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Hydrogeology • Mineral Resources Waste Management • Geological Engineering • Mine Hydrology

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Communication No. 184

Mr. Jeff Pohle
Division of Waste Management
Mail Stop 4-H-3
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Jeff:

We have been evaluating the basic assumptions inherent in the description of the groundwater flow system presented in the Consultation Draft SCP (CDSCP). This letter constitutes an addendum to our Communication No. 181. Communication No. 181 presents a list of assumptions that we believe are inherent in the CDSCP. This letter discusses an important assumption which we did not include in Communication No. 181. The assumption described in this letter is related to the U.S. Department of Energy report by Szymanski (November 1987).

The CDSCP assumes that temporal groundwater level fluctuations in the vicinity of Yucca Mountain are minimal. Water level fluctuations are assumed to be insignificant throughout the length of time considered for groundwater travel time.

Szymanski (November 1987) states that the area is tectonically active. Tectonic activity in the area could cause groundwater level fluctuations in the vicinity of Yucca Mountain.

Groundwater level changes have occurred in other areas where the changes have been correlated to earthquake-related stress changes. The Borah Peak Earthquake in Idaho created significant water level changes in the vicinity of Mt. Borah (Whitehead, 1985). It is well understood that water level fluctuations in observation wells in artesian aquifers frequently are created by earthquakes at great distances from the source of the seismic event (Eaton and Takasaki, 1959). A combination of man-induced seismic events and natural seismic events may prove informative in ascertaining whether significant water level fluctuations can be expected at Yucca Mountain.

The occurrence and magnitude of groundwater level fluctuations in the vicinity of Yucca Mountain are unknown at this time. Continuous water level

records are not available for the water table aquifer beneath Yucca Mountain. This type of water level data is required to verify that water level changes do not occur over short periods of time. Water level data must be obtained in order to verify that groundwater levels at the site are reasonably stable. Increases in groundwater levels would be expected to be based on changes in tectonic stresses at the site. The occurrence of groundwater elevation increases is dependent upon the temporal relationship of tectonic stresses and the hydrogeologic characteristics of the tuffs and underlying aquifers at Yucca Mountain.

Water level fluctuations at Yucca Mountain should be correlated with seismic records. The correlation should indicate whether significant changes in groundwater elevations can be attributed to seismic events. Man-induced stresses (bomb tests) on the geologic-hydrogeologic system will have to be differentiated from natural events.

Extrapolation of water level data and seismic events from short-term data collection to long-term repository performance will be difficult. Such extrapolation will require extensive use of expert opinion. Extrapolation may benefit from correlation of man-induced seismic events with groundwater level fluctuations. Research on the relationship between seismic events and groundwater level fluctuations may benefit from the proximity of the site and the location of bomb test sites.

As stated in Communication No. 181, the list of assumptions that we have produced is not prioritized. We have not ranked the assumptions in any order of importance. Please call if you have any questions regarding the contents of this letter.

Sincerely,

Roy E. Williams, ld

Roy E. Williams

REW:sl

Reference Cited

Eaton, J.P. and Takasaki, K.J., July 1959, Seismological Interpretation of Earthquake-Induced Water-Level Fluctuations in Wells. Bulletin of the Seismological Society of America, vol. 49, no. 3, p. 227-245.

Szymanski, J.S., November 1987, Conceptual Considerations of the Death Valley Groundwater System with Special Emphasis on the Adequacy of this System to Accommodate the High-Level Nuclear Waste Repository. U.S. Department of Energy, Draft, Nevada Operations Office.

Whitehead, R.L., 1985, Hydrologic Changes Following the Idaho Borah Peak Earthquake. From Proceedings of Workshop XXVIII on the Borah Peak, Idaho, Earthquake, ed. by R.S. Stein and R.C. Bucknam. U.S. Geological Survey, Open-File Report 85-290, vol. A.