TRIP REPORT

SUBJECT: Geological Society of America (GSA) Annual Meeting and associated short course on site selection for critical facilities

DATE AND PLACE: October 27 - November 1, 1990
Dallas, Texas

AUTHOR: William M. Murphy

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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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SUBJECT: Geological Society of America (GSA) Annual Meeting and associated short course on site selection for critical facilities

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AUTHORS: William M. Murphy, John L. Russell

PERSONS PRESENT: Thousands of geoscientists.

BACKGROUND AND PURPOSE: The GSA annual meeting is the largest conference on geology and related fields in the world. It is a major forum for exchange of research results and ideas, and for professional recruitment in the geosciences.

SUMMARY AND CONCLUSIONS:

William Murphy presented a paper titled "Reaction path models of gas-water-rock interactions in tuff." A copy of the published abstract is attached. John Russell attended a one day short course on site selection of critical facilities conducted by Norman Tilford of Texas A&M University. A copy of the workshop materials will be placed in the CNWRA Library. The GSA employment Service was utilized to recruit qualified applicants for employment opportunities at the CNWRA. Russell and Murphy reviewed numerous résumés of candidates for geoscience positions at the CNWRA, and Russell interviewed seventeen individuals. Abstracts for presentations at the meeting are published by the Geological Society of America as Abstracts with Programs, volume 22, no. 7, 1990 annual meeting. A copy of this volume will be placed in the CNWRA Library. Numerous presentations were attended and many contacts were made with individuals conducting research or management relevant to activities at the CNWRA.

SIGNATURES:

William M. Murphy
Senior Research Scientist

Michael P. Miklas Jr. for
John L. Russell
Manager, Geologic Setting

CONCURRENCE SIGNATURE AND DATE

Allen R. Whiting
Director - Systems Engineering and Integration

12/3/90
Date

03:30 p.m. Murphy, William M. **Nº 04530**

REACTION PATH MODELS OF GAS-WATER-ROCK INTERACTIONS IN TUFF

MURPHY, William M., Southwest Research Institute, 6220 Culebra Rd., San Antonio, TX 78228-0510

Kinetic reaction path modeling offers predictions of the evolution of groundwater and mineral chemistry at the proposed high-level nuclear waste site at Yucca Mountain, Nevada. Computations using EQ3/6 (e.g. Wolery et al., 1990) of the irreversible, isothermal reaction of a bicarbonate solution saturated with calcite at pH 7, representing recharge zone soil water, with an alkali feldspar plus cristobalite assemblage, representing devitrified rhyolite tuff, yield relations between Na, Ca, K, pH and HCO_3^- similar to those observed in analyses of groundwaters from Yucca Mountain. The model results indicate that high aqueous silica concentrations are controlled by dissolution of volcanic glass. Solid solutions of smectite and clinoptilolite, plus calcite, K-feldspar, and albite correspond to observed secondary minerals. Calculated Ca:Na:K ratios for clinoptilolites correspond well to observed compositions. Computed reaction paths at 25° to 100°C relevant to near-field interactions in the proposed repository, using a version of EQ6 modified for nonisothermal kinetics, indicate that changes in secondary phase assemblages and water chemistry are possible over short periods of time. For example, accelerated growth of quartz from initially supersaturated solutions at elevated temperatures, and the absence of volcanic glass at the repository horizon may lead to decreases in aqueous silica and consequent mineralogical variations. Possible validation of this prediction derives from variations in mineral assemblages with depth at Yucca Mountain corresponding to higher temperatures and lower aqueous silica activities. Equilibrium fractionation of H_2O and CO_2 between aqueous and gas phases affects pH and secondary mineralization as shown in reaction paths computed using EQ6 modified to simulate Rayleigh gas fractionation processes such as open system boiling.