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July 11, 1986

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 June 1986 for B0287, "Technical Assistance in Geochemistry."

Sincerely,

*Gary K. Jacobs*

Gary K. Jacobs  
Manager, NRC Waste Program  
Environmental Sciences Division  
Building 1505, MS-3

GKJ/

Enclosure:

Monthly Progress Report For June 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  
P. S. Justus, Chief, Geotechnical Branch  
K. C. Jackson, Geotechnical Branch  
J. W. Bradbury, Geotechnical Branch  
G. F. Birchard, Waste Management Branch, RES  
M. Siegel, Sandia National Laboratory  
A. D. Kelmers  
R. E. Meyer  
A. P. Malinauskas  
GKJ File

WM-RES  
WM Record File  
B0287  
ORNL

WM Project 10, 11, 12  
Docket No. \_\_\_\_\_  
PDR   
LPDR  (B, N, S)

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PDR WMRES EXIORNL  
B-0287 PDR

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MONTHLY PROGRESS REPORT FOR JUNE 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

OBJECTIVE:

The objective of this project is to provide technical assistance to the NRC in the evaluation of geochemical information pertinent to candidate HLW repository sites. The project emphasizes the collection and review of key information in order to provide input to the NRC analysis of technical issues regarding the geochemical aspects of HLW isolation.

TECHNICAL HIGHLIGHTS:

Hanford Site Geochemical Technical Assistance

J. G. Blencoe reviewed the report, "Reactions in the system basalt/simulated spent fuel/water," Mat. Res. Soc. Proc. 26, 1984, by D. E. Grandstaff, G. L. McKeon, E. L. Moore, and G. C. Ulmer. The goals of the study were to: (1) elucidate the geochemical characteristics of the groundwaters; (2) identify the types of secondary minerals that crystallized during the experimentation; and (3) determine the quantities and fate of radionuclide-analog elements released from the simulated spent fuel. Because of the physicochemical state of the simulated spent fuel (e.g., unconsolidated), it is apparently more reactive than actual spent fuel might be. Thus, it would appear that the experimental results may be of limited practical use for predicting the performance of actual spent fuel in a repository. Additional comments are contained in letter report LR-287-50 forwarded under separate cover.

Yucca Mountain Geochemical Technical Assistance

Nothing significant to report.

Salt Site Geochemical Technical Assistance

K. L. Von Damm reviewed the report, The organic chemistry of ground waters from the Palo Duro Basin, Texas: Implications for radionuclide complexation, ground water origin, and petroleum exploration, BMI/ONWI-578, 1985, by J. L. Means and N. J. Hubbard. The subject report documents the organic

geochemistry of deep groundwaters from the Palo Duro Basin, Texas. The organic carbon in these groundwaters is almost entirely comprised of aliphatic acids. The distribution of these acids, along with other parameters, suggests that the Deaf Smith County area of the Palo Duro Basin has a lower potential for petroleum than the Swisher County area. The aliphatic acids are probably not important for radionuclide complexation when compared to the high concentrations of chloride, fluoride, and sulfate present in these brines. Additional details can be found in letter report LR-287-48 forwarded under separate cover.

#### Short-Term Technical Assistance

A. D. Kelmers reviewed the report, Sorption and desorption reactions of radionuclides with a crushed basalt-bentonite packing material, RHO-BW-SA-416 P, 1985, by G. S. Barney, D. L. Lane, C. C. Allen, and T. E. Jones as part of a reconsideration of the NRC Draft Site Technical Position on the use of hydrazine to simulate Hanford Site redox conditions (Short-Term Task Order 35). Serious reservations are expressed concerning the testing methods and the conclusions in the study by Barney et al. (1985) which utilized hydrazine as a reductant for radionuclides. As a result, it is recommended that greater emphasis be given to the two concerns in the draft STP regarding: (1) the uncertainties in the redox condition produced by the addition of hydrazine to experiments and (2) the potential reactions between hydrazine, radionuclides, groundwater components, and site materials. The concern in the draft STP dealing with the possible formation of hydrazine carbamate should be dropped from the final version due to a lack of firm evidence as pointed out by Barney et al. (1985). The remaining three concerns of the draft STP should be retained as presently written. The detailed letter report (LR-287-49) will be forwarded under separate cover.

G. D. O'Kelley reviewed the report, "Plutonium speciation in selected basalt, granite, shale, and tuff groundwaters," Nucl. Tech. 62, 298-310, by J. M. Cleveland, T. F. Rees, and K. L. Nash (1983). This paper on the oxidation states of plutonium is the second of two papers by the same authors on the behavior of actinide elements in natural groundwaters. Because of the qualitative nature of the results and the poor control of experimental conditions, there is little information of general use in this study for predicting the chemical behavior of plutonium in repositories -- similar conclusions were reached in a previous letter report (LR-287-44) reviewing the work of Cleveland et al. on neptunium and americium speciation in natural groundwaters. See letter report LR-287-45, forwarded under separate cover, for additional details.

#### PROJECT MANAGEMENT:

Don Kelmers completed a first draft of the letter report (LR-287-47) summarizing the results of the workshop on sorption held during May 13-16 in Silver Spring. After receiving comments from the NRC Project Manager, the draft letter report will be revised and forwarded to the rest of the participants of the workshop for final review. The final report will be completed early in August.

**MEETINGS AND TRIPS:**

None.

**REPORTS AND PUBLICATIONS:**

LR-287-45, by G. D. O'Kelley, "Review of: Plutonium speciation in selected basalt, granite, shale, and tuff groundwaters," Nucl. Tech. 62, 298-310, by J. M. Cleveland, T. F. Rees, and K. L. Nash (1983)."

LR-287-47, by A. D. Kelmers, Draft of: "Proceedings of the NRC/ORNL workshop: Radionuclide sorption modeling related to high-level nuclear waste repository performance assessment."

LR-287-48, by K. L. Von Damm, "Review of: The organic chemistry of ground waters from the Palo Duro Basin, Texas: Implications for radionuclide complexation, ground water origin, and petroleum exploration, BMI/ONWI-578, 1985, by J. L. Means and N. J. Hubbard."

LR-287-49, by A. D. Kelmers, "Reconsideration of the NRC Draft Site Technical Position on the use of hydrazine to simulate Hanford Site redox conditions and reactions." Also contains a review of: Sorption and desorption reactions of radionuclides with a crushed basalt-bentonite packing material, RHO-BW-SA-416 P, 1985, by G. S. Barney, D. L. Lane, C. C. Allen, and T. E. Jones.

LR-287-50, by J. G. Blencoe, "Review and Evaluation of: "Reactions in the system basalt/simulated spent fuel/water," Mat. Res. Soc. Proc. 26, 1984, by D. E. Grandstaff, G. L. McKeon, E. L. Moore, and G. C. Ulmer."

**PROBLEM AREAS:**

None.

**COST/BUDGET REPORT:**

Expenditures were \$33.3K for June 1986 and \$357K for FY 86 to date. A detailed cost/budget report will be sent under separate cover.