

DRAFT

Memorandum

To: File
CC:
From: Chris Garrett, SWCA
Date: August 23, 2013
Re: Use of 200 year scenario for pit lake model

Public comments were received on the Draft EIS, as well as on the Preliminary Administrative FEIS that was distributed to the cooperating agencies on July 1, 2013, concerning the use of the 200-year scenario for the pit lake water quality model. The purpose of this memo is to document the rationale for use of this scenario and the review the Forest has conducted on the pit lake water quality model.

Cooperating Agency Comments

From Pima County: "The AFEIS did not consider pit lake water quality at time periods on than 200 years. Pima County had requested this in previous comments. Because pit lake geochemistry can change considerably with time, this is a significant lack of disclosure; the pit lake may have much worse water quality at earlier or later times, but the AFEIS has not provided information or discussion regarding other time periods."

Initial Rationale for Use of 200-Year Period

The following rationale was provided by Tetra Tech, Rosemont's geochemical consultant:

"The DSM includes both stochastic (variable) and deterministic (fixed) parameters. The stochastic parameters are used to assess the uncertainty in the predictions due to the data and analytical constraints and natural variability in the input parameters. This was accomplished by utilizing GoldSim in the Monte Carlo simulation mode. The model was allowed to run for a 200-year period using Monte-Carlo sampling (for the stochastic parameters) with 1,000 realizations. The 200-year period of simulation was determined to be the longest period with practical significance, given the transient nature of natural systems (e.g., climate, changes in near surface geochemistry of the exposed geologic materials, groundwater elevations, and quality). The period of simulation also allows the time required for the system to approximate a hydrologic steady-state condition." (Tetra Tech 2010a).

Peer Review of Pit Lake Water Quality Model

As with other groundwater and geochemical analyses, the Coronado undertook a process of peer review with recognized industry experts in order to validate and improve Tetra Tech's pit lake water quality modeling. Stephen Day and Dr. Vladimir Ugorets of SRK Consulting were the primary experts overseeing the peer review process. The following is a timeline of the peer review of the pit lake water quality modeling:

- February 2010. Initial pit lake modeling report from Tetra Tech (Tetra Tech 2010a)
- May 2010. SRK peer review of initial pit lake modeling report (Ugorets and Day 2010)
- November 2010. Tetra Tech response to SRK peer review (Williamson 2010)
- November 2010. Tetra Tech revision of pit lake modeling report (Tetra Tech 2010b)
- March 2011. SRK peer review of revision of pit lake modeling report (Ugorets 2011)
- May 5, 2011. SRK memo outlining action items from a March 10, 2011 conference call (Day and Stone 2011)
- May 13, 2011. Rosemont response to action items (Krizek 2011)
- May 25, 2011. SRK memo responding to Rosemont memo (Hoag 2011)
- July 2012. SRK memo responding to public comments concerning geochemical modeling (Hoag, Bird, and Day 2012)
- July 2012. SRK memo responding to EPA comments concerning geochemical modeling (Hoag, Sieber, and Rasmussen 2012)

The last two items were requests made directly by the Coronado in order to obtain professional opinions on public comments that were raised on the DEIS concerning the pit lake model, including comments raised by the EPA.

Throughout the peer review, SRK did not contradict the rationale or conclusions presented for the 200-year scenario for the pit lake model; however, the process did lead to additional exploration of water quality changes over time as described below.

Further Exploration of Water Quality Changes over Time

In the revision to the pit lake water quality model (Tetra Tech 2010b), Tetra Tech undertakes an additional exploration of how individual water quality constituents change over time (Section 6.3). The changes in concentration of individual water quality constituents are modeled through year 1,000 (all constituents are modeled to continue to increase over time).

This investigation was not conducted in order to obtain estimates of water quality at year 1,000. Rather, the results of these estimates were meant to provide reasonable bounds for sensitivity analysis at year 200. Tetra Tech modeled low, average, and high geochemical loading at year 200 in order to provide a range of reasonable estimates of pit lake water quality. Tetra Tech cautions about the use of the water quality projections:

Over the 1,000-year simulation period, calculations were performed to provide low, average, and elevated chemical loading scenarios. This was done to provide a sensitivity evaluation of the model...Although water quality predictions were modeled to the 1,000-year simulation time-frame, these results should only be used for determining overall trends. Specific water quality predictions beyond the 200-year time-frame become excessively speculative based on the long simulation periods. (Tetra Tech 2010b)

Use of Water Quality Analysis in NEPA Analysis

Use of "speculative" information is problematic in the NEPA analysis. This is a common problem that has been encountered with all of the hydrologic models, because of the need to run them for long time periods into the future, and various methods have been used to ensure that EIS disclosures are reasonable. In the case of the pit lake water quality model, it was determined that the best course would be to:

- Rely upon the predicted pit lake water quality at 200 years to provide a reasonable prediction of pit lake water quality. Provide full disclosure in the EIS of these predictions.
- Acknowledge in the EIS that concentrations of most constituents will increase over time, although it also needs to be acknowledged that pH was predicted to remain neutral, which is one of the primary concerns voiced about the pit lake.

References

- Day, S. and Stone, C. 2011. Technical Memorandum: Rosemont Pit Lake Geochemistry Action Items for Tetra Tech and SRK, Phone Conference Call of March 10, 2011. May 5, 2011.
- Hoag, C. 2011. Technical Memorandum: Response to Rosemont's memorandum regarding Pit Lake Source Terms and Waste Rock Segregation. May 25, 2011.
- Hoag, C., Bird, D., and Day, S. 2012. Memorandum: Rosemont Copper DEIS – Response to specific geochemical modeling concerns from CNF. July 18, 2012.
- Hoag, C., Sieber, M., and Rasmussen, J. 2012. Memorandum: Rosemont Copper DEIS – Response to EPA Geochemistry comments – Final. July 18, 2012.
- Krizek, D. 2011. Memorandum: Response to SRK Pit Lake Comments. May 13, 2011.
- Tetra Tech. 2010a. Geochemical Pit Lake Predictive Model. February 2010.
- Tetra Tech. 2010b. Geochemical Pit Lake Predictive Model – Revision 1. November 2010
- Ugorets, V. and Day, S. 2010. Technical Memorandum: Technical Review of (Tetra Tech, 2010) Geochemical Pit Lake Predictive Model, Rosemont Copper Project. May 3, 2010.
- Ugorets, V. 2011. Technical Memorandum: Technical Review of (Tetra Tech, 2010b) Geochemical Pit Lake Predictive Model, Revision 1, Rosemont Copper Project. March 31, 2011.
- Williamson, M. 2010. Technical Memorandum: Response to Comments on February 2010 Geochemical Pit Lake Predictive Model Report. November 16, 2010.