

Preliminary estimates of groundwater travel time and radionuclide transport at the Yucca Mountain Repository Site

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ABSTRACT

This report presents the assumptions, methods, and data used in a probabilistic approach to the calculation of groundwater travel times and total radionuclide releases to the water table below Yucca Mountain, Nevada. Assumptions and mathematical principles that serve as the basis for the formulation of the calculational model are described. Data to support the analyses are abstracted from formal and informal reports generated by the staff of such participating organizations as the United States Geological Survey, Los Alamos National Laboratory, Lawrence Livermore National Laboratories, and Sandia National Laboratories, for the Nevada Nuclear Waste Storage Investigations (NNWSI) Project activities. Results from the analyses consist of distributions of groundwater travel time from the disturbed zone to the water table and the cumulative curie releases to the water table. The studies provide some of the information needed in support of requirements for the NNWSI statutory Environmental Assessment and indicate that for the upper limit of percolation flux below the repository level at Yucca Mountain, groundwater travel time has a mean of about 43,000 years and a standard deviation of about 12,000 years; less than 1% of the calculated groundwater travel times are less than 10,000 years. Values for cumulative releases of radionuclides, for a 70,000-MTHM inventory of spent fuel, subject to a percolation flux of 0.5 mm/yr, have been estimated at about 6.0×10 curies of C-14, 2.0×10 curies of Tc-99, and 5.0×10 curies of I-129, which would be released to the water table within 10,000 years following repository closure. Therefore, based on the present model, this evidence indicated that the Yucca Mountain repository site would be in compliance with regulatory requirements.

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