Dr. English Pearcy, Manager
Geohydrology and Geochemistry Element
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road, Building 189
San Antonio, Texas 78238-5166

SUBJECT: COMPLETION OF TWO INTERMEDIATE MILESTONES - IM 1402.861.250 and IM 1402.861.240 (JOURNAL PAPERS)

Dear Dr. Pearcy:

The U.S. Nuclear Regulatory Commission staff has completed its review of the subject reports, both of which were sent to us on April 2, 2002. Both documents were sent one month early and provide timely input to ongoing issue resolution work.

Journal Paper - Late Pleistocene and Holocene Groundwater Recharge from the Chloride Mass Balance Method and Chlorine-36 Data

This paper provides estimates of large-scale infiltration at Yucca Mountain for the present-day climate and for the late-Pleistocene (Wisconsin glacial stage). The report is technically and programmatically acceptable. The timing for receipt of the paper is very helpful because next month we expect to receive products from the U.S. Department of Energy (DOE) related to three NRC/DOE agreements on shallow infiltration. The report makes effective use of perched water chemistry at Yucca Mountain to estimate groundwater recharge. This aspect of the work is an important scientific contribution that will be very useful to other researchers. The paper notes that most perched waters at Yucca Mountain are a mixture of Holocene and late Pleistocene recharge. Perched waters at Yucca Mountain have much lower chloride concentrations than are found in rock matrix cores. This shows that fracture flow during extreme precipitation events (rather than gradual flow through the rock matrix) is the most likely source for Holocene replenishment. The authors estimate Holocene and late Pleistocene recharge rates as 5 mm/yr and 15 mm/yr, respectively. Although these values have considerable uncertainty, the data corroborate recharge rates independently estimated using numerical watershed modeling. The recharge values are also similar to those being used in the DOE's Total System Performance Assessment for the Yucca Mountain site.

This Center report relates to two of our integrated subissues, which also form sections of the Yucca Mountain Review Plan. These are: 4.2.1.3.5 (Climate and Infiltration) and 4.2.1.3.6 (Flow Paths in the Unsaturated Zone).

Journal Paper - Alternative Explanation for Groundwater Temperature Variations Near Yucca Mountain, Nevada

This report examines whether large vertical faults at Yucca Mountain might provide pathways for flow between the volcanic tuff aquifers and the regional Paleozoic carbonate aquifer. Temperature measurements near the water table in the tuffs reveal elevated water temperatures aligned with the Solitario Canyon fault and the Paintbrush-Bow Ridge fault

system. The authors used a coupled flow and heat transport model to simultaneously analyze heat and groundwater flow near the Paintbrush-Bow Ridge fault. Results suggest that regions of enhanced temperature along this fault can be explained without significant vertical flow from the underlying Paleozoic carbonate aquifer. Instead, heat conduction enhanced slightly by buoyancy-driven vertical flow within the volcanic aquifer can account for the observed temperatures.

This Center report relates to one of our integrated subissues, 4.2.1.3.8 (Flow Paths in the Saturated Zone) which also forms a section of the Yucca Mountain Review Plan. If you have questions, please call me at (301) 415-6615.

Sincerely,

Neil Coleman, Program Element Manager
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Enclosure: As stated

cc: J. Linehan
B. Meehan
B. Sagar, CNWRA

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