Document Review: Summary of Calibrations and Plant Site CorroborationDocuments, June 18, 2012

Comment #	Location (Doc, Page, Figure, or Table)	Section Number	Comment/Concern
1	General	General	The calibration objectives (% acceptable modeling errors) could be explained in more detail, e.g., are there any suggested "standards" for this type of modeling?? How do these % errors relate to modeling accuracy given the anticipated impacts and water quality standards?
2	General	General	It seems that the modeled means for many of the water quality constituents (Table 3) are pretty darn close to the observed means, suggesting a good model. For most of these constituents the RMSE % error is <1%. However, for a few constituents (Ag, Be, Pb?) the % difference between modeled and observed values appears quite large, yet the RMSE % error is also <1%. This difference may not be important in terms of modeling impact analysis for reasons I don't fully understand, but it might be valuable to have Barr address.

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3	Fig. 1	1.1.3	It appears that if the bedrock data were plotted on separate graph, the slope of the line would not approach 1:1, e.g., the range of predicted data is much less (approx. 4m) compared to the range of observed data (approx. 9m). It seems appropriate that Barr address the data sets separately in terms of impact predictions.
4	Pg. 3-7	1.2	Three XP-SWMM modeling calibration targets are mentioned, total flow volume, daily flows, and 30-day low flow (base flow), yet the calibration objectives and results only address the first target, total annual flow. Baseflow is covered in the MODFLOW section, but the XP-SWMM model will be used to estimate changes in several daily flow statistics, so shouldn't the the calibration objectives and results for daily flows also be addressed, at least in narrative form?
5	Pg. 7	Table 2	1985 should be added to the calibration years
6	Pg. 9	Table 3	Modeled standard deviation is always exactly the same as modeled mean?
7	Pgs. 8, 13	1.3, 1.5	Suggest adding a brief discussion of the ranges of flows during data collection to help the reader conclude that groudwater is not a significant influence.
8	Pg. 11	1.4.1	50 of 471 transient drawdown observations (>10%) were eliminated because they were "inconsistent with other observations". This seems like an unusually high % of errand data. Can Barr provide a more detailed explanation of why?

Barr Response	Response to response
Where data is available, references to standard metrics have been made (e.g., XP-SWMM calibration). Acceptable error varies, however, according to model type and purpose. Thus, reference to "standard" or "common" percent error ranges are of limited availability or applicability to these models. ASTM D5490-93(2002) - Standard Guide for Comparing Ground-Water Flow Model Simulations to Site-Specific Information and ASTM D5981-96(2002) - Standard Guide for Calibrating a Ground-Water Flow Model Application provide general guidance for how to quantitatively compared modeled values to site-specific data and how to evaluate a model calibration. However, specific numeric measures for evaluating calibrations are not provided. ASTM D5490 notes that "In general, however, the acceptable residual should be a small fraction of the difference between the highest and lowest heads across the site." The techniques used to evaluate the MODFLOW calibrations are consistent with the guidance presented in these documents. An extensive sensitivity analysis would be required to quantify the relationship between calibration error and model impacts. However, the use of probabilistic model inputs reduces the likelihood that minor differences in calibration accuracy will have impacts on critial model results (e.g., exceedneces of water quality standards). In addition, the with project model results are compared to the no action model results; such a model to model comparison should be minimally affected by percent error in input calibration.	Please include this explanation in the next revision.
The table headings are poorly labeled. The "Modeled Mean" refers to the mean surface runoff concentration. The "Observed Mean" refers to the Partridge River concentration. These columns are not the observed and modeled values of the same parameter. The headings will be revised to clarify. For many constituents, the river concentration is similar to runoff concentrations. In the case of Ag, Be, and Pb, the groundwater concentrations are higher than the observed river concentrations. Thus, the calibrated surface runoff concentrations are much lower than the observed river concentrations (as the surface runoff dilutes the groundwater inflow to the river, resulting in modeled river concentrations similar to the observed values).	Ok

Barr Response	Response to response
Attachment B of the Mine Site Water Modeling Package notes that the modeled hydraulic gradient in the bedrock is flatter than the gradient that would be expected based on measured heads (see page 12). In the MODFLOW model, each bedrock type is simulated as a separate zone with homogeneous hydraulic conductivity. In reality, there is likely localized heterogeneity within each type of bedrock that results in the range of heads observed. Due to the simplyfying assumptions that have been made in constructing the MODFLOW model, this localized hetergeneity is not simulated. In the current GoldSim model, separate predictions of groundwater quality are made for the unconsolidated deposits and bedrock for the groundwater flow paths that originate at the mine pits.	Please include this explanation in the next revision.
The three calibration parameters (Deviation in volume, Coefficient of Efficiency, and RMSE') utilize the three calibration targets (annual flow, daily flow, and 30-day low flow), respectively. The deviation in volume calculation is based on total flow volume. The coefficient of efficiency is calculated from daily flows (see equation in report). The RMSE' measures only the error in the observed 30-day low flow to the modeled 30-day low flow. The RMSE' calibration target addresses only the baseflow estimate.	Please include this explanation in the next revision.
This is an error in the text, not the table. The text implies that two water years were used in calibration. Only water year 1984 was used in calibration. Water year 1984 corresponds to *calendar year* 1984-1985. The text will be corrected.	ok
The model mean was accidentally repeated in the table. It will be replaced with the modeled standard deviation.	ok
Text will be added indicating the range of flows in the observed data set. The calibration, however, does not rely on the dominance of surface runoff on river concentrations (see response to comment 2). The contribution of groundwater and surface runoff to overall river concentration is considered in the calibration.	ok
The 50 transient drawdown observations that were eliminated are from the following locations: DH96-30 (11 observations); P2HB-99 (23 observations - all available at this location); P3H1-99 (15 observations - all available at this location); GW-005 (1 observation). The eliminated data points are indicated on Figures 6a, 6c, and 6f of Attachment A of the Plant Site Water Modeling Package. The specific rationale for eliminating the selected data points was as follows: DH96-30: Water levels at this location rose abruptly (by ~8 meters) starting in 2005, which is inconsistent with the declining water levels observed at the other peizometers in the Tailings Basin area since operations ceased. P2HB-99 and P3H1-99: Water levels at these two locations were essentially unchanged from 2002 to 2010, which is inconsistent with the water level trends observed at surrounding piezometers GW-005: A single data point from 2008 was removed because it appeared to be an outlier compared with the other data points for this location.	That helps, but I was looking for a hydrogeologic or well construction explanation, if Barr has any insight. Single outlier data points (GW-005) and are common, but why all the data from P2HB-99 and P3H1-99? Any explanation for the 8 meter rise at DH96-30, ie.surface water?