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B0287
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Dr. D. J. Brooks
Geotechnical Branch
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Room 623-SS
Washington, D.C. 20555

Dear Dave:

Please find enclosed the progress report for the month of February 1986 for B0287, "Technical Assistance in Geochemistry."

Sincerely,

Gary

Gary K. Jacobs
Manager, NRC Waste Programs

GKJ/

Enclosure:

Monthly Progress Report For January 1986

cc: Office of the Director, NMSS (Attn: Program Support Branch)
Division Director, NMSS Division of Waste Management (2)
Branch Chief, Waste Management Branch, RES
M. R. Knapp, Chief, Geotechnical Branch
K. C. Jackson, Geotechnical Branch
J. R. Bradbury, Geotechnical Branch
G. F. Birchard, Waste Management Branch, RES
M. Siegel, Sandia National Laboratory
A. D. Kelmers
A. P. Malinauskas
R. E. Meyer
GKJ File

2881

03/05/86

MONTHLY PROGRESS REPORT FOR FEBRUARY 1986

PROJECT TITLE: Technical Assistance in Geochemistry

PROJECT MANAGER: G. K. Jacobs

PROJECT STAFF: J. G. Blencoe, R. M. Gove, A. D. Kelmers, R. E. Meyer, G. D. O'Kelley, and K. L. Von Damm

ACTIVITY NUMBER: ORNL #41 88 54 92 4 (FIN No. B0287)
NRC #50 19 03 01

TECHNICAL HIGHLIGHTS:

Task 1 - Hanford Site Geochemical Technical Assistance

As part of his work on the Topical Report related to solubility information for the Hanford Site, J. G. Blencoe reviewed the report, Examination of Solids from 200°C Hydrothermal Tests with Spent Fuel, SD-BWI-TI-283, September 1985, by L. E. Thomas, B. Mastel, and E. D. Jensen. Based on the report and his review, two major points can be made: (1) simulated spent fuel is an unsatisfactory analogue for actual spent fuel and (2) actual spent fuel is essentially immune to chemical attack in spent fuel + groundwater and spent fuel + groundwater + basalt tests performed at 25 MPa, 200°C for durations of 1400 to 4362 hours. Detailed comments may be found in Letter Report LR-287-33 forwarded under separate cover.

Task 2 - Yucca Mountain Geochemical Technical Assistance

K. L. Von Damm reviewed the report, "The Behavior of Actinide Containing Glasses during Gamma Irradiation in a Saturated Tuff Environment," by J. K. Bates and V. M. Oversby, in Scientific Basis for Nuclear Waste Management VIII, Mat. Res. Soc. Symp. Vol. 44, 257-264, 1985. The report, which addresses the potential importance of the interaction of Gamma radiation with nitrogen in air to increase the dissolution rate of glasses, documents the early efforts of a well-conceived set of experiments that need to be continued and expanded. Details of the evaluation may be found in Letter Report LR-287-34 forwarded under separate cover.

K. L. Von Damm reviewed the report, "Hydrothermal Interaction of Topopah Spring Tuff with J-13 Water as a Function of Temperature," by K. G. Knauss, J. M. Delany, W. J. Beiriger, and D. W. Peifer, in Scientific Basis for Nuclear Waste Management VIII, Mat. Res. Soc. Symp. Vol. 44, 539-546, 1985. The subject report documents the changes in both solution composition and the mineralogy/composition of solids when Topopah Spring tuff is reacted with J-13 water at both 150°C and 250°C. The results are then modeled using the EQ3/6 software package. Good agreement between the calculations and experiments was found at 150°C. However, at 250°C, significant quantities of zeolites are formed in the tests, and no thermodynamic data are available

for these phases. Thus, the stability of the zeolites - important phases for radionuclide retardation - cannot be adequately modeled at this time. Additional details of the review may be found in Letter Report LR-287-35 forwarded under separate cover.

A. D. Kelmers reviewed the report, "Distribution of Plutonium and Americium Beneath a 33-year-old Liquid Waste Disposal Site," by J. W. Nyhan, B. D. Drennon, W. V. Abeele, M. L. Wheeler, W. D. Purtymun, G. Trujillo, W. J. Herrea, and J. W. Booth, J. Environ. Qual. 14, 501-509, 1985. Significant fractions of the americium (3 to 49%) and plutonium (0.3 to 5%) in an old waste disposal bed were found to be much more mobile in the underlying Bandelier tuff than had been predicted based on laboratory tests. The results in the paper illustrate the importance of validating laboratory migration information by field tests. By analogy, similar extrapolations of laboratory sorption data for americium and plutonium in performance assessment calculations pertinent to the Yucca Mountain candidate site need to be carefully evaluated. Details of the review may be found in LR-287-28 forwarded under separate cover.

Task 3 - Salt Site Geochemical Technical Assistance

Nothing signficant to report.

Task 4 - Short-Term Technical Assistance

A. D. Kelmers reviewed the report, An Assessment of the Important Radionuclides in Nuclear Waste, by J. F. Kerrisk, LA-10414-MS, 1985. The report contains several rankings of radionuclides for a variety of assumptions - a favored set is not indicated in the report. The report draws only general conclusions about which radionuclides are most important. As requested in the short-term task order, we have considered the need for a DOE/NRC meeting on the subject. The report itself may be of insufficient substance to warrant a specific meeting, although there are many assumptions used in the analysis that could be clarified. We will call to discuss this matter further with the NRC Project Manager. The review will be forwarded under separate cover as LR-287-30.

G. D. O'Kelley reviewed the report, "Surface Oxidation-Reduction Kinetics Associated with Experimental Basalt-Water Reaction at 25°C," by A. F. White, A. Yee, and S. Flexser, Chem. Geol. 49, 73-86, 1985, as requested by short-term task order. Details may be found in LR-287-31.

As directed by the NRC Project Manager, planning for the international conference "Status of Sorption Methodology for High-Level Radioactive Waste Repository Performance Assessment" was terminated. In order to better aid the NRC staff in formulating technical positions on sorption, or in developing a strategy for review of the DOE Site Characterization Plans due out later this year, planning was initiated for a smaller workshop to be held this spring in Silver Spring, MD. The workshop is tentatively titled: "Strategy for the Evaluation of DOE Site Plans, Methodology, and Data for

Modeling Radionuclide Sorption in the Waste Package and the Far Field at Candidate High-Level Waste Repository Sites." Final organization of the workshop is being coordinated with the NRC Project Manager.

The "Radwaste Natural Analog Catalog", completed by D. G. Brookins under subcontract to ORNL, was received and a copy was forwarded to the NRC Project Manager. The catalog completes the current subcontract. After review of the catalog, discussions with the NRC Project Manager will determine if additional work in this area in warranted.

PROJECT MANAGEMENT:

Nothing to report.

MEETINGS AND TRIPS:

Representing NRC/NMSS projects B0287, B0288, and B0290, G. K. Jacobs attended the briefing by T. H. Pigford and M. J. Apted on mass transfer analyses for waste package release estimates held in Silver Spring, Maryland, February 27. The approach of Pigford and coworkers, published in several reports over the last few years, provides analytical solutions to a variety of conceptual models for radionuclide releases from a waste package. The most desirable aspect of the approach is that it requires only a small number of fundamental parameters -- none of which are arbitrary adjustable parameters resulting from simple curve fitting. Most of these parameters can be determined on a site-specific basis (most desirable) or conservatively estimated or measured for a generic system (least desirable). The approach, complemented with more flexible and realistic numerical analyses, may be of significant utility for waste package performance assessment.

Progress and plans for work within the B0287 project were also discussed with the NRC Project Manager during G. K. Jacobs' trip to Silver Spring.

REPORTS AND PUBLICATIONS:

LR-287-28, by A. D. Kelmers, "Review of "Distribution of Plutonium and Americium Beneath a 33-year-old Liquid Waste Disposal Site," by J. W. Nyhan, B. D. Drennon, W. V. Abeele, M. L. Wheeler, W. D. Purtymun, G. Trujillo, W. J. Herrea, and J. W. Booth, J. Environ. Qual. 14, 501-509, 1985."

LR-287-30, by A. D. Kelmers, "Review of An Assessment of the Important Radionuclides in Nuclear Waste, by J. F. Kerrisk, LA-10414-MS, 1985."

LR-287-31, by G. D. O'Kelley, "Review of "Surface Oxidation-Reduction Kinetics Associated with Experimental Basalt-Water Reaction at 25°C," by A. F. White, A. Yee, and S. Flexser, Chem. Geol. 49, 73-86, 1985."

LR-287-33, by J. G. Blencoe, "Review of Examination of Solids from 200°C Hydrothermal Tests with Spent Fuel, SD-BWI-TI-283, Sept., 1985, by L. E. Thomas, B. Mastel, and E. D. Jensen."

LR-287-34, by K. L. Von Damm, "Review of "The Behavior of Actinide Containing Glasses during Gamma Irradiation in a Saturated Tuff Environment," by J. K. Bates and V. M. Oversby, in Scientific Basis for Nuclear Waste Management VIII, Mat. Res. Soc. Symp. Vol. 44, 257-264, 1985."

LR-287-35, by K. L. Von Damm, "Review of "Hydrothermal Interaction of Topopah Spring Tuff with J-13 Water as a Function of Temperature," by K. G. Knauss, J. M. Delany, W. J. Beiriger, and D. W. Peifer, in Scientific Basis for Nuclear Waste Management VIII, Mat. Res. Soc. Symp. Vol. 44, 539-546, 1985."

PROBLEM AREAS:

None.

COST/BUDGET REPORT:

Expenditures were $32.5K for February 1986 and $214.3K for FY 86 to date. A detailed cost/budget report will be sent under separate cover.