REQUEST FOR ADDITIONAL INFORMATION (RAI)
Volume 3—Postclosure Chapter 2.2.1.3.8—Flow Path in the Saturated Zone
Set 1 (RAIs 1through 3)
(DEPARTMENT OF ENGERGY'S SAFETY ANALYSIS REPORT SECTION 2.3.9.2.2 and 2.3.9.2.3)

RAI #1: Justify the validity of Bayesian updating of the groundwater specific discharge multiplier using Alluvial Testing Complex data.

Basis: The applicant uses a groundwater specific discharge multiplier (i.e., the GWSPD parameter in Total System Performance Assessment) to propagate uncertainty related to the site-scale specific discharge (SAR Section 2.3.9.2.3.6). The probability distribution of GWSPD was originally provided by an Expert Elicitation Panel (CRWMS M&O, 1998). Based on tracer testing at the Alluvial Testing Complex, 12 specific discharge values (SAR Table 2.3.9-2) were estimated using four interpretation methods. In light of this new information, the applicant applied a Bayesian updating formula to reduce uncertainty in GWSPD, where the probability distribution provided by the Expert Elicitation Panel was treated as a log-normal prior. The applicant then uses the 12 specific discharge data to estimate a log-normal likelihood function, although the applicant states that "some significant uncertainties are associated with each of the estimation methods" (Sandia National Laboratories, 2007b, Appendix G4.4). The applicant needs to justify the validity of assuming the 12 specific discharge estimates as independent and identically distributed random samples from a log-normal distribution, which is an underlying assumption of Bayesian updating (Gelman et al., 2004, Section 2.6)

The information is needed to determine whether uncertainty in GWSPD is appropriately reduced using *in-situ* data and to verify compliance with 10 CFR § 63.114(b), (g).

RAI #2: Demonstrate that the GWSPD values used in the applicant's Total System Performance Assessment analysis are representative of new information derived from the Alluvial Testing Complex as well as those derived from the Expert Elicitation.

Basis: The applicant uses specific discharge estimates obtained from Alluvial Testing Complex to reduce uncertainty in the variance of a groundwater specific discharge multiplier (GWSPD). The applicant states the mean of GWSPD need not be updated because it is only a multiplier (Bechtel SAIC Company, LLC, 2008, Section 6.5.2.1[a]). However, updating the multiplier ignores the shift in the posterior mean (or median) of the specific discharge values. The median of the expert-elicited specific discharge distribution is 0.6 m/yr, whereas the median of the Alluvial Testing Complex data is 3.85 m/yr (Sandia National Laboratories, 2007a, Section 7.2.3).

The applicant should demonstrate that the Total System Performance Assessment analysis adequately captures and propagates uncertainty in the specific discharge.
This information is needed to verify compliance with 10 CFR § 63.114(b), (g).

RAI #3: Demonstrate quantitatively that the calibrated site-scale flow model reproduces the upward vertical hydraulic gradient and shows the lateral continuity of the model-simulated upward hydraulic gradient.

Basis: The applicant considers the upward vertical hydraulic gradient from the Paleozoic carbonate aquifer to overlying volcanic aquifers an important barrier to radionuclide transport. The applicant states that "wells showing an upward gradient are assigned a weight of 10 because it is important to reproduce this phenomenon" (SAR Section 2.3.9.2.3.2). Only two boreholes (UE-25 p#1) and NC-EWDP-2DB penetrate the carbonate aquifers. However, neither UE-25 p#1 nor NC-EWDP-2DB is assigned a weight factor of 10 during the calibration process (Sandia National Laboratories, 2007a, Table 6-8).

The information is needed to verify compliance with 10 CFR § 63.21(c)(9) and 10 CFR § 63.114(a),(g).

REFERENCES

Bechtel SAIC Company, LLC. "Saturated Zone Flow and Transport Model Abstraction." MDL–NBS–HS–000021. Rev. 03 AD 02. Las Vegas, Nevada: Bechtel SAIC Company, LLC. 2008.

CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractor) 1998. Saturated Zone Flow and Transport Expert Elicitation Project. Deliverable SL5X4AM3. Las Vegas, Nevada: CRWMS M&O.

Gelman, A., Carlin, J.B., Stern, H.S., and Rubin, D.B. Bayesian Data Analysis. Texts in Statistical Science. 2nd Edition. New York, New York: Chapman & Hall. 2004.

Sandia National Laboratories. "Saturated Zone Site-Scale Flow Model." MDL–NBS–HS–000011. Rev. 03. Las Vegas, Nevada: Sandia National Laboratories. 2007a.

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Sandia National Laboratories. "Site-Scale Saturated Zone Transport." ANL-NBS-HS-000010. Rev 03 and CAN 01. Las Vegas, Nevada. Sandia National Laboratories. 2008b.