phases that were forced to reach equilibrium in the model, including SbO2, which will limit predicted antimony concentrations. As noted by Nordstrom (2019), SbO2 is one of many phases selected that are unreasonable solubility controls; in fact, SbO2 is not a known mineral. Even though this phase does not appear to exist, it exercises a strong control on the predicted concentrations of antimony in groundwater under the DRSF in the modeling effort.

Running the input file in PHREEQC with the selections in the input file creates a separate file with the predicted results. Using the results for predicted antimony concentrations without modification, with the assumption of saturation with SbO2, and with adsorption, I created Figure 1. The figure shows that without the forced solubility control for antimony, predicted concentrations under the DRSF would exceed the groundwater standard for all years under all conditions. Predicted results assuming saturation with SbO2 and with adsorption are similar - both sets of results show that the predicted antimony concentrations in groundwater would never exceed the relevant groundwater standard.

SEE LETTER ATTACHMENT: FIGURE 1: Predicted antimony concentrations in groundwater under the Hangar Flats DRSF over time. The dashed red line is the groundwater quality standard of 6 [mu]g/L (DEIS, Table 3.9-2, p. 3.9-15).

The results demonstrate the uncertainty of the predictions and the influence of incorrect conceptual models [ndash] in this case, the assumption of equilibrium with an antimony phase that does not exist. A revised DEIS should present the results of the geochemical modeling efforts and use a range of predicted concentrations that would feed into the site-wide water chemistry (SWWC) model. If this were done, it is likely that some of the predicted water quality in surface water and groundwater would exceed relevant water quality standards.

6. References Cited

Maest AS, 2020. Evaluation of the Draft Environmental Impact Statement (DEIS) for the Stibnite Gold Project, Idaho, and Related Water Quality Conditions, Predictions, and Effects. Prepared for Idaho Conservation League, Earthworks, and Judy Anderson. October 27. 37pp.

Nordstrom DK, 2019. Review of MIDAS GOLD REPORTS ON SITE-WIDE WATER CHEMISTRY AND GEOCHEMICAL MODELING. 9pp.

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1 Available: https://usfs-public.app.box.com/s/y35kam707j0560hm9n5yjcsyeb3lye9y/folder/124615400518