THE GEOLOGIC BASIS FOR VOLCANIC HAZARD ASSESSMENT FOR THE PROPOSED HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY AT YUCCA MOUNTAIN, NEVADA

PERRY, Frank. V., Earth and Environmental Sciences Division, Los Alamos National Laboratory, Los Alamos, NM 87545, YOUNGS Robert, Geomatrix Consultants, Inc., 2101 Webster Street, Oakland, CA 94612

Studies of volcanic risk to the proposed high-level radioactive waste repository at Yucca Mountain have been ongoing for 25 years. These studies are required because three episodes of small-volume, alkalic basaltic volcanism have occurred within 50 km of Yucca Mountain during the Quaternary. Probabilistic hazard estimates for the proposed repository depend on the recurrence rate and spatial distribution of past episodes of volcanism in the region. Several independent research groups have published estimates of the annual probability of a future volcanic disruption of the proposed repository, most of which fall in the range of 10^{-7} to 10^{-9} per year; similar conclusions were reached through an extensive expert elicitation sponsored by the Department of Energy in 1995-1996. The estimated probability values are dominated by a regional recurrence rate of 10^{-5} to 10^{-6} volcanic events per year (equating to recurrence intervals of several hundred thousand years). The recurrence rate, as well as the spatial density of volcanoes, is low compared to most other basaltic volcanic fields in the western United States, factors that may be related to both the tectonic history of the region and a lithospheric mantle source that is relatively cold and not prone to melting. The link between volcanism and tectonism in the Yucca Mountain region is not well understood beyond a general association between volcanism and regional extension, although areas of locally high extension within the region may control the location of some volcanoes. Recently, new geologic data or hypotheses have emerged that could potentially increase past estimates of the recurrence rate, and thus the probability of repository disruption. These are (1) hypothesized episodes of anomalously high strain rate, (2) hypothesized presence of a regional mantle hotspot, and (3) new aeromagnetic data suggesting as many as twelve previously unrecognized volcanoes buried in alluvial-filled basins near Yucca Mountain.