REQUEST FOR ADDITIONAL INFORMATION (RAI)
Volume 3—Postclosure Chapter 2.2.1.3.9—Radionuclide Transport in the Saturated Zone
Set 1 (RAIs 1 and 2)
(DEPARTMENT OF ENERGY'S SAFETY ANALYSIS REPORT SECTION 2.3.9)

RAI #1
Justify the assumption that setting the activity of non-simulated radionuclide decay products in the aqueous phase to be equal to the activity of aqueous-phase parent radionuclides does not underestimate aqueous-phase activity.

Basis: In its saturated zone radionuclide transport model, the applicant simulates the transport of various radionuclide species in the aqueous phase. The radionuclides are subject to various processes, such as sorption, filtration, and matrix diffusion that attenuate their activity in groundwater. During transport simulations, these radionuclides are allowed to radiodecay and produce daughter products. Only a subset of the daughter products is directly simulated, however. The activities of the non-simulated daughter products are assumed, in the model, to be equivalent to the activity of the parent radionuclide in the aqueous phase.

Sorption, along with filtration and matrix diffusion can result in accumulation of radionuclides in the alluvial aquifer. These accumulated radionuclides will also decay, in addition to those radionuclides in the aqueous phase, to produce daughter radionuclides. The radioactive decay of parents accumulated in the alluvium can produce daughters whose activity in the ground water can exceed those of the dissolved parents, depending upon their sorption coefficients relative to that of the parent. Furthermore, the applicant has acknowledged that sorption coefficient distributions have been biased to lesser values than suggested from experimental evidence. An underestimation of sorption coefficients could lead to smaller quantities of accumulated radionuclides and lower doses.

The staff needs this information to determine whether radionuclide accumulation and decay products could result in an underprediction of radionuclide concentrations in groundwater. The staff needs information on the contribution to dose from accumulated radionuclides in the alluvial aquifer system to evaluate compliance with 10 CFR Part 63.114 (a)(3) and 63.311.

References:

SNL 2008. Saturated Zone Flow and Transport Model Abstraction. MDL-NBS-HS-000021 REV 03 ADD 02. Las Vegas, Nevada: Sandia National Laboratories.

SNL 2008a. Site-Scale Saturated Zone Transport. MDL-NBS-HS-000010 REV 03 ADD 01. Las Vegas, Nevada: Sandia National Laboratories.

RAI #2
Justify the assumption, implicit in the SAR, that groundwater flow paths under future climates and associated water table rise can be characterized using the same fate and transport characteristics as those under current conditions.

Basis: The applicant states that climate change is implicitly and conservatively included in the site-scale saturated zone transport model by increasing flow rates without raising the water table or changing flow paths (SAR p.2.3.9-83). The applicant states that particle tracking

simulations incorporating the water table rise (effect of climate change) produce longer simulated transport times because some transport occurs in lower permeability units. Staff requires confirmation and justification of the assumption that these longer flow paths through lesser permeability units can be represented using the same geochemical assumptions and data as the more permeable units to evaluate compliance with 10 CFR 63.114(a)(1-3).

References:

SNL 2008a. Site-Scale Saturated Zone Transport. MDL-NBS-HS-000010 REV 03 ADD 01. Las Vegas, Nevada: Sandia National Laboratories.