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HOLONICH, J.      Repository Licensing & Quality Assurance Project Director

SUBJECT: Forwards Ofc of Geologic Disposal Weekly Highlights for wk ending 930507 & 14 & Yucca Mountain Site Ofc Field Activity Rept dtd 930518.

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Reply to:  
301 E. Stewart Ave., #203  
Las Vegas, NV 89101

Tel: (702) 388-6125

TO: Joseph Holonich, Director, HLPD, M/S 4 H 3  
FROM: Sr. On-Site Licensing Representatives Office, Las Vegas  
DATE: MAY 21, 1993  
SUBJECT: OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE  
WEEK ENDING MAY 7 AND MAY 14, 1993 and YUCCA MOUNTAIN SITE  
OFFICE (YMSO) FIELD ACTIVITY REPORT DATED MAY 18, 1993

Please find enclosed the above-referenced reports.

There is nothing requiring specific management attention in the reports.

cc: w/enc.: Charlotte Abrams, M/S 4 H 3  
Rosetta Virgilio, M/S 3 D 23  
Dean Kunihiro, Region 5

JSP:nan  
Enclosures as stated

NOTE TO CHARLOTTE: Los Alamos Yucca Mountain Site Characterization  
Project Monthly Activity Report (February/March 1993) and REECo April YMP  
Status Report

*See enclosed  
shuf.*

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WM-11  
NHC3*

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PDR WASTE  
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*Rec'd with letter  
M.D. 5/21/93*

**Department of Energy**  
Yucca Mountain Site Characterization  
Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

WBS 1.2.9.2  
QA: N/A

**MAY 12 1993**

Lake H. Barrett, Acting Director, Civilian Radioactive Waste Management,  
HQ (RW-1) FORS

OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE WEEK ENDING  
MAY 7, 1993 (SCP: N/A)

I. CRITICAL ITEM STATUS - YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT (YMP)

A. Site Characterization Planning

Exploratory Studies Facility (ESF) Task Force Activities

Construction

Excavation continues on the Tunnel Boring Machine (TBM) Starter Tunnel at the North Portal. The pilot drift is in approximately 20 meters as of April 30, 1993. Construction is continuing on drainage improvements to the North Portal access road and on the drainage channel around the North Portal pad.

The following milestones represent the near-term plan for ESF activities:

|  |                    |
|--|--------------------|
| Award TBM Contract                             | May 15, 1993       |
| Award Subcontract for Underground Construction | June 1993          |
| Begin 90 percent design review, Package 1B     | July 19, 1993      |
| Begin 90 percent design review, Package 2      | August 11, 1993    |
| Complete 60 meters of TBM Starter Tunnel       | September 15, 1993 |

Design

The 50 percent management and independent technical reviews of Design Package 1B (Surface Facilities, North Portal) and Design Package 2 (North Ramp - Surface to Topopah Spring Level) are currently underway. Design continues on both packages for 90 percent reviews scheduled for July and August 1993.

Teams of auditors for Fire Safety and Tunnel Safety from the U.S. Department of Energy (DOE)/Headquarters (HQ) conducted audits of the ESF Design and Construction efforts.

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### Field Operations

On Job Package (JP) 92-17, UZ-14 drilling with the LM-300 drill rig, Reynolds Electrical & Engineering Co., Inc. (REECO), has cored to a depth of 141.94 feet with the 12 1/4-inch reamed hole down to 141.50 feet as of April 30, 1993.

As of April 30, 1993, the depth of NRG-5 was 689.65 feet. The 3 7/8-inch hammer drill hole is down to 525.82 feet, and they are currently reaming at 546.19 feet.

On May 4, 1993, the Site Manager prepared and issued the JP authorization for JP 93-05, which is the drilling and testing of Borehole NRG-6, 2A. REECO will mobilize and set up by May 10, 1993.

The Site Manager anticipates receipt of the notice to proceed on the JP for the access road and drill pad for Borehole NRG-4 by May 7, 1993.

On JP 92-20, North Portal Pad and Facilities, REECO continues to place bedding material at the reinforced concrete pipeline ditch which is across the access road. REECO also continues with the subgrade, placing aggregate and subgrade coarse at the access road. They have drill-loaded and shot several loads during the week. They continue applying shotcrete to the portal top.

The Site Manager and Field Operations Center (FOC) staff participated in and provided logistical support for seven major tours this reporting period. The FOC staff is making preparations for the next general public open house and site tour scheduled for May 19, 1993.

### Sample Management Facility (SMF)

Core and cutting samples were collected from USW UZ-14. Cuttings samples were received from 365 feet to 517 feet for UE-25 NRG-5. Core and cuttings samples were received from USW UZ-14 to a depth of 79 feet. Approximately 25 core specimens were removed for shipment to Los Alamos National Laboratory (Los Alamos) and the U.S. Geological Survey (USGS). Approximately 142 boxes of core were laid out for examination by principal investigators from Boreholes USW UZ-16, UE-25 NRG-6, and UE-25 NRG-1.

### Regulatory Interactions

#### Issue Resolution

The Issue Resolution Steering Group met on May 3, 1993, to discuss the results of the DOE/U.S. Nuclear Regulatory Commission (NRC) Management Meeting on Topical Reports. The DOE and Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) comments on the NRC's position paper on topical reports were reviewed and will be sent to the NRC within two weeks. April Gil, Regulatory Interactions Branch, Yucca Mountain Site Characterization Project Office (YMPO), gave a presentation on the Issue Resolution Process at the Regulatory Evolution session at the International High-Level Radioactive Waste Management (IHLRWM) Conference on April 29, 1993.

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Mined Geologic Disposal System (MGDS) Annotated Outline (AO)

The comment resolution meeting was held on April 29, 1993; the authors are currently incorporating proposed changes into the document. Delivery to DOE is expected by May 20, 1993, with transmittal to the NRC expected at the end of May 1993. Thomas Williamson, CRWMS M&O, gave a presentation on the AO process at the Regulatory Evolution session at the IHLRWM Conference on April 29, 1993.

Site Characterization Progress Report (PR)

The preliminary draft of PR 8 is being reviewed by YMPO staff. The official review draft PR 8 will be sent to DOE/HQ and participants on May 7, 1993.

Site Characterization Plan (SCP)/Study Plan (SP) Status

The NRC completed Phase I review of SP 8.3.4.2.4.3, "Characterization of the Geomechanical Attributes of the Waste Package Environment." SP 8.3.1.17.4.12, "Tectonic Models and Synthesis," has been submitted to YMPO for review.

STUDY PLAN BREAKDOWN

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|   |    |
|---|----|
| In Screening Review .....                           | 1  |
| In YMPO Review .....                                | 4  |
| Awaiting Comment Resolution .....                   | 6  |
| Awaiting Author Revision .....                      | 0  |
| In YMPO Verification Audit .....                    | 8  |
| Preparing to Submit or Awaiting YMPO Approval ..... | 1  |
| Awaiting Submission to the NRC .....                | 1  |
| NRC Phase 1 Review .....                            | 10 |
| NRC Acceptance .....                                | 46 |
| Total .....   | 77 |

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SCP/SP Status:

|   |     |
|---|-----|
| Total SPs Assigned to Cover 106 Studies ..... | 104 |
| SPs Not Yet Submitted for Review .....        | 41  |
| SPs Submitted for Initial Review .....        | 63  |
| Revised SPs Submitted for Review .....        | 6   |
| Revised ESF SPs Submitted for Review .....    | 8   |
| Total SPs Submitted for Review .....          | 77  |

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State of Nevada Comments Status:

|  |    |
|--|----|
| Received Comments from the State of Nevada .....   | 18 |
| Responses Transmitted to the State of Nevada ..... | 17 |

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NRC Comments Status:

|  |    |
|--|----|
| Received Comments from NRC .....               | 20 |
| Responses Transmitted from OGD to DOE/HQ ..... | 18 |

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B. Project Planning and Control

The preliminary draft of the Planning and Control System (PACS) System Description was submitted to the Plans and Procedures Department.

Work Breakdown Structure (WBS) elements 1.2.6.2.2.5 and 1.2.5.5 were restructured to lower level WBS elements in the PACS data bases and downloaded to the participant work stations.

The DOE management books for March 1993 PACS cost and schedule status data were distributed.

A formal review process was initiated for revision of project-level administrative procedures (AP) associated with PACS.

Vincent Iorii, YMPO, signed a letter to all participants emphasizing the importance of accurate reporting of accrued costs on the Monthly Cost/Full-Time Equivalent Report.

The fiscal year 1993 Cost/Schedule Baseline was reconciled to the Approved Funding Program.

The NRG-2A final integrated schedule development for JP 93-05 was completed and approved by DOE. The final draft of NRG-4 integrated schedule was completed. Preliminary integrated schedule development of Borehole SRG-5/SD-11 was initiated.

The Summary Schedule Implementation Plan was initiated which included review of high-level schedule by the Core Team and identification of activities, milestones, and relationships for WBS elements 1.2.1 through 1.2.7.

Analysis began of the CRWMS M&O detailed ESF schedule upload to PACS.

C. Quality Assurance (QA) Implementation

The Yucca Mountain Quality Assurance Division (YMQAD) Director and one staff member met with the Information Resources Management Records representative to coordinate the implementation of the Quality Assurance Requirements Document (QARD) requirements with the YMPO records system.

A Lessons Learned addressing verification of experience and education is being finalized by YMQAD. The program clarification will be distributed to all affected organizations. Lessons Learned are utilized by the Office of QA to provide global clarification on programmatic issues.

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Preparation of a presentation on verification validation of software is in process. As requested by the YMQAD Director, the presentation will provide individuals with general information regarding the process of verification and validation of software.

The YMQAD staff held a conference call with the Office of QA support staff to discuss resolution of comments on Quality Assurance Procedure (QAP) 16.1 and QAP 2.4. The teleconference resulted in resolution of all major comments.

Surveillance Report 93-021 of REECo, "First Line Inspection Activities," was completed.

Surveillance Report 93-023 of Raytheon Services Nevada/REECo-Nevada Test Site, "Submittal of Completed Job Packages Documents," was issued.

The Audit Report of YMPO Audit YMP-93-09 was issued.

#### Determination of Importance and Grading Enhancement

##### Quality (O) List and O-List Procedure Development

Implementing Line Procedure 1.3/Office of the Project Manager (YMP Matrix of Controls, Development, and Maintenance) has been approved.

##### Implementation

Development of the revised Q-List continues. This revision is to incorporate the results of the ESF Starter Tunnel Drill and Blast Section Determination of Importance Evaluation and to retain all natural barriers per the Deputy Project Manager.

Development of documentation (revised plans, new procedures, and revised procedures) for the evolving role of the Assessment Team continues. This also involves the continued support to efforts leading to phase-out of AP 6.17Q.

#### D. Public Outreach and Institutional Activities

William Simecka, YMPO, gave a technical presentation on underground structures to approximately 50 people at the Colorado School of Mines in Golden, Colorado, on May 4, 1993.

Several general overview presentations were provided this week. J. Russell Dyer, YMPO, gave a general overview presentation to the Defense Nuclear Agency's Fifth Annual Hardened Facility Site Managers' Conference on May 4, 1993, with approximately 60 people in attendance. Paul Standish, a consultant, gave a general overview presentation to 12 students at the University of Washington in Seattle, Washington, on May 5, 1993. April Gil gave a general overview presentation to 90 students at Roy Martin Middle School in Las Vegas, Nevada, on May 5, 1993.

Richard Arnold, a consultant, provided presentations on Native American Indian Culture to 50 students at Indian Springs School on May 4, 1993, and to 20 children from Child Haven on May 6, 1993.

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Several educational presentations were given this week. These included presentations on electricity by Todd Kaish, CRWMS M&O, and on radiation by John Follette, Technical and Management Support Services (T&MSS), to 120 students at Harvey Dondero Elementary School in Las Vegas on May 4, 1993; presentations on electricity by Todd Kaish and on radiation by Paul Snyder, T&MSS, to 140 students at Twin Lakes Elementary School in Las Vegas on May 6, 1993; and a Yucca Mountain Johnny presentation given by John Hartley, T&MSS, to 25 students at C. C. Ronnow Elementary School in Las Vegas on May 7, 1993.

Carl Gertz, Project Manager, gave a presentation on the history and scientific factors relating to YMP to 85 employees of the Nevada Power Company in Las Vegas on May 6, 1993.

Several tours to Yucca Mountain, Nevada, were conducted. These included a tour on May 1, 1993, for 40 guests of the Teacher Workshop and Occidental College; on May 3, 1993, for 40 guests from the Institute of Shaft Drilling Technology; and on May 5, 1993, for 25 people from USGS/HQ. A school tour was also conducted on May 6, 1993, for 90 students from Pahrump Junior High School.

Institutional and External Affairs (IEA) staff visited with Lander County staff in Battle Mountain, Nevada, on May 3, 1993, and with Churchill County staff in Fallon, Nevada, on May 5, 1993. The IEA staff also visited with Eureka County staff and delivered information materials to the Eureka County Yucca Mountain Information Office in Eureka, Nevada, on May 4, 1993.

The IEA staff finalized follow-up assignments as a result of supporting the American Society of Civil Engineers media office at last week's IHLRWM Conference in Las Vegas. The staff also distributed the updated video showing new work at Yucca Mountain.

## II. ANALYSIS & VERIFICATION DIVISION

The staff participated in the DOE/NRC Management Meeting on Topical Reports on May 3, 1993, in Las Vegas; in the review of Multipurpose Canister/CRWMS M&O activities on May 5, 1993, in Washington, D.C.; and in the YMP Colloid Workshop May 3-5, 1993, in Santa Fe, New Mexico. They attended the joint USGS/NRC workshop on "Research Related to Low-Level Radioactive Waste Disposal" May 4-6, 1993, in Reston, Virginia.

### MGDS

The staff coordinated several meetings: on Section 801 of the National Energy Policy Act on April 28, 1993; on Alternative Program Strategy, Convergence, and the Alternative Licensing Strategy on April 28, 1993; and a senior management meeting on Program Strategy on April 29, 1993.

Draft C of the Site Design and Test Requirements Document was reviewed and informal comments were provided to the document author in Las Vegas (Milton Rindskopf, CRWMS M&O).

The Regulatory Guidance Document was reviewed and informal comments were provided to the document author in Washington, D.C. (Paul Krishna, CRWMS M&O).

### III. GENERAL INFORMATION ITEMS

#### CRWMS M&O

Efforts continued to acquire, permit, install, and operate a concrete batch plant to be located near Well J-13. Representatives from all involved participants are on board.

The Monte-Carlo neutronics code MCPN was completed for the 21 PWR waste package. This will permit evaluations of the length of time that criticality material will need to be present and the amount of poison (natural Boron and Boron 10) required to meet Title 10 CFR 60 under various conditions of enrichment and burnup.

#### Lawrence Livermore National Laboratory

Regarding WBS 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment), calculations show that extending the model to more than one kilometer below the water table does not affect the unsaturated zone temperature or saturation distributions. Since the model assumes a perfect heat sink at its lower edge, a fast moving aquifer deeper than one kilometer below the water table would not affect the unsaturated zone thermohydrological performance.

Regarding WBS 1.2.2.2.5 (Characterization of the Effects of Man-Made Materials on Chemical & Mineralogical Changes in the Post-Emplacement Environment), investigation activities into the stability and reactivity of organic materials have been initiated:

1. Planning of the initial experimental phases has been completed.
2. Laboratory facilities are in the final stages of completion.
3. The first phase of data base evaluation for organic compounds that are liable to be introduced into the ESF and the potential radioactive waste repository, and for which the thermodynamic and kinetic properties are not well established, has been completed.

#### Los Alamos

Los Alamos hosted a Colloid Workshop in Santa Fe, New Mexico, May 3-5, 1993, to evaluate whether colloids will significantly increase radionuclide release to the accessible environment at Yucca Mountain, Nevada. The following topics were covered: Colloid Transport Calculations, Evidence of Colloids from Sampling Studies, Evidence of Colloid Transport at the Field Scale, Potential Sources of Colloids at Yucca Mountain, Laboratory and Field Experiments Relevant to Yucca Mountain, and Future Direction of Colloid Studies in YMP.

#### Sandia National Laboratories (SNL)

The staff continued construction monitoring activities in the ESF North Ramp Starter Tunnel. These activities are being conducted under SP 8.3.1.15.1.8, "In Situ Design Verification." The construction blasting seismometer and geophones were relocated to provide better coupling to the rock near the North Portal. Recordings of peak particle velocity and seismic wave forms are being made for each blast.

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As a result of concerns expressed by YMP personnel regarding possible movement of the rock mass in the highwall over the Starter Tunnel, SNL began installing instrumentation to monitor the vertical closure of the tunnel. Load cells will also be installed to monitor load changes on rock bolts that will be installed in the highwall before the tunnel is excavated to full width. The intent of this activity is to provide data to the constructor for their continuous evaluations of safety conditions as construction proceeds.

#### T&MSS

Two surveillances were completed for UZ-14 and NRG-5; the SMF trailer was inspected for safety compliance. Functional appraisal (audit) of the REECO Safety and Health Program continued. The 50 percent design on the ventilation and conveyor belt system was reviewed and commented on.

Thirty classes were conducted and 125 students were trained for a total of 318.5 contact hours. Nine training notifications were distributed. A special General Employee Training class was conducted for Los Alamos and Science Applications International Corporation students. The lesson plan, New Underground Worker Training for YMP, was developed and approved. A dry run of QARD Orientation was conducted and revisions were implemented.

The staff attended the FOC Site Meeting and briefed on the start-up of a Continuous Improvement team that will address the improvement of the communication process between DOE, the participants, and the "outside" world.

#### IV. UPCOMING EVENTS CALENDAR

Please note that the usage of "(P)" in the calendar indicates that the event is open to the public. Educational presentations and State and Public Interactions are coordinated by the Speakers Bureau; contact Jacqueline Brandt at (702) 794-7896 or Theresa Hirsch at (702) 794-7759 for additional information. Exhibits and Public Update Meetings are coordinated by Joanna Magruder at (702) 794-7056, and Tours are coordinated by Carleen Hill at (702) 794-7375.

| <u>Date</u>                          | <u>Event</u>  | <u>Location</u> | <u>YMPO Contact</u> |
|--------------------------------------|---|-----------------|---------------------|
| <u>A. DOE/HO Meetings</u>            |   |                 |                     |
| Tuesday-<br>Wednesday,<br>June 8-9   | Office of Civilian<br>Radioactive Waste<br>Management Quarterly<br>Program Review | Televideo       | C. Gertz            |
| <u>B. CRWMS M&amp;O/DOE Meetings</u> |   |                 |                     |
| Tuesday,<br>May 25                   | CRWMS M&O Program<br>Management Review  | Vienna,<br>VA   | C. Gertz            |
| Wednesday,<br>June 30                | CRWMS M&O Quarterly<br>Integration Meeting  | Televideo       | C. Gertz            |

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| <u>Date</u>   | <u>Event</u>  | <u>Location</u>                          | <u>YMPO Contact</u> |
|---|---|--|---------------------|
| C. <u>Internal and DOE Nevada Operations Office Meetings</u>        |   |  |                     |
| Wednesday,<br>May 19  | NV Monthly Program<br>Review                                    | Las Vegas,<br>NV                         | C. Gertz            |
| D. <u>NRC Interactions</u>  |   |  |                     |
| Tuesday-<br>Wednesday,<br>May 25-26                                 | NRC Site Visit (P)  | Las Vegas,<br>NV                         | T. Bjerstedt        |
| Monday,<br>June 7   | NRC Management<br>Meeting for<br>Interactions<br>Scheduling (P) | Las Vegas,<br>NV                         | T. Bjerstedt        |
| Tuesday,<br>June 8  | Technical Exchange -<br>Geophysics<br>Integration (P)           | Las Vegas,<br>NV                         | T. Bjerstedt        |
| Wednesday,<br>June 9  | Technical Exchange -<br>Volcanism (P)                           | Las Vegas,<br>NV                         | T. Bjerstedt        |
| Wednesday,<br>July 28   | Technical Exchange -<br>ESF Title II Design<br>(P)              | TBD                                      | T. Bjerstedt        |
| E. <u>Nuclear Waste Technical Review Board (NWTRB) Interactions</u> |   |  |                     |
| Tuesday-<br>Saturday,<br>June 1-12                                  | NWTRB International<br>Trip                                     | United<br>Kingdom,<br>France,<br>Belgium | J. Cooper           |
| Monday-<br>Thursday,<br>July 12-15                                  | NWTRB Full Board<br>Meeting (P)                                 | Denver,<br>CO                            | J. Cooper           |
| Tuesday-<br>Friday,<br>October 19-22                                | NWTRB Full Board<br>Meeting (P)                                 | Las Vegas,<br>NV                         | J. Cooper           |
| F. <u>Advisory Committee on Nuclear Waste (ACNW) Interactions</u>   |   |  |                     |
| Wednesday-<br>Thursday,<br>May 19-20                                | ACNW 53rd Meeting<br>(P)  | Bethesda,<br>MD                          | A. Gil              |
| Tuesday,<br>July 20   | ACNW Working Group<br>on Engineered<br>Barrier System (P)       | TBD                                      | A. Gil              |
| Wednesday-<br>Thursday,<br>July 21-22                               | ACNW 55th Meeting<br>(P)  | TBD                                      | A. Gil              |

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| <u>Date</u>                                | <u>Event</u>             | <u>Location</u>  | <u>YMPO Contact</u> |
|--|--------------------------|------------------|---------------------|
| F. <u>ACNW Interactions</u> (Continued)    |                          |                  |                     |
| Wednesday-<br>Thursday,<br>August 25-26    | ACNW 56th Meeting<br>(P) | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>September 22-23 | ACNW 57th Meeting<br>(P) | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>October 27-28   | ACNW 58th Meeting<br>(P) | Las Vegas,<br>NV | A. Gil              |
| Monday-<br>Tuesday,<br>November 22-23      | ACNW 59th Meeting<br>(P) | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>December 15-16  | ACNW 60th Meeting<br>(P) | TBD              | A. Gil              |

| <u>Date</u>                             | <u>Event</u>  | <u>Location</u>       | <u>Speaker</u>       |
|---|---|-----------------------|----------------------|
| G. <u>State and Public Interactions</u> |   |                       |                      |
| Saturday,<br>May 8                      | Girl Scouts   | Las Vegas,<br>NV      | D. Rakestraw         |
| Saturday,<br>May 8                      | Boy Scouts Atomic<br>Energy Merit Badge<br>Workshop | Las Vegas,<br>NV      | E. Harle             |
| Monday,<br>May 10                       | Mt. Charleston<br>Elementary                        | Mt. Charleston,<br>NV | A. Gil               |
| Tuesday,<br>May 11                      | Roy Martin<br>Middle School                         | Las Vegas,<br>NV      | A. Gil               |
| Tuesday,<br>May 11                      | Nye County<br>Democratic Club                       | Pahrump,<br>NV        | P. Carmack           |
| Tuesday,<br>May 11                      | Lomie Heard<br>Elementary                           | Las Vegas,<br>NV      | R. Arnold            |
| Tuesday,<br>May 11                      | John S. Park<br>Elementary                          | Las Vegas,<br>NV      | T. Kaish<br>E. Harle |
| Wednesday,<br>May 12                    | Southwest Las Vegas<br>Kiwanis Club                 | Las Vegas,<br>NV      | T. Tait              |
| Thursday,<br>May 13                     | Martin Luther<br>King School                        | Las Vegas,<br>NV      | J. Hartley           |
| Friday,<br>May 14                       | Orr Junior High<br>School                           | Las Vegas,<br>NV      | A. King              |

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| <u>Date</u>   | <u>Event</u>  | <u>Location</u>      | <u>Speaker</u>                       |
|---|---|----------------------|--------------------------------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                      |                                      |
| Friday,<br>May 14                                   | Sandy Valley<br>Elementary                              | Sandy Valley,<br>NV  | A. Gil                               |
| Saturday,<br>May 15                                 | Girl Scouts<br>Geology Workshop                         | Las Vegas,<br>NV     | E. Harle                             |
| Monday,<br>May 17                                   | Green Valley<br>Kiwanis Club                            | Henderson,<br>NV     | A. Robison                           |
| Monday,<br>May 17                                   | Booker Sixth<br>Grade Center                            | Las Vegas,<br>NV     | B. Schultz                           |
| Monday,<br>May 17                                   | Conference of<br>Radiation Control<br>Program Directors | San Francisco,<br>CA | C. Gertz                             |
| Wednesday,<br>May 19                                | Eureka High School                                      | Eureka,<br>NV        | A. Robison<br>P. Standish<br>R. Dyer |
| Wednesday,<br>May 19                                | International Right<br>of Way Association               | Las Vegas,<br>NV     | G. Fasano                            |
| Wednesday,<br>May 19                                | Mayor's Youth<br>Council                                | Las Vegas,<br>NV     | J. Peck                              |
| Wednesday,<br>May 19                                | Sunrise Acres   | Las Vegas,<br>NV     | M. Dorsey<br>J. Brandt               |
| Thursday,<br>May 20                                 | Greenspun Junior<br>High School                         | Henderson,<br>NV     | R. Arnold                            |
| Thursday,<br>May 20                                 | C. C. Ronnow<br>Elementary                              | Las Vegas,<br>NV     | J. Hartley                           |
| Friday,<br>May 21                                   | Burkholder Middle<br>School                             | Las Vegas,<br>NV     | J. Blink                             |
| Saturday,<br>May 22                                 | President's Tea of<br>the Sunrise Council<br>(PTA)      | Henderson,<br>NV     | E. Harle<br>A. Gil                   |
| Sunday,<br>May 23                                   | Yucca Mountain<br>Lecture Series (P)                    | Beatty,<br>NV        | J. Weigand                           |
| Tuesday,<br>May 25                                  | Pittman School  | Las Vegas,<br>NV     | T. Kaish<br>C. Tung                  |
| Tuesday,<br>May 25                                  | Yucca Mountain<br>Lecture Series (P)                    | Las Vegas,<br>NV     | J. Weigand                           |

| <u>Date</u>   | <u>Event</u>  | <u>Location</u>     | <u>Speaker</u>           |
|---|---|---------------------|--------------------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                     |                          |
| Wednesday,<br>May 26                                | Sandy Valley<br>Elementary  | Sandy<br>Valley, NV | T. Kaish<br>L. Anderson  |
| Thursday,<br>May 27                                 | American Business<br>Women's Association  | Las Vegas,<br>NV    | J. Younker<br>B. Reilly  |
| Friday,<br>May 28                                   | Public Relations<br>Society of America  | Las Vegas,<br>NV    | D. Bradford<br>J. Brandt |
| Friday,<br>May 28                                   | Professional<br>Analysis, Inc.  | Las Vegas,<br>NV    | A. Gil                   |
| Monday,<br>June 14                                  | Rapid Excavation<br>& Tunneling<br>Conference                                     | Boston,<br>MA       | C. Gertz                 |
| Wednesday,<br>June 16                               | Palo Verde<br>Generating Station  | Phoenix,<br>AZ      | G. Fasano<br>E. Harle    |
| Sunday,<br>June 20                                  | Vanishing Desert<br>Greater Opportunity<br>Group                                  | Las Vegas,<br>NV    | A. Gil                   |
| Sunday,<br>June 20                                  | Yucca Mountain<br>Lecture Series (P)  | Pahrump,<br>NV      | W. Dixon                 |
| Tuesday,<br>June 22                                 | Yucca Mountain<br>Lecture Series (P)  | Las Vegas,<br>NV    | W. Dixon                 |
| Friday,<br>June 25                                  | Diablo Canyon<br>Nuclear Power<br>Plant   | Avila Beach,<br>CA  | G. Fasano                |
| Wednesday,<br>July 7                                | University of<br>California,<br>Santa Barbara                                     | TBD                 | C. Gertz                 |
| Thursday,<br>July 15                                | Spring Valley<br>Library  | Las Vegas,<br>NV    | T. Tait                  |
| Monday,<br>August 2                                 | U.S. Council on<br>Energy Awareness<br>(USCEA) Energy<br>Information Centers      | Chicago,<br>IL      | C. Gertz                 |
| Tuesday,<br>August 17                               | 1993 American<br>Institute of<br>Chemical Engineers<br>Summer National<br>Meeting | Seattle,<br>WA      | C. Gertz                 |

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| <u>Date</u>   | <u>Event</u>   | <u>Location</u>      | <u>Speaker</u> |
|---|--|----------------------|----------------|
| G. <u>State and Public Interactions</u> (Continued) |  |                      |                |
| Tuesday-<br>Friday,<br>August 17-20                 | Second<br>International<br>Mixed Waste<br>Symposium            | Baltimore,<br>MD     | C. Gertz       |
| Friday,<br>September 10                             | Public Gas Service<br>Gas Company                              | TBD                  | C. Gertz       |
| Sunday,<br>September 26                             | Children's<br>Discovery Museum                                 | Las Vegas,<br>NV     | R. Arnold      |
| Sunday,<br>September 26                             | Focus '93 Site<br>Characterization &<br>Model Validation       | Las Vegas,<br>NV     | C. Gertz       |
| Monday-<br>Wednesday,<br>September 27-29            | Industrial &<br>Engineering<br>Chemistry<br>Division Symposium | Atlanta,<br>GA       | C. Gertz       |
| Monday-<br>Friday,<br>November 15-19                | American Nuclear<br>Society                                    | San Francisco,<br>CA | C. Gertz       |
| Sunday,<br>February 27,<br>1994                     | Waste Management<br>Symposia                                   | Tucson,<br>AZ        | C. Gertz       |

| <u>Date</u>                        | <u>Event</u>  | <u>Location</u>       |
|------------------------------------|---|-----------------------|
| H. <u>Exhibits Scheduled</u>       |   |                       |
| Monday,<br>May 10                  | Public Update Meeting (P)   | Beatty,<br>NV         |
| Tuesday,<br>May 11                 | Public Update Meeting (P)   | Las Vegas,<br>NV      |
| Thursday,<br>May 13                | Public Update Meeting (P)   | Reno,<br>NV           |
| Sunday-<br>Tuesday,<br>May 16-18   | USCEA   | St. Petersburg,<br>FL |
| Wednesday,<br>May 19               | Public Open House (P)   | Las Vegas,<br>NV      |
| Wednesday-<br>Friday,<br>May 19-21 | Geological Society of<br>America 1993 Combined<br>Cordilleran & Rocky<br>Mountain Section Meeting | Reno,<br>NV           |

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| <u>Date</u>   | <u>Event</u>               | <u>Location</u>  |
|---|----------------------------|------------------|
| H. <u>Exhibits Scheduled</u> (Continued)            |                            |                  |
| Saturday,<br>June 19                                | Public Open House (P)      | Las Vegas,<br>NV |
| Saturday,<br>July 24                                | Public Open House (P)      | Las Vegas,<br>NV |
| Friday-<br>Saturday,<br>August 20-21                | Home Show (P)              | Las Vegas,<br>NV |
| Saturday,<br>August 21                              | Public Open House (P)      | Las Vegas,<br>NV |
| Tuesday-<br>Monday,<br>August 24-30                 | Nevada State Fair Reno (P) | Reno,<br>NV      |
| Thursday-<br>Tuesday,<br>September 2-7              | Elko Fair (P)              | Elko,<br>NV      |
| Saturday,<br>September 25                           | Public Open House (P)      | Las Vegas,<br>NV |
| Tuesday-<br>Saturday,<br>September 28-<br>October 2 | Nevada Library Association | Elko,<br>NV      |
| Friday-<br>Monday,<br>October 1-11                  | Jaycee State Fair (P)      | Las Vegas,<br>NV |
| Saturday,<br>November 6                             | Boy Scouts Expo            | Las Vegas,<br>NV |
| <u>Date</u>   | <u>Event</u>               | <u>Escorts</u>   |

I. Tours Scheduled

|                      |  |     |
|----------------------|--|-----|
| Monday,<br>May 10    | Los Alamos   | TBD |
| Monday,<br>May 10    | DOE Contractor<br>Classification<br>Officers Meeting | TBD |
| Wednesday,<br>May 12 | Kitt Carson Junior<br>High School                    | TBD |
| Wednesday,<br>May 12 | U.S. Environmental<br>Protection Agency              | TBD |

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| <u>Date</u>                           | <u>Event</u>                             | <u>Escorts</u>       |
|---------------------------------------|--|----------------------|
| I. <u>Tours Scheduled</u> (Continued) |  |                      |
| Saturday,<br>May 15                   | Native American<br>Consultation Program  | G. Fasano<br>V. Best |
| Wednesday,<br>May 19                  | Public Open House (P)                    | Various<br>Escorts   |
| Wednesday,<br>May 26                  | Laughlin High School                     | TBD                  |
| Saturday,<br>June 19                  | Public Open House (P)                    | Various<br>Escorts   |
| Monday,<br>June 21                    | Girl Scouts Wider<br>Opportunity Program | TBD                  |
| Saturday,<br>July 24                  | Public Open House (P)                    | Various<br>Escorts   |
| Tuesday,<br>August 17                 | Senior Tripsters                         | TBD                  |
| Saturday,<br>August 21                | Public Open House (P)                    | Various<br>Escorts   |
| Saturday,<br>September 25             | Public Open House (P)                    | Various<br>Escorts   |



Carl P. Gertz  
Project Manager

YMP:VFI-4135



**Department of Energy**  
Yucca Mountain Site Characterization  
Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

WBS 1.2.9.2  
QA: N/A

**MAY 17 1993**

Lake H. Barrett, Acting Director, Civilian Radioactive Waste Management,  
HQ (RW-1) FORS

OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE WEEK ENDING  
MAY 14, 1993 (SCP: N/A)

I. CRITICAL ITEM STATUS - YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT (YMP)

A. Site Characterization Planning

Exploratory Studies Facility (ESF) Task Force Activities

Construction

Excavation continues on the Tunnel Boring Machine (TBM) Starter Tunnel at the North Portal. The pilot drift is in approximately 22 meters and the north and south slashes are in 1.5 meters each, as of May 7, 1993. Construction is continuing on drainage improvements to the North Portal access road and on the drainage channel around the North Portal pad.

The following milestones represent the near-term plan for ESF activities:

|  |                    |
|--|--------------------|
| Award TBM Contract                             | May 19, 1993       |
| Award Subcontract for Underground Construction | June 1993          |
| Begin 90 percent design review, Package 1B     | July 19, 1993      |
| Begin 90 percent design review, Package 2      | August 11, 1993    |
| Complete 60 meters of TBM Starter Tunnel       | September 15, 1993 |

Design

The 50 percent management and independent technical reviews of Design Package 1B (Surface Facilities, North Portal) and Design Package 2 (North Ramp - Surface to Topopah Spring Level) are nearing completion. The final comment resolution process is in progress. Design continues on both packages for 90 percent reviews scheduled for July and August 1993.

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### Field Operations

On Job Package (JP) 92-17, UZ-14 drilling with the LM-300 drill rig, Reynolds Electrical & Engineering Co., Inc. (REECo), has cored to a depth of 141.94 feet with the 12 1/4-inch reamed hole down to 141.50 feet. Drilling activities were halted for several days until the drill bit and stabilizer were loosened. Drilling activities resumed on May 10, 1993.

Regarding NRG-5, the depth cored was 914 feet with the five-inch casing at 689 feet, as of May 7, 1993. The projected depth of the hole was 950 feet and it was finished on May 10, 1993. REECo mobilized the CME-850 drill rig to start work at NRG-2A on May 10, 1993.

On JP 92-20, North Portal Pad and Facilities, REECo continues grouting the Williams bolts (rock bolts) in the back. They have installed 27 bolts. The grout has been returned on 13 of the bolts. They have also started the first and second lattice girders. The installation of the four-foot reinforced concrete in the drainage channel under the access road has been completed. REECo is working on the aggregate base coarse for the access road.

The Site Manager and Field Operations Center staff participated in and provided logistical support for two major tours this reporting period. Preparations are being finalized for the next general public open house and site tour scheduled for May 19, 1993.

### Sample Management Facility

The staff continued supporting drilling of UE-25 NRG-5 on double shifts. Double shifts have been discontinued until further notice. Two hundred twenty-five feet of core were received for processing.

There was no drilling activity on USW UZ-14.

Two hundred twenty boxes of core from UE-25 NRG-3, UE-25 NRG-2, UE-25 NRG-6, and USW UZ-16 were laid out for examination by Sandia National Laboratories (SNL) and the U.S. Geological Survey (USGS).

One hundred fifty-seven specimens were removed from core for Los Alamos National Laboratory (Los Alamos) and USGS.

The staff participated in two-year budget plan exercises.

The Sample Overview Committee met on May 5, 1993.

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Site Investigations

The following is a listing of site characterization field activities that are currently active.

| SCP ACTIVITY  | TITLE  | COMMENTS  |
|---------------|--|---|
| 8.3.1.3.2.1   | Mineralogy, Petrology & Rock Chemistry of Transport Pathways       | Outcrop sampling  |
| 8.3.1.3.2.2   | Mineralogic & Geochemical Alteration                               | Outcrop sampling  |
| 8.3.1.4.2.2   | Structural Features within Site Area                               | Surface mapping, ESF mapping                            |
| 8.3.1.8.5.1   | Characterization of Volcanic Features                              | Test pits, trenching                                    |
| 8.3.1.14.2    | Soil & Rock Properties of Potential Location of Surface Facilities | Test pits, trenching, ramp exploration holes            |
| 8.3.1.17.4.2  | Location & Recency of Faulting Near Prospective Surface Facilities | Trench mapping  |
| 8.3.1.17.4.3  | Quaternary Faulting within 100 km of Yucca Mountain                | Surface mapping   |
| 8.3.1.17.4.4  | Quaternary Faulting in NE-Trending Fault Zones                     | Surface mapping   |
| 8.3.1.17.4.10 | Geodetic Leveling  | Traversing  |
| 8.3.1.17.4.6  | Quaternary Faulting within Site Area                               | Trench mapping  |
| 8.3.1.2.1.1   | Precipitation & Meteorological Monitoring for Regional Hydrology   | Ongoing measurements                                    |
| 8.3.1.2.1.2   | Runoff & Streamflow  | Ongoing measurements                                    |
| 8.3.1.2.2.1   | Unsaturated Zone Infiltration                                      | Drilling/logging of neutron-access holes; ponding tests |
| 8.3.1.2.2.2   | Water Movement Tracer Tests  | Cl-36 measurements                                      |
| 8.3.1.2.2.3   | Percolation in Unsaturated Zone                                    | UZ drilling/testing                                     |
| 8.3.1.2.2.6   | Gaseous Phase Movement in Unsaturated Zone                         | UZ drilling/testing                                     |
| 8.3.1.2.2.7   | Unsaturated Zone Hydrochemistry                                    | UZ drilling/testing                                     |
| 8.3.1.2.3.1   | Site Saturated Zone Groundwater Flow System                        | Ongoing monitoring                                      |
| 8.3.1.2.3.2   | Saturated Zone Hydrochemistry                                      | Ongoing sampling  |
| 8.3.1.15.1.8  | In Situ Design Verification  | Construction monitoring/testing                         |

Regulatory InteractionsIssue Resolution

A Steering Group videoconference meeting was held on May 12, 1993, from 8 a.m. to 12 noon.

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Site Characterization Progress Report (PR)

Internal Yucca Mountain Site Characterization Project Office (YMPO) and participant review of draft PR 8 began this week. Sections of the report for which YMPO determined additional or clarified input was needed are identified in the draft document and will be supplied before the Office of Civilian Radioactive Waste Management (OCRWM) review.

Technical Analysis

The Technical Analysis staff are preparing the technical summary and workshop review for the Colloid Workshop conducted last week in Santa Fe, New Mexico. The workshop was attended by 80 workers in the field, including international participants. Three waste isolation evaluations are continuing for Well SRG-5, the ESF, and the large block heater test.

Site Characterization Plan (SCP)/Study Plan (SP) Status

No new SPs were approved by YMPO this week.

Confusion has resulted from the report for the week ending April 23, 1993. Six SPs have been deleted from the YMPO review cycle because of inactivity. However, these SPs were not deleted from the system and will eventually be resubmitted to YMPO. Consequently, the total number of SPs is still 104 SPs.

STUDY PLAN BREAKDOWN

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|  |    |
|--|----|
| In Screening Review .....  | 0  |
| In YMPO Review .....   | 5  |
| Awaiting Comment Resolution .....  | 6  |
| Awaiting Author Revision .....   | 0  |
| In YMPO Verification Audit .....   | 8  |
| Preparing to Submit or Awaiting YMPO Approval .....                          | 1  |
| Awaiting Submission to the U.S. Nuclear Regulatory<br>Commission (NRC) ..... | 0  |
| NRC Phase 1 Review .....   | 11 |
| NRC Acceptance .....   | 46 |
| Total .....  | 77 |

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SCP/SP Status:

|   |     |
|---|-----|
| Total SPs Assigned to Cover 106 Studies ..... | 104 |
| SPs Not Yet Submitted for Review .....        | 40  |
| SPs Submitted for Initial Review .....        | 64  |
| Revised SPs Submitted for Review .....        | 5   |
| Revised ESF SPs Submitted for Review .....    | 8   |
| Total SPs Submitted for Review .....          | 77  |

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State of Nevada Comments Status:

|  |    |
|--|----|
| Received Comments from the State of Nevada .....   | 18 |
| Responses Transmitted to the State of Nevada ..... | 18 |

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NRC Comments Status:

|  |    |
|--|----|
| Received Comments from NRC .....   | 21 |
| Responses Transmitted from OGD to the U.S. Department of<br>Energy (DOE)/Headquarters (HQ) ..... | 18 |

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B. Project Planning and Control

Training was provided to Regulatory and Site Evaluation Division personnel on operating the Planning and Control System (PACS) Participant Work Station (PWS) which includes all participant data for Work Breakdown Structure (WBS) elements 1.2.2, 1.2.3, and 1.2.4.

Fiscal year (FY) 1994 and outyear planning data were installed on the PACS PWS laptop for the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O)/TRW to initiate the project rebaselining effort.

Program modification and testing were completed to allow report selection of only variant accounts in PACS.

Draft A of the PACS System Description was completed for review.

Indepth analysis was prepared of the March 1993 Project Cost Performance Report for YMPO. The analysis included status to date plus projected performance through the remainder of the fiscal year.

Preliminary summary schedule development was completed for each WBS element. The summary schedule integration and review process were initiated.

The final integrated schedule development of the NRG-4 schedule was completed.

A DOE letter to participants was prepared requesting concurrence to deobligate non-earmarked capital equipment carryover.

Advance copies of the DOE approved capital equipment list were forwarded to participants. The participants were advised to input the approved capital equipment into the PACS system before their April 1993 status submittal to PACS.

C. Quality Assurance (QA) Implementation

The draft "Internal Review Budget" for FY 1995 was completed and provided to the Project Control Branch.

The QA Requirements and Descriptions Training Package was completed. This includes course outline, lesson plan, course contents, and handouts.

The Yucca Mountain Quality Assurance Division (YMQAD) staff reviewed and provided comments on Administrative Procedure (AP) Supplement III.1-Q, YMP Field Verification of Geophysical Logging Operations.

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The YMQAD staff completed a draft flowchart for AP 5.27Q, Nonconforming Items and Samples. This will be evaluated for incorporation into the next revision which will provide some enhanced methodologies for subject activities.

As part of the remedial action associated with Corrective Action Request 93-041, YMQAD is in the process of gathering 3 to 35 SCP SPs for QA review.

A meeting was conducted on May 13, 1993, to evaluate the status of the QA Requirements Matrix.

Surveillance 93-024 of USGS Sub-Surface Moisture Content Measurements at the Nevada Test Site (NTS) is in progress.

#### Determination of Importance and Grading Enhancement

##### Implementation

Phase-out of AP 6.17Q continues with the emphasis on development and implementation of the CRWMS M&O processes.

The Assessment Team (AT) continues to support ongoing YMP efforts through YMP requested reviews of participant Classification Analyses (CA) and Determination of Importance Evaluations (DIE). This support also includes preparation of Q-List and Management Control List revisions to incorporate the YMP approved recommendations from the CAs and DIES. Also, the AT is participating in the intermediate design reviews, including the 50 percent ESF Design Package 2 review.

#### D. Public Outreach and Institutional Activities

Three tours to Yucca Mountain, Nevada, were conducted on May 10, 1993. These included a tour for 40 guests from the Los Alamos and DOE Contractor Classification Officers Meeting; a media tour for Keith Rogers from the Las Vegas Review-Journal; and a tour for Les Bradshaw, Nye County. A school tour was conducted on May 12, 1993, for 40 students from Kit Carson Middle School. A tour was also conducted on May 12, 1993, for 15 guests from the U.S. Environmental Protection Agency (EPA). Todd Kaish, CRWMS M&O, gave a pretour briefing to the students from Kit Carson Middle School.

The YMP Public Update Meetings were held on May 10, 1993, in Beatty, Nevada; on May 11, 1993, in Las Vegas, Nevada; and on May 13, 1993, in Reno, Nevada. The YMP exhibits were set up and staffed for these events. The total attendance was approximately 900 people.

There were several general overviews of the YMP given to various groups. Pete Carmack, Technical and Management Support Services (T&MSS), gave a general overview to 25 members of the Nye County Democratic Club on May 11, 1993, in Pahrump, Nevada. April Gil, YMPO, gave a general overview to 90 students at Roy Martin Middle School on May 11, 1993, in Las Vegas. Terry Tait, T&MSS, gave a general overview to 10 members of the Southwest Las Vegas Kiwanis Club on May 12, 1993, in Las Vegas.

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An environmental presentation was given by Danny Rakestraw, EG&G Energy Measurements, Inc., to 150 Girl Scouts on May 8, 1993, in Las Vegas. James Blink, Lawrence Livermore National Laboratory (LLNL), gave a science presentation to 25 Boy Scouts at the Boy Scouts Atomic Energy Workshop in Tonopah, Nevada, on May 11, 1993. Christopher Lewis and Douglas Switzer, both from T&MSS, gave a geology presentation to 100 members of the Las Vegas Gem Club on May 10, 1993, in Las Vegas. Richard Arnold, a consultant, gave a Native American Indian Cultural presentation to 100 students at Lomie Heard Elementary School on May 11, 1993, in Las Vegas.

In addition to the above presentations, several educational presentations were given this week. These included a presentation on fossils by April Gil to 30 students at Mt. Charleston Elementary School on May 10, 1993; presentations on geology/palontology by April Gil to 100 students at Sandy Valley Elementary School in Sandy Valley, Nevada, on May 14, 1993; a career presentation by Aubrey King, T&MSS, to 150 students at Orr Junior High School in Las Vegas on May 14, 1993; and an electricity presentation by Michael Griffin, T&MSS, and Todd Kaish to 140 students from John S. Park Elementary School in Las Vegas on May 11, 1993.

The YMP sponsored a Boy Scouts Energy Workshop on May 8, 1993, at the Las Vegas Yucca Mountain Information Office. Todd Kaish and Michael Penovich, CRWMS M&O, conducted the hands-on workshop, which was attended by 22 Boy Scouts and eight leaders. The Boy Scouts earned the Energy Merit Badges by building a solar box and learning about the effects of energy all around the world.

Institutional and External Affairs (IEA) staff accompanied Lincoln County officials on a tour of the Savannah River Project in Savannah, Georgia, on May 12, 1993. The IEA staff also finalized arrangements for the White Pine County tour of the Waste Isolation Pilot Plant in Carlsbad, New Mexico, to be conducted on May 20, 1993.

The IEA staff attended the Clark County Steering Committee meeting in Las Vegas on May 13, 1993.

The IEA staff developed exhibits and finalized logistical arrangements for the YMP Public Update Meetings in Beatty, Las Vegas, and Reno.

## II. ANALYSIS & VERIFICATION DIVISION

The staff attended the YMP Public Update Meetings in Beatty, Las Vegas, and Reno, May 10-13, 1993. They participated in the Waste Form Barrier/Canister Team kick-off meeting at Idaho National Engineering Laboratory (INEL) May 11-12, 1993, in Idaho Falls, Idaho; the purpose of the meeting was to assess development program needs to implement a long-lived barrier for INEL high-level waste and spent fuel. The staff also participated in the Energy Coordinating Committee meeting in Germantown, Maryland, on May 14, 1993.

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#### Mined Geologic Disposal System

The staff coordinated the Section 801 videoconference to discuss DOE's role in the upcoming National Academy of Sciences (NAS) meeting. A draft agenda was prepared for DOE's part in the NAS meeting on the EPA standard. The staff participated in the project-level design requirements documentation meeting between RW-30 and YMPO.

#### Occurrence Reporting Processing System (ORPS)

Two ORPS reports were provided to RW-1. The National Earthquake Conference was attended in Knoxville, Tennessee, May 3-5, 1993.

### III. GENERAL INFORMATION ITEMS

#### CRWMS M&O

The staff participated in the videoconference to plan for the first meeting of the NAS Committee on Technical Bases for Yucca Mountain Standards. The meeting will be held in Las Vegas May 27-28, 1993. A dry run for the DOE presentations will be held on May 19, 1993, in Washington, D.C.

#### LLNL

Regarding WBS 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment), work continued measuring electrical resistivity as a function of moisture content of Topopah Spring Tuff samples from U3hg-1 and GU-3 holes at room temperature, using J-13 water as pore fluid. The electrical impedance and high frequency electromagnetic tomography used in the laboratory and the field to monitor the distribution of moisture content in the tuffaceous rock depend on accurate laboratory measurements for their calibration. The electrical conductivity of partially saturated rocks is largely dependent on saturation level, fluid conductivity, and temperature. Thus far, electrical conductivity as a function of moisture content has been determined during both imbibition and drying cycles at 20 degrees Celcius on tuff samples for Area 3 and Area 25 NTS, Nevada, using distilled water. Results indicate an exponential dependence of conductivity on water content (Sw) for both imbibition and drying cases. Hysteresis between the imbibition and drying cycles is observed for both rock types. The imbibition curve is more conductive than the drying curve between 20 and 70 percent Sw. Possible explanations of the hysteresis are changing ionic concentration or conducting mechanism in the pore fluid with changing saturation levels. Additional experiments using J-13 well water as the saturating fluid do not show any departure from the curves determined with distilled water during the imbibition cycle up to 30 percent saturation. The established curves have successfully been used to determine saturation levels of a core sample used in a flow test.

#### Los Alamos

Julie Canepa hosted a Technical Advisory Group meeting in Los Alamos to review the FY 1994 annual plan for WBS 1.2.3.

David Vaniman reported that staff prepared polished one-inch rounds of devitrified, zeolitic, and vitric Yucca Mountain tuffs for micro-autoradiography studies by the Sorption and Mineralogy/Petrology tasks. They will investigate the potential impact of a variety of trace minerals on the retardation of various transuranic elements.

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David Vaniman reported that papers on the following subjects were being prepared for the Zeolite '93 Conference to be held in Boise, Idaho, June 21-25, 1993: (1) distribution of fracture-lining minerals at Yucca Mountain; (2) equilibrium modeling of zeolite formation; (3) the importance of zeolites in transport, thermal, and hydrologic effects at the site; and (4) radiometric dating of zeolites.

#### SNL

Three papers on YMP site characterization work were presented at the International High-Level Radioactive Waste Management (IHLRWM) Conference. One paper described a geostatistical analysis of a surface transect sampling study that is being used to develop a model for characterization of spatial variability of physical properties at Yucca Mountain. A second geostatistics paper described upscaling models for providing input of hydrologic properties to larger scale flow models. A rock mechanics paper described the impact of porosity distribution on strength characteristics of intact tuff.

Six papers on model validation studies were presented at the IHLRWM Conference. One paper described geochemical analysis of tracers and materials for the intermediate scale reactive transport experiment that is being conducted as a joint study by SNL and Los Alamos. Three papers described a series of experiments and numerical simulations that are being used to characterize fingering of flow in unsaturated fractures. One paper described new x-ray based techniques that have been developed to image and measure fluid fluxes between fractures and adjacent matrix material. The final paper described an ongoing experimental study to develop multi-scale permeability data for assessing the viability of statistically based upscaling models.

Several SNL staff attended the Colloid Workshop held in Santa Fe, New Mexico, May 3-4, 1993. Mike Wilson presented a paper entitled, "Colloids, a Performance Assessment Perspective." The paper was coauthored with Jack Gauthier and Malcolm Siegel.

This week two SNL QA staff members attended a training seminar on "Self-Assessment Techniques." This three-day class was designed to familiarize individuals with a technique that can be used to effectively perform self-assessments. Requirements review, procedure compliance evaluation, and implementation efficiency and other strategies were presented.

#### USGS

The rock characteristics staff completed a two-week field session mapping Calico Hills outcrops in the Fortymile Wash and upper Paintbrush Canyon areas. A major angular unconformity within the bedded tuff of the Calico Hills was mapped in upper Paintbrush Canyon, and important outcrops highlighting paleotopography were described in Fortymile Wash.

At the request of DOE/CRWMS M&O, the USGS staff evaluated the North Ramp Starter Tunnel excavation for imaging of fracture sets beyond the tunnel face by seismic tomography. Recommendations were proposed for a modest imaging program with minimal impact on excavation schedules.

Unsaturated zone hydrology staff report that the automated tracer gas injection system has been repaired so that it functions automatically and will be ready when coring resumes at USW UZ-14.

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IV. UPCOMING EVENTS CALENDAR

Please note that the usage of "(P)" in the calendar indicates that the event is open to the public. Educational presentations and State and Public Interactions are coordinated by the Speakers Bureau; contact Jacqueline Brandt at (702) 794-7896 or Theresa Hirsch at (702) 794-7759 for additional information. Exhibits and Public Update Meetings are coordinated by Joanna Magruder at (702) 794-7056, and Tours are coordinated by Carleen Hill at (702) 794-7375.

| <u>Date</u>  | <u>Event</u>   | <u>Location</u> | <u>YMPO Contact</u> |
|--|--|-----------------|---------------------|
| <u>A. DOE/HO Meetings</u>                                    |  |                 |                     |
| Tuesday,<br>May 18   | Program Management Meeting                             | Washington, DC  | C. Gertz            |
| Tuesday-<br>Wednesday,<br>June 8-9                           | OCRWM Quarterly Program Review                         | Televideo       | C. Gertz            |
| <u>B. CRWMS M&amp;O/DOE Meetings</u>                         |  |                 |                     |
| Tuesday,<br>May 25   | CRWMS M&O Program Management Review                    | Vienna, VA      | C. Gertz            |
| Wednesday,<br>June 30  | CRWMS M&O Quarterly Integration Meeting                | Televideo       | C. Gertz            |
| <u>C. Internal and DOE Nevada Operations Office Meetings</u> |  |                 |                     |
| Wednesday,<br>May 19   | NV Monthly Program Review                              | Las Vegas, NV   | C. Gertz            |
| <u>D. NRC Interactions</u>                                   |  |                 |                     |
| Tuesday-<br>Wednesday,<br>May 25-26                          | NRC Site Visit (P)                                     | Las Vegas, NV   | T. Bjerstedt        |
| Monday,<br>June 7  | NRC Management Meeting for Interactions Scheduling (P) | Las Vegas, NV   | T. Bjerstedt        |
| Tuesday,<br>June 8   | Technical Exchange - Geophysics Integration (P)        | Las Vegas, NV   | T. Bjerstedt        |
| Wednesday,<br>June 9   | Technical Exchange - Volcanism (P)                     | Las Vegas, NV   | T. Bjerstedt        |
| Wednesday,<br>July 28  | Technical Exchange - ESF Title II Design (P)           | TBD             | T. Bjerstedt        |

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| <u>Date</u>   | <u>Event</u>  | <u>Location</u>                 | <u>YMPO Contact</u> |
|---|---|---------------------------------|---------------------|
| <u>E. Nuclear Waste Technical Review Board (NWTRB) Interactions</u> |   |                                 |                     |
| Tuesday-Saturday,<br>June 1-12                                      | NWTRB International Trip                            | United Kingdom, France, Belgium | J. Cooper           |
| Wednesday-Friday,<br>July 14-16                                     | NWTRB Full Board Meeting (P)                        | Denver, CO                      | J. Cooper           |
| Tuesday-Friday,<br>October 19-22                                    | NWTRB Full Board Meeting (P)                        | Las Vegas, NV                   | J. Cooper           |
| <u>F. Advisory Committee on Nuclear Waste (ACNW) Interactions</u>   |   |                                 |                     |
| Wednesday-Thursday,<br>May 19-20                                    | ACNW 53rd Meeting (P)                               | Bethesda, MD                    | A. Gil              |
| Tuesday,<br>July 20   | ACNW Working Group on Engineered Barrier System (P) | TBD                             | A. Gil              |
| Wednesday-Thursday,<br>July 21-22                                   | ACNW 55th Meeting (P)                               | TBD                             | A. Gil              |
| Wednesday-Thursday,<br>August 25-26                                 | ACNW 56th Meeting (P)                               | TBD                             | A. Gil              |
| Wednesday-Thursday,<br>September 22-23                              | ACNW 57th Meeting (P)                               | TBD                             | A. Gil              |
| Wednesday-Thursday,<br>October 27-28                                | ACNW 58th Meeting (P)                               | Las Vegas, NV                   | A. Gil              |
| Monday-Tuesday,<br>November 22-23                                   | ACNW 59th Meeting (P)                               | TBD                             | A. Gil              |
| Wednesday-Thursday,<br>December 15-16                               | ACNW 60th Meeting (P)                               | TBD                             | A. Gil              |
| <u>Date</u>   | <u>Event</u>  | <u>Location</u>                 | <u>Speaker</u>      |
| <u>G. State and Public Interactions</u>                             |   |                                 |                     |
| Saturday,<br>May 15   | Girl Scouts Geology Workshop                        | Las Vegas, NV                   | E. Harle            |
| Monday,<br>May 17   | Green Valley Kiwanis Club                           | Henderson, NV                   | A. Robison          |

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| <u>Date</u>   | <u>Event</u>  | <u>Location</u>      | <u>Speaker</u>          |
|---|---|----------------------|-------------------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                      |                         |
| Monday,<br>May 17                                   | Booker Sixth<br>Grade Center                            | Las Vegas,<br>NV     | B. Schultz              |
| Monday,<br>May 17                                   | Conference of<br>Radiation Control<br>Program Directors | San Francisco,<br>CA | C. Gertz                |
| Wednesday,<br>May 19                                | Eureka High School                                      | Eureka,<br>NV        | P. Standish             |
| Wednesday,<br>May 19                                | International Right<br>of Way Association               | Las Vegas,<br>NV     | G. Fasano               |
| Wednesday,<br>May 19                                | Mayor's Youth<br>Council                                | Las Vegas,<br>NV     | J. Peck                 |
| Wednesday,<br>May 19                                | Sunrise Acres   | Las Vegas,<br>NV     | M. Dorsey<br>J. Brandt  |
| Thursday,<br>May 20                                 | Greenspun Junior<br>High School                         | Henderson,<br>NV     | R. Arnold               |
| Thursday,<br>May 20                                 | C. C. Ronnow<br>Elementary                              | Las Vegas,<br>NV     | J. Hartley              |
| Thursday,<br>May 20                                 | Crestwood Elementary                                    | Las Vegas,<br>NV     | T. Kaish                |
| Friday,<br>May 21                                   | Burkholder Middle<br>School                             | Las Vegas,<br>NV     | J. Blink                |
| Saturday,<br>May 22                                 | President's Tea of<br>the Sunrise Council<br>(PTA)      | Henderson,<br>NV     | E. Harle<br>A. Gil      |
| Sunday,<br>May 23                                   | Yucca Mountain<br>Lecture Series (P)                    | Beatty,<br>NV        | J. Weigand              |
| Tuesday,<br>May 25                                  | Pittman School  | Las Vegas,<br>NV     | T. Kaish<br>C. Tung     |
| Tuesday,<br>May 25                                  | Greenspun Junior<br>High School                         | Las Vegas,<br>NV     | R. Arnold               |
| Tuesday,<br>May 25                                  | Yucca Mountain<br>Lecture Series (P)                    | Las Vegas,<br>NV     | J. Weigand              |
| Wednesday,<br>May 26                                | Sandy Valley<br>Elementary                              | Sandy<br>Valley, NV  | T. Kaish<br>L. Anderson |
| Wednesday,<br>May 26                                | Laughlin High<br>School                                 | Laughlin,<br>NV      | T. Kaish                |
| Thursday,<br>May 27                                 | American Business<br>Women's Association                | Las Vegas,<br>NV     | J. Younker<br>B. Reilly |

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| <u>Date</u>   | <u>Event</u>   | <u>Location</u>         | <u>Speaker</u>           |
|---|--|-------------------------|--------------------------|
| G. <u>State and Public Interactions</u> (Continued) |  |                         |                          |
| Friday,<br>May 28                                   | Public Relations<br>Society of America   | Las Vegas,<br>NV        | D. Bradford<br>J. Brandt |
| Friday,<br>May 28                                   | Professional<br>Analysis, Inc.   | Las Vegas,<br>NV        | A. Gil                   |
| Monday,<br>June 14                                  | Rapid Excavation<br>& Tunneling<br>Conference                                      | Boston,<br>MA           | C. Gertz                 |
| Wednesday,<br>June 16                               | Palo Verde<br>Generating Station   | Phoenix,<br>AZ          | G. Fasano<br>E. Harle    |
| Sunday,<br>June 20                                  | Vanishing Desert<br>Greater Opportunity<br>Group                                   | Las Vegas,<br>NV        | A. Gil                   |
| Sunday,<br>June 20                                  | Yucca Mountain<br>Lecture Series (P)   | Pahrump,<br>NV          | W. Dixon                 |
| Tuesday,<br>June 22                                 | Yucca Mountain<br>Lecture Series (P)   | Las Vegas,<br>NV        | W. Dixon                 |
| Thursday,<br>June 24                                | National Academy of<br>Sciences Board on<br>Radioactive Waste<br>Management        | Las Vegas,<br>NV        | C. Gertz                 |
| Friday,<br>June 25                                  | Diablo Canyon<br>Nuclear Power<br>Plant  | Avila Beach,<br>CA      | G. Fasano                |
| Wednesday,<br>July 7                                | University of<br>California,<br>Santa Barbara                                      | Santa<br>Barbara,<br>CA | C. Gertz                 |
| Thursday,<br>July 15                                | Spring Valley<br>Library   | Las Vegas,<br>NV        | T. Bjerstedt             |
| Monday,<br>August 2                                 | U.S. Council on<br>Energy Awareness<br>(USCEA) Energy<br>Information Centers       | Chicago,<br>IL          | C. Gertz                 |
| Tuesday,<br>August 17                               | 1993 American<br>Institute of<br>Chemical Engineers.<br>Summer National<br>Meeting | Seattle,<br>WA          | C. Gertz                 |
| Tuesday-<br>Friday,<br>August 17-20                 | Second<br>International<br>Mixed Waste<br>Symposium                                | Baltimore,<br>MD        | C. Gertz                 |

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Lake H. Barrett

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| <u>Date</u>   | <u>Event</u>   | <u>Location</u>      | <u>Speaker</u> |
|---|--|----------------------|----------------|
| G. <u>State and Public Interactions</u> (Continued) |  |                      |                |
| Friday,<br>September 10                             | Public Gas Service<br>Gas Company                              | TBD                  | C. Gertz       |
| Sunday,<br>September 26                             | Children's<br>Discovery Museum                                 | Las Vegas,<br>NV     | R. Arnold      |
| Sunday,<br>September 26                             | Focus '93 Site<br>Characterization &<br>Model Validation       | Las Vegas,<br>NV     | C. Gertz       |
| Monday-<br>Wednesday,<br>September 27-29            | Industrial &<br>Engineering<br>Chemistry<br>Division Symposium | Atlanta,<br>GA       | C. Gertz       |
| Monday-<br>Friday,<br>November 15-19                | American Nuclear<br>Society                                    | San Francisco,<br>CA | C. Gertz       |
| Sunday,<br>February 27,<br>1994                     | Waste Management<br>Symposia                                   | Tucson,<br>AZ        | C. Gertz       |

| <u>Date</u>                          | <u>Event</u>  | <u>Location</u>       |
|--------------------------------------|---|-----------------------|
| H. <u>Exhibits Scheduled</u>         |   |                       |
| Saturday,<br>May 15                  | Armed Forces Day  | Hawthorne,<br>NV      |
| Sunday-<br>Tuesday,<br>May 16-18     | USCEA   | St. Petersburg,<br>FL |
| Wednesday,<br>May 19                 | Public Open House (P)   | Las Vegas,<br>NV      |
| Wednesday-<br>Friday,<br>May 19-21   | Geological Society of<br>America 1993 Combined<br>Cordilleran & Rocky<br>Mountain Section Meeting | Reno,<br>NV           |
| Saturday,<br>June 19                 | Public Open House (P)   | Las Vegas,<br>NV      |
| Saturday,<br>July 24                 | Public Open House (P)   | Las Vegas,<br>NV      |
| Friday-<br>Saturday,<br>August 20-21 | Home Show (P)   | Las Vegas,<br>NV      |
| Saturday,<br>August 21               | Public Open House (P)   | Las Vegas,<br>NV      |

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Lake H. Barrett

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| <u>Date</u>   | <u>Event</u>                             | <u>Location</u>             |
|---|--|-----------------------------|
| H. <u>Exhibits Scheduled</u> (Continued)            |  |                             |
| Tuesday-<br>Monday,<br>August 24-30                 | Nevada State Fair Reno (P)               | Reno,<br>NV                 |
| Thursday-<br>Tuesday,<br>September 2-7              | Elko Fair (P)                            | Elko,<br>NV                 |
| Saturday,<br>September 25                           | Public Open House (P)                    | Las Vegas,<br>NV            |
| Tuesday-<br>Saturday,<br>September 28-<br>October 2 | Nevada Library Association               | Elko,<br>NV                 |
| Friday-<br>Monday,<br>October 1-11                  | Jaycee State Fair (P)                    | Las Vegas,<br>NV            |
| Saturday,<br>November 6                             | Boy Scouts Expo                          | Las Vegas,<br>NV            |
| <u>Date</u>   | <u>Event</u>                             | <u>Escorts</u>              |
| I. <u>Tours Scheduled</u>                           |  |                             |
| Saturday,<br>May 15                                 | Native American<br>Consultation Program  | G. Fasano<br>V. Best        |
| Wednesday,<br>May 19                                | Public Open House (P)                    | Various<br>Escorts          |
| Thursday,<br>May 20                                 | Earth Magazine                           | S. Williams<br>T. Bjerstedt |
| Tuesday-<br>Wednesday,<br>May 25-26                 | NRC                                      | T. Bjerstedt                |
| Wednesday,<br>May 26                                | Laughlin High School                     | TBD                         |
| Saturday,<br>June 19                                | Public Open House (P)                    | Various<br>Escorts          |
| Monday,<br>June 21                                  | Girl Scouts Wider<br>Opportunity Program | TBD                         |
| Saturday,<br>July 24                                | Public Open House (P)                    | Various<br>Escorts          |
| Tuesday,<br>August 17                               | Senior Tripsters                         | TBD                         |

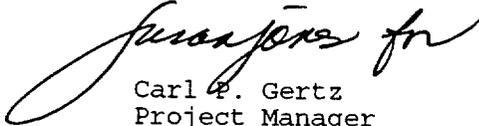
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Lake H. Barrett

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| <u>Date</u>                           | <u>Event</u>          | <u>Escorts</u>     |
|---------------------------------------|-----------------------|--------------------|
| I. <u>Tours Scheduled</u> (Continued) |                       |                    |
| Saturday,<br>August 21                | Public Open House (P) | Various<br>Escorts |
| Saturday,<br>September 25             | Public Open House (P) | Various<br>Escorts |

YMP:VFI-4197

  
Carl P. Gertz  
Project Manager



Department of Energy  
Yucca Mountain Site Characterization  
Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

WBS: 1.2.7.3  
QA: N/A

**MAY 18 1993**

Carl P. Gertz, Project Manager, YMP, NV

YUCCA MOUNTAIN SITE OFFICE (YMSO) FIELD ACTIVITY REPORT

1. Field Operations Center, (YMSO)

A. Management and Administration

- a. The Site Manager and FOC staff participated in and provided operational and logistical support to several tours conducted during this period. These were: Teacher Workshop and Occidental College; Institute of Shaft Drilling Technology; USGS Headquarters; O'Callahan M.S. and Pahrump Jr. High.
- b. The Site Manager worked on preparing the Job Package (JP) Authorization Letter for JP 93-02, Construction of Access road for Borehole UE 25 NRG-4. Notice to Proceed should be finalized and submitted to the Site Manager during next week.
- c. The Site Manager prepared and distributed the Weekly YMSO Field Activity Report to the Project Manager for week ending April 30, 1993.
- d. Provided operations, administrative, and security support to the Yucca Mountain Site Manager and his DOE staff.
- e. Provided operational and administrative support for site characterization activities in the field.
- f. Provided administrative support for issuing vehicles, first aid kits, fire extinguisher and other necessary equipment to personnel performing field duty.
- g. Prepared and transmitted daily operations reports to NORSOC, and the biweekly reports to HQ OCRWM.
- h. Prepared thirty-five (35) badging request for site visitors and daily field work, including 2 foreign national requests.

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- i. Provided duty officer support for ESF swing and graveyard shift operations.
  - j. Processed seven (7) Work Order Requests, providing for radios, instrument calibration and general support.
  - k. Continued planning for office reorganization within the FOC building.
  - l. Continued providing round the clock photographic coverage for ESF North Portal operations.
  - m. Completed script and footage for April Field Activities video report.
  - n. The Bullfrog Planning Commission continuing with development of data base for Facilities Management Program.
  - o. Met with the Site Development Plan committee, continuing to review comments on common facilities sitting trade paper.
- B. Project Safety and Health, (DOE/SAIC)
- a. Continued audit on First Aid Kit Program.
  - b. Research and drafted letter for Site Manager's signature to TPO's concerning access control to portal/tunnel area.
  - c. Staff assisted OCRWM Consulting teams review of bldg. 4015 and 4215 and the ESF Pad.
  - d. Continued REECo Safety & Health functional appraisal.
  - e. Met with Training and Institutional staff concerning the "Visitor Training on ESF Starter Tunnel."
  - f. Assisted in New Miner Training Class.
  - g. Attended monthly Safety & Health Advisory Committee meeting.
  - h. Reviewed AP 1.10Q and drafted letter to M&O requesting revision of Procedure.
  - i. Completed inspection of trailer behind Change House.

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- j. Monitored gas levels in Starter Tunnel during cleaning out operations.
- k. Occurrence Reports - one waiting for FM Signature.
  - 1. REECO- six outstanding: 1 awaiting FM Signature; 2 awaiting Program Manager signature; 3 rejected (09/22/92 and 2 on 4/15/93).
  - 2. SAIC - 2 outstanding: 1 initial notification (04/20/93); 1 10 day notification (04/29/93).

2. Raytheon Services Nevada, (RSN)

A. Field Support

- a. Geologic mapping survey of Ghost Dance Fault, Phase II is ongoing.
- b. GSF test pits surveyed. Calculations and plotting remain. Survey of booster pump station test pits complete. Survey and calculations of percolation test boreholes are complete. MTL test are complete.
- c. Survey for Geologic Mapping of North Portal Box Cut, Phase II and IV are complete, calculations remain.
- d. Re-survey of trenches CF1 and T8 complete. Calculations remain.
- e. Environmental survey of Batch Plant is complete.
- f. Starter Tunnel survey is ongoing.
- g. Survey of Geophone locations for Construction monitoring is completed.
- h. Survey of NRG-5 drill pad and access road completed, calculations remain.
- i. Survey NRG-4 centerline complete, calculations remain.
- j. Issued (6) Work Initiations in support of ongoing and upcoming job packages.
- k. Field Engineering continues to provide support to JP: 91-9 Rev. 3; 92-2; 92-5; 92-8; 92-12; 92-17; 93-03 and 92-20.

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- l. Field Engineering continues to check Trench 14, JP 91-2, daily to insure suitability for operations.
- m. Survey crew continuing work on the Area 25 Survey Control Net.
- n. Survey of Starter Tunnel, support is ongoing.

B. Quality Control

- a. Continued verification activities on NRG-5 borehole utilizing the Joy #1 drill rig.
- b. Continued verification of activities on UZ-14 borehole, utilizing the LM-300 drill rig.
- c. Closed Field Verification Plan, FVP-92-022-0. Sent records package to RSN Records Coordinator.

3. Sample Management Facility, (SMF/SAIC)

- a. Support drilling operations and continued processing core on NRG-5. No drilling activity on UZ-14.
- b. Removed 157 specimens from core for LANL and USGS.
- c. Laid out approximately 220 boxes of core from UZ-16, NRG-6, NRG-3, and NRG-2 for examination by Sandia and USGS.
- d. Sample Overview committee met, 05/05.

4. YMP Hydrologic Research Facility, (USGS)

The following activities were accomplished by USGS Staff.

- a. Monitoring Tracer gas injection at UZ-14.
- b. Collecting data and calibrate equipment at seismic sites on the Ranch.
- c. Mapping Ghost Dance Fault in the area of Antler Ridge.
- d. Logging of Trench SCR-T1 and SCR-T3, completed trench log for outer north wall of Trench 14D.

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Participated in aerial overflight of Quaternary faults.

- e. Conducting mapping Upper Paint Brush Canyon.
- f. Conducting overflights of Yucca Mountain and surrounding areas to collect moisture and temperature data, and for Laser Mapping and Surveying.
- g. Conducting geologic mapping of ESF North Ramp.
- h. Performing field work in Rock Valley.
- i. Conduct water level measurements.
- j. Collecting water flow data and set up new sites.
- k. Log core from UZ-16 for Deep UZ Project.

5. Reynolds Electrical and Engineering Co., Inc., (REECO)

A. Drilling

- a. JP 92-17, UZ-14, LM-300 drill rig, cored to 141.94 feet, reamed to 141.50 feet. 9 5/8 dual-wall pipe stuck while pulling out of hole.
- b. JP 92-11, NRG-5 hammered 5 7/8" hole to 689.65 feet. Lost returns at 676 feet. Cored 3.937" to 814.47 feet.

B. Logistics

- a. Continued requisitioning supplies, materials, and services for YMP Field Operations Center.
- b. Supported tours during the week.
- c. Supported construction efforts in Area 25.

C. Construction

- a. JP 92-20, "ESF North Portal Pad and Facilities...REECO continued preparing ESF access road subgrade for application of aggregate base course; Finished drilling and shot round NP-NS-001 and NP-SS-001; began rework of rip-rap in drainage channel; shot trim round NP-SS-002; advanced south slash; removed muck; drilled for and installed 27 Williams Bolts on 5' centers, started grouting in the back.

6. Los Alamos National Laboratory, (LANL)

- a. Continued monitoring construction activities at the north portal box cut.
- b. Continued to blast in Starter Tunnel. Mapping, photography and surveying continue. Shotcreting of crown commenced right after mapping.
- c. Continue to obtain list of individuals available for shift work for the Field Test Coordinator.
- d. PI's placed their geophones, geophones recorded data from blasts and peak particle velocity was determined.
- e. Survey crews provided REECO with elevations coordinates.

7. Document and Records Center, (CRWMS M&O)

- a. Received and Issued to following Controlled Documents:

Job Packages

YMP/JP 93-05, Rev. 0, "Drilling and Testing of Borehole UE25 NRG-2A."

Test Planning Packages N/A

Specifications N/A

Drawings N/A

Work Programs

YMP/WP/93-06, Rev. 1, "UE-25 NRG-3 North Ramp Borehole Work Program."

YMP/WP/93-12, Rev. 0, "UE-25 NRG-2A North Ramp Borehole Work Program."

Field Change Requests (FORS)

FCR 93/297, "Wingwall Geometry."

FCR 93/318, "Change to MG143 to Allow Cement Grout and Hollow Core Rockbolts."

FCR 93/304, "Removal of Hold H-12 from the Drawing."

FCR 93/305, "Removal of Hold H-13 from the Drawing."

FCR 93/296, "Documentation Ground Control Care and Maintenance Items in Spec SP09."

FCR 93/297, Rev 1 Reissue.

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FCR 93/307, "UE-25 NRG-5, North Ramp Borehole, Revision 0."

FCR 93-320, "Correction of Typo Error on SS-M-SK018."

FCR 93/321, "Certification Requirement Change to Rock Bolt Specifications."

b. Reproduction:

9,340 pages copied.

754 drawings copied.

c. Documents Issued:

800 controlled documents

663 FCR's

11 DWG's

102 WP's

46 JP's

230 information copies

d. DTAR logoffs: 248

8. Field Training

a. Eight (8) personnel attended the New Underground Worker Training.

b. Radiological Control Technician Testing was conducted. A Total of 9 personnel took the testing.

*Winfred A. Wilson*

Winfred A. Wilson  
Site Manager

YMP:WAW-93/121

cc:

R. M. Cameron, CRWMS M&O/YMSO, Mercury, NV

M. D. Voegele, SAIC, Las Vegas, NV

R. R. Schneider, SAIC/YMSO, Mercury, NV

G. K. Beall, SAIC, Las Vegas, NV

C. L. Lugo, SAIC, Mercury, NV

E. M. Gardiner, SAIC, Las Vegas, NV

C. J. Cotten, SAIC, Las Vegas, NV

G. D. Milligan, YMP, Las Vegas, NV

M. B. Blanchard, YMP, Las Vegas, NV

R. V. Barton, YMP, Las Vegas, NV

J. R. Dyer, YMP, Las Vegas, NV

S. B. Jones, YMP, Las Vegas, NV



# Reynolds Electrical & Engineering Co., Inc.

Post Office Box 98521 • Las Vegas, NV 89193-8521

*Chas 7/21*

REPLY REFER TO:  
580-01-420

WBS 1.2.9.1  
QA: N/A

May 10, 1993

Carl P. Gertz, Project Manager  
Yucca Mountain Site Characterization  
Project Office  
U.S. Department of Energy  
Post Office Box 98608  
Las Vegas, NV 89193-8608

## YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT (YMP) STATUS REPORT (SCP: N/A)

Attached is the April YMP Status Report for Reynolds Electrical & Engineering Co., Inc.'s participation in the YMP.

If further information is required, please contact Rene' R. Knott at 794-7193.

*Rene R. Knott For R.E.P.*

R. F. Pritchett, Manager  
Yucca Mountain Project Division  
YMP Technical Project Officer

RFP:RRK:mab

Enclosure  
Status Report (3 pages)

cy: See page 2



**REYNOLDS ELECTRICAL & ENGINEERING CO., INC.  
(REECo)**

**YUCCA MOUNTAIN SITE CHARACTERIZATION ~~PROJECT (TEMP)~~**

**APRIL 1993 - STATUS REPORT**

Reeco has no reportable Level 0 or Level 1 Milestones. REECo met Proposed Level 3 Milestone OR02 for initiation of underground excavation on April 2, 1993.

**SITE (1.2.3)**

**WBS 1.2.3.2**

**Task: USGS Integrated Data Acquisition System (IDAS)**

Continued support of IDAS to include technical support, equipment testing, maintenance and repairs.

**WBS 1.2.3.5**

**Task: Capital Equipment to support Drilling Programs**

Awaiting approval and funding transfer of \$100,000 requested in the Capital Requirements Plan submitted in February.

**Task: USW UZ-14 Drilling (Job Package 92-17)**

Completed mobilization of the LM-300 drill rig and associated equipment from UZ-16 to UZ-14 and began coring/drilling operations on April 15, 1993. Set 16-inch surface casing at 51.36 feet and cemented to surface. Currently coring and reaming from under surface casing at 141 feet. Scheduled total depth for UZ-14 is 2,000 feet.

**Task: UE-25 NRG-5 North Portal Ramp Borehole (Job Package 93-3A)**

Constructed access road and drill pad. Began mobilizing the Joy 1 Drill Rig and associated equipment on April 16, 1993. Currently hammer drilling at 689 feet. Scheduled total depth of NRG-5 is 950 feet with continuous core from 710 feet to 950 feet.

**Task: USW WT-7 Additional Work Activities (Job Package 93-13)**

Completed USW WT-7, Additional Work Activities, April 9, 1993. All equipment was returned to the Area 25 Subdock.

**Procurement Actions**

Issued a Notice to Proceed to Central Fishing Tool, Inc. so that support of drilling fishing operations would be available within ten hours following notification.

**REGULATORY (1.2.5)**

**WBS 1.2.5.2.4**

**Task: Site Characterization Plan (SCP) Reference Library and Database**

Continued distribution and database maintenance for the SCP and Progress Reports. Distributed two sets of the SCP and four copies of Progress Report #7 during this reporting period.

## **EXPLORATORY STUDIES (1.2.6)**

### **WBS 1.2.6.1**

#### **Task: Exploratory Studies Facility (ESF)**

Continued administrative support for ESF activities to include planning, scheduling, and ~~revising~~. Revised three Technical Control (TC) Procedures and wrote three Interim Change Notices to TC procedures in response to Field Change Requests issued by the M&O affecting design specifications; performed 50% Title II Design Review of Package 1B; and issued rental request for shotcrete boom.

#### **Task: Technical Support and Underground Excavation for the ESF (RFP 1-DH-92)**

Definitized the selected offeror's proposal received on April 27, 1993, for Request For Proposal (RFP) 1-DH-93, Technical Support for Underground Excavation. The package is in Procurement review. Conducted a meeting with Kiewit Construction Company at their request, to clarify accomplishment of Task 1 requirements.

#### **Task: Procurement of a Tunnel Boring Machine (RFP 2-DH-93)**

Procurement is proceeding on schedule. Revised proposals received from all offerors on April 6, 1993. Received written permission from DOE/NV on April 20, 1993 for use of Progress Payments. Best and Final Offers were received from all proposers on April 20, 1993. Review of apparent successful offeror's accounting system for acceptability for progress payments performed on April 20 through April 23, 1993. Technical review of proposer's facilities completed on April 23, 1993. Purchase Order file has been assembled and is in the Procurement Review cycle.

#### **Task: ESF North Portal Pad & Facilities (Job Package 92-20)**

Completed fill work on North Portal Pad to top of subgrade; completed grouting and testing 10-foot rockbolts on highwall for portal protection; mined 61 feet of Pilot Drift in the top heading; bolted, wired, and fibercreted same; supported mappers in pilot drifts; lowered ramp pad to spring line elevation and predrilled slash cut perimeter holes; continued mobilizing mining infrastructure including walkers' office, telephones, electrical utilities, and traced water batch system; continued Drainage Channel rip rap production and placement; completed Topsoil and Rock Storage Access Road, all drainage ditches associated with this area and the Rock Storage Pad; completed the installation of the twin 48-inch reinforced concrete pipe storm drains under the North Portal Pad Access road; and began plating the North Portal Pad Access road with aggregate base course.

The work to be performed by St. George Steel and the manufacturer of the portal gate, with Curtis Steel for reinforcing bars, was suspended until further notice. St. George Steel has submitted a claim for the suspended work which will have to be resolved. Wulfenstein Construction Company was also directed to delay the delivery of aggregate for one month.

RFP 12-DH-93, Prefabricated Metal Building (Switchgear Building), issued on April 14, 1993 with a closing date of May 4, 1993.

## **TEST FACILITIES (1.2.7)**

### **Task: Field Operations Support**

Continued logistical and tour support for DOE Yucca Mountain Site (YMSO) staff. Fourteen tours were held during this period with 669 people attending. Support included but was not limited to arrangements for buses, registration of guests, coordination of lunches/beverages, medical service, furniture, and mechanical service. Continued preparations for upcoming tours.



Continued support services to participants and maintenance of YMP utilized facilities, utilities, equipment and roads in Area 25. Suspended installation of new chiller unit and auxiliary units for Building 4015, Area 25 Field Operations Center, due to funding limitations. Incremental funding was identified and authorized by the Project Office. Operations scheduled to resume on May 10, 1993. We are working with the Project Office to obtain remaining funding required to complete this task.

#### **PROJECT MANAGEMENT (1.2.9)**

##### **WBS 1.2.9**

##### **Task: Technical Project Office Management/Project Control**

Continued normal administrative level of effort support. Continued status and update of Planning and Control System (PACS); supported ESF Construction activities, drilling activities, and completed cost estimates as required.

#### **QUALITY ASSURANCE (1.2.11)**

##### **WBS 1.2.11**

##### **Task: Quality Assurance**

Continued normal administrative level of effort support. One Corrective Action Report (CAR) was issued identifying a significant condition adverse to quality in the area of material control.

Responses to the CARs issued as a result of the March 1993 audit of inspection activities have been received by the QA Office. The responses are currently being evaluated for acceptability.

#### **ENVIRONMENT, SAFETY & HEALTH (1.2.13)**

##### **WBS 1.2.13**

##### **Task: Safety & Occupational Health**

Provided medical, occupational safety, industrial hygiene and fire protection support. Completed training for experienced underground workers during this period.

#### **SUPPORT SERVICES (1.2.15)**

##### **WBS 1.2.15**

##### **Task: Administrative Support and Training**

Continued to provide procurement, logistical, and information management administrative level of effort support; continued support services to various YMP participants.

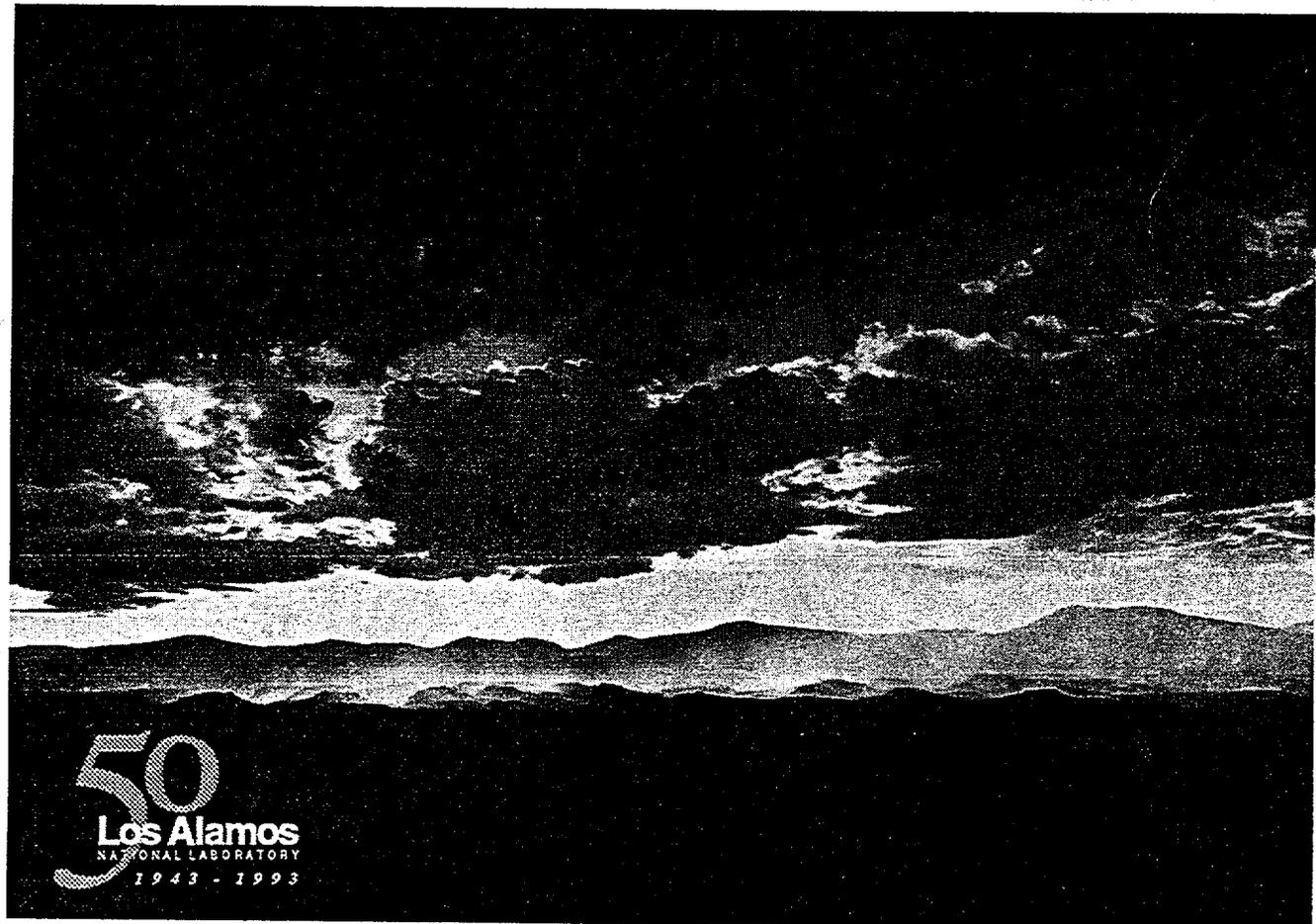
Staffed the Technical Information Display at the American Association of Petroleum Geologists 1993 annual convention in New Orleans, Louisiana; and provided a technical information display at the International High-Level Radioactive Waste Management Conference in Las Vegas, Nevada.

*Charlotte*

# *Yucca Mountain Site Characterization Project*

## *Monthly Activity Report*

*February/March 1993*



**50**  
**Los Alamos**  
NATIONAL LABORATORY  
1943 - 1993

Photograph by Chris J. Lindberg

*Attachment to TWS-EES-13-05-93-026*

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**LOS ALAMOS NATIONAL LABORATORY**  
**YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT**  
**Monthly Activity Report**  
**February/March 1993**

**WBS 1.2.1**

**Systems Engineering**

**Objective**

The objective of this task is to integrate systems with the Geologic Repository Program, to describe the Yucca Mountain Site Characterization Project Mined Geologic Disposal System, and to evaluate the performance of the natural, engineered barrier, and total systems for meeting regulatory standards.

**Activities and Accomplishments**

Staff attended the CASY meeting on thermal loads in Denver.

Staff attended the kick-off meeting to support a systems-engineering-based thermal decision paper.

D. Bish was appointed to the Working Group on Geochemistry, which will evaluate thermal goals.

**Planned Activities**

None

**Problem Areas**

None

**WBS 1.2.3.1.1 Site Investigation Coordination and Planning/  
Site Management**

**Objective** The objective of this task is to manage and coordinate site characterization activities.

**Activities and Accomplishments** The TPO supported the Geochemistry Integration Team (GIT) meetings and telecon. E. Springer attended a Hydrology Integration Task Force (HITF) meeting on 11 February at LLNL. Participants discussed thermal-loading issues and how characterization of the hydrologic system will be affected. J. Fabryka-Martin replaced E. Springer as Los Alamos representative to the HITF.

The TPO supported planning for the Colloid Workshop to be held in Santa Fe 3-5 May and attended the CASY meeting on thermal loading in Denver.

The TPO assessed the technical progress in geochemistry, hydrology, and geology; evaluated planning, milestones, and variance analysis; and worked with the M&O to prepare the FY94 Annual Plan.

**Planned Activities** No planned activities reported.

**Problem Areas** None

**WBS 1.2.3.1.2**

**Site Investigation Coordination and Planning/  
Test Management and Integration**

**Objective**

The objective of this task is to manage and integrate ESF and Los Alamos site characterization test activities and to provide coordination for Los Alamos surface-based test planning and package development.

**Activities and  
Accomplishments**

**Surface-based Test Coordination.** Staff participated in the work scope consolidation by the M&O for SRG-5. Test planning package (TPP) and job packages (JP) TPP 92-16 and JP 92-17 (USW UZ-14) were signed for CI-36 sample collection from cuttings during borehole drilling.

Staff continued to develop an administrative database, which will be merged with the YMP GIS, to identify and track Los Alamos interfaces with other participant and Project surface-based testing activities.

B. Carlos represented the principal investigators at the February and March Sample Overview Committee meetings.

**ESF Test Coordination.** The Test Coordination Office completed coordinating geologic mapping in conjunction with construction at the ESF north-ramp starter tunnel.

Staff completed Phase II of ESF test planning for the following test planning TPPs and JPs: "Geologic Mapping," "Perched Water," and "Monitoring in Conjunction with North-portal Starter Tunnel Construction," and forwarded them to YMPO.

Staff revised the schedule for Phase III ESF testing to reflect the latest construction schedule.

Staff coordinated FY94 ESF testing capital equipment budget requests.

**Planned Activities**

Continue evolution and support of the Los Alamos surface-based and ESF activities in response to the Project program directives.

**Problem Areas**

None

### **WBS 1.2.3.2.1.1.1 Mineralogy, Petrology, and Rock Chemistry of Transport Pathways**

#### **Objective**

The purpose of this activity is to define the important mineralogical and geochemical variables along fracture and rock-matrix transport pathways at Yucca Mountain, in support of performance assessment and to evaluate the impact of repository construction on natural waste-transport barriers.

#### **Activities and Accomplishments**

D. Vaniman reviewed the Erosion topical report.

D. Vaniman described portions of drill core UE-25 UZ-16 at the Sample Management Facility on 23-24 February. Systematic sampling at spaces of less than 20 ft. apart will be used to define vertical variations in mineralogy, and distributed bulk samples of the lower Topopah Spring Member and of tuff from Calico Hills will be used to concentrate trace minerals for sorption studies. In contrast to previous sampling of other drill cores for XRD mineralogy, sample spacing for this new core is closer and focused on the critical barriers between the welded Tiva and Topopah units and the potential repository horizon and the water table. Vaniman described approximately half of UZ-16; the remainder will be described for sampling after drilling is completed.

On 10-11 March, D. Vaniman obtained samples of opal, calcite, and clay from exposed depths to 18 m in the ramp starter tunnel. Because shallow intervals were often missed in the drilling program, these samples are excellent sources of mineral deposits that have been rarely sampled in drill cores.

B. Carlos examined fractures in core from UE-25 UZ-16 at the SMF and selected samples for further analysis.

R. Raymond obtained probe data on Yucca Mountain clinoptilolites (from UE-25b #1H, UE-25a #1, G-2, G-4) to search for chemical variation, vertically and laterally and within large crystals.

Twenty-four fracture samples from drill holes USW G-1, G-2, GU-3, and G-4 were analyzed using x-ray powder diffraction (XRD), and goethite was seen for the first time at Yucca Mountain in sample USW G-2-2812.1. Re-analysis of previously collected fracture XRD data also confirmed goethite in sample USW G-2-3000.2. Both samples were from below the water table, and each also contained a significant amount of hematite (hematite >> goethite).

R. Raymond and G. Guthrie collected dust samples in the vicinity of UZ-16 to assess their background levels and changes that may have resulted from operations at UZ-16. Arrangements were also made to have air-filter samples collected by D. Chapman of SAIC. Raymond, Guthrie, and D. Bish were preparing a LAMS report on the distribution of hazardous minerals at Yucca Mountain (Milestone 3352).

Images of material collected on filters located near rock saws at the SMF were obtained. New SEM images and analyses of erionite, mordenite, and palygorskite were obtained from Yucca Mountain samples.

G. Guthrie presented a briefing at the March TPO meeting on potentially hazardous airborne minerals at Yucca Mountain. He discussed research dealing with mordenite as a possible carcinogen. He pointed out that although researchers have not demonstrated that mordenite is carcinogenic, the existing data are of poor quality and were obtained with poorly defined samples.

**Planned Activities**

Collection and compilation of data on zeolites in fractures from "old" core will continue, with emphasis on microprobe and XRD analysis. Preliminary information on fracture-lining minerals in UE-25 UZ-16 will be prepared for inclusion in a preliminary report on UE-25 UZ-16 to be compiled by the USGS.

Work planned within the next few months includes the following activities:

- (1) continue analysis of fracture-coating minerals in existing drill core, with emphasis on microprobe and XRD analysis, and prepare paper on distribution of fracture-lining zeolites at Yucca Mountain for inclusion in the proceedings volume for Zeolite '93;
- (2) continue analysis of calcites to understand transport and precipitation mechanisms;
- (3) sample UE-25 UZ-16 for studies of stratigraphic variability in bulk mineralogy;
- (4) preliminary information on fracture-lining minerals in UE-25 UZ-16 will be prepared for inclusion in a preliminary report on UE-25 UZ-16 to be compiled by the USGS;
- (5) continue statistical evaluation of X-ray powder diffraction quantitative mineral analysis.

**Problem Areas**

We are concerned because it is taking approximately 3 months for the investigator to receive samples from the SMF, once distribution of the samples is approved by the SOC. Because requests for samples must be submitted 3 weeks before the SOC meeting, we must wait a total of more than 4 months from the time we identify a sample to the time we receive it. This is becoming a serious problem, delaying milestones and other reports.

**Milestone Progress**

3130

15 December 1993

*Fracture Mineralogy of the Paintbrush Tuff*

Expanded scope.

3352

31 March 1993

*Fibrous Minerals at Yucca Mountain*

3361

1 July 1993

*Thermal Behavior of Natural Zeolites*

3364

1 June 1993

*Distribution of Fracture-Lining Zeolites at Yucca Mountain, Nevada*

3365

1 July 1993

*Equilibrium Modeling of the Formation of Zeolites in Fractures at Yucca Mountain, Nevada*

**Publications**

D. L. Bish  
*Thermal Behavior of Natural Zeolites*  
Conference paper, *Zeolites '93*  
Submitted to YMPO.

D. L. Bish and D. T. Vaniman  
*The Importance of Zeolites in the Potential High-Level Radioactive Repository at Yucca Mountain*  
Conference paper, *Zeolites '93*  
In preparation.

D. Broxton  
*Geological Evaluation of Six nonweleded tuff sites in the vicinity of Yucca Mountain, Nevada, for a surface-based test facility for the Yucca Mountain Project.* (3137)  
LA-series report  
Submitted to YMPO.

B. Carlos, D. Bish, S. Chipera, and S. Craven  
*Fracture-Lining Manganese Oxide Minerals in a Silicic Tuff*  
Conference paper, *Zeolites '93*  
Approved by YMPO.

B. Carlos, S. Chipera, and D. Bish  
*Distribution of Fracture-Lining Zeolites at Yucca Mountain, Nevada*  
Conference paper, *Zeolite '93*  
Approved by YMPO.

S. J. Chipera, D. L. Bish, and B. A. Carlos  
*Equilibrium Modeling of the Formation of Zeolites in Fractures at Yucca Mountain, Nevada*  
Conference paper, *Zeolites '93*  
Approved by YMPO.

G. D. Guthrie, D. L. Bish, and B. T. Mossman  
*Quantitative Analysis of Zeolite-Bearing Dusts Using the Rietveld Method*  
Journal article, *Science*  
Submitted to *Science*.

D. Vaniman  
*Calcite Deposits in Fractures at Yucca Mountain, Nevada*  
Conference paper, *International High-Level Waste Management Conference*  
Approved by YMPO.

D. Vaniman, D. Bish, D. Broxton, B. Carlos, S. Chipera, and S. Levy  
*Mineralogy as a Factor in Radioactive Waste Transport Through Pyroclastic Rocks at Yucca Mountain, Nevada*  
Journal article, submitted to *Bulletin of the Geological of Society of America*.

D. T. Vaniman  
*Calcite Deposits in Drill Cores USW G-2 and USW GU-3/G-3 at Yucca Mountain, Nevada*  
LA-series report  
Approved by YMPO.

## **WBS 1.2.3.2.1.1.2 Mineralogical and Geochemical Alteration**

### **Objective**

The objective of this task is to characterize past and present natural alteration processes that have affected the potential geologic repository and to predict future effects of natural and repository-induced alteration.

### **Activities and Accomplishments**

D. Bish and S. Levy attended the USGS /CASY symposium on the effects of repository thermal loading on fluid movement and geochemistry at Yucca Mountain. Bish presented data on the mineralogical effects of short- and long-term heating of zeolites, smectite, and glass, and he emphasized that these phases can be affected simply by changing the water vapor pressure. Levy discussed natural hydrothermal alteration during the cooling of the Topopah Spring and Tiva Canyon pyroclastic deposits and its potential for natural analog studies. Bish was appointed to the SCP Thermal Goals Working Group, which is evaluating SCP thermal goals. He will oversee geochemical and mineralogical considerations.

Bish and Levy also discussed thermal loading concerns with staff from LLNL. Specifically, they discussed the assumptions inherent in the calculations performed by T. Buscheck and J. Nitao and the importance of mineralogical and petrological features in their modeling. Bish and Levy also discussed the information on mineralogical effects of heating and natural hydrothermal alteration discussed above. The participants identified numerous experimental and modeling needs that are important in understanding the behavior of a "hot repository."

D. Vaniman and D. Bish attended a meeting on 10-11 March in Las Vegas to discuss thermal loading effects. The discussion focused on cooperative studies on mineral stability by LLNL and Los Alamos. S. Levy and D. Vaniman met at the Sample Management Facility during the week of 15 March with representatives of the ESF wall mappers and others involved in ESF planning to discuss mineralogy-petrology sampling needs.

D. Vaniman, J. Whelan (USGS), and S. Levy and members of the mapping team visited the north ramp portal face, on the east side of Exile Hill, and noted several important features exposed in the portal face. These features included (1) many fractures and lithophysal cavities in the densely welded Tiva Canyon wall rock coated and partly filled with waxy clay accumulations and (2) a few large-aperture fractures contain argillized silicic ash that may correspond to ash flows between the Tiva Canyon and Rainier Mesa tuffs.

### **Planned Activities**

W. Carey will begin a postdoctoral appointment this summer. He will study the thermodynamics of water in zeolites, smectite, and glass at Yucca Mountain and the kinetics of dehydration of these phases.

The steam-heating experiments will continue; the samples will be examined for mineralogical changes on a periodic basis. Chemical and mineralogical characterization of samples of bedrock breccias and hydrothermal deposits exposed at the surface will continue, as will calcite-silica laminated-deposit studies.

G. WoldeGabriel will travel to Cleveland in April to do K/Ar analysis of samples from Lake Tecopa and Barstow. The minerals to be dated include feldspars, clays, and clinoptilolite (with or without mordenite), including material subjected to cation exchange at elevated temperatures.

A follow-up field (and perhaps SMF) orientation session for the ESF wall mappers and the mineralogy-petrology researchers is tentatively set for April.

**Problem Areas** None

**Milestone Progress** 3138  
30 September 1993  
*Chemical Transport in Zeolitic Alteration*

3142  
31 January 1993  
*K/Ar Dating of Clays and Zeolites*  
Submitted to TPO.

3150  
15 April 1993  
*Final Report on Bedrock*

3343  
30 September 1993  
Zeolite Dating

3361  
1 April 1993  
*Thermal Behavior of Natural Zeolites*

**Publications**

D. Bish and J. Aronson  
*Paleothermal and Paleohydrologic Conditions in Silicic Tuff from Yucca Mountain, Nevada*  
Journal article, *Clay and Clay Minerals*  
Submitted to *Clay and Clay Minerals*.

S. Levy  
*Surface-discharging hydrothermal systems at Yucca Mountain -- examining the evidence*  
Proceedings paper, *Materials Research Society Fall Meeting*  
Approved by YMPO; submitted.

S. Levy and C. Naeser  
*Bedrock Breccias Along Fault Zones near Yucca Mountain, Nevada*  
Chapter in USGS Bulletin on Yucca Mountain studies  
In USGS editorial review.

S. Reneau  
*Manganese Accumulation in Rock Varnish in a Desert Piedmont, Mojave Desert, California, and Application to Evaluating Varnish Development*  
Journal article, *Quaternary Research*  
Accepted for publication.

D. Vaniman, D. Bish, and S. Chipera  
*Dehydration and Rehydration of a Tuff Vitrophyre*  
Journal article, *Journal of Geophysical Research* (3143)  
Approved by YMPO.

D. Vaniman, S. Chipera, and D. Bish  
*Pedogenesis of Siliceous Calcretes at Yucca Mountain, Nevada* (3141)  
Journal article  
Approved by YMPO.

**WBS 1.2.3.2.1.2 Stability of Minerals and Glasses**

**Objective**

The objective of this activity is to produce a model for past and future mineral alteration in Yucca Mountain. The model is intended to explain the natural mineral evolution resulting from the transformation of metastable mineral assemblages to more stable assemblages and the effects of a repository emplacement.

**Activities and Accomplishments**

D. Bish met with H. Barnes of Pennsylvania State University and A. Lasaga of Yale University to discuss appropriate means of obtaining information on the reaction kinetics of minerals at Yucca Mountain. The study plan entitled "Kinetics and Thermodynamics of Mineral Evolution at Yucca Mountain" was being modified to reflect these recent interactions.

## **WBS 1.2.3.2.5 Postclosure Tectonics**

### **Objective**

The objective of these volcanism studies is to determine the hazards of future volcanic activities with respect to siting a high-level radioactive waste repository at Yucca Mountain.

### **Activities and Accomplishments**

A draft of the Volcanism Status Report was completed.

Revisions were completed to Study Plans 8.3.1.8.1.1, "Probability of Magmatic Disruption of the Repository" and 8.3.1.8.5.1, "Characterization of Volcanic Features."

Revised calculations of the recurrence rate of volcanic events (E1); the disruption ratio (E2); and the probability of magmatic disruption of the repository, the controlled area, and the Yucca Mountain region ( $\Pr[E2 \text{ given } E1] \Pr[E1]$ ) were completed. This work differs from previous work in which the calculations established probability bounds. We found that the most likely value of the probability of magmatic disruption of the repository is  $< 1$  in 10,000 in 10,000 years. The most likely values of the probability of magmatic disruption of the controlled area and the Yucca Mountain region are  $> 1$  in 10,000 in 10,000 years.

**Lathrop Wells Volcanic Center.** Trenching studies resumed. We re-examined the basal contact of the Q13 lava flow to determine the thermoluminescence (TL) age of sediments below the lava, and we verified the stratigraphic contact of the sediments. A TL age of the sediments of about 30 ka does not agree with results using other geochronology methods, and we have no current explanation for this.

We examined the field relations of a cluster of small satellite cones located south of the main cone; the cones are marked by a north-south alignment of conduit plugs formed by agglutinated vent scoria and are associated spatially with a distinctive sequence of black tephra-fall deposits containing pyroclastic surge deposits. These deposits cannot be traced to the main cone or to the quarry section, in which we have identified tephra units interbedded with soil with horizon development.

A soil pit was dug and enlarged to a trench (Qs1); soil units in the trench were interbedded with possible tephra deposits, and the tephra deposits exhibited lateral continuity through the trench walls, except where they were cross-cut by channels and infilled with aeolian sands or where they were bioturbated. Two soil pits were dug on the flanks of a Qs6 scoria mound.

Staff completed additional measurements of the cosmogenic surface-exposure ages of the volcanic units. Multiple sample sites from the Q15 lava showed consistent ages of about  $70 \pm 4$  ka, which suggests that the sample sites share a uniform exposure history and that the ages may be close to the age of the lava flows. A surface scoria sample collected near summit of the main cone yielded an age of about 30 ka. A sample of welded spatter from the Qs2b fissure yielded a cosmogenic helium age of 49 ka.

Surface samples for cosmogenic helium studies were collected from a separate lobe of the Q15 lava, new sites were collected from surfaces of the Q13 and Q14 lavas, and a sample was collected from the Qs2d vents. Samples were collected from the interior of Q14b and from the main cone.

**Activities and Accomplishments (cont.)**

**Work in Progress.** Sample preparations for olivine separations of four new samples were completed. The samples include a spatter mound from the southeast end of the northwest-trending fissure (Qs2b), a lava sample of Ql6 and surface scoria samples from the main cone (Qs2a).

Staff completed X-axis isotopic measurements to determine the U-Th disequilibrium of a sample from the Little Black Cone center and for a re-analysis of Ql4.

We are still awaiting results of  $^{40}\text{Ar}/^{39}\text{Ar}$  age determinations of lithic fragments from the Ql3 lava of Lathrop Wells.

**Planned Activities**

Field studies of the distribution of lithic fragments in dissected basalt centers will be undertaken at sites in Nevada, Arizona, and New Mexico in April and May.

**Problem Areas**

We are concerned because commercial quarrying activity at the Lathrop Wells center has increased, and key outcrops that provide the basis for establishing the stratigraphic relations of the youngest volcanic units of the center may be removed or disturbed in the next few months.

**Milestone Progress**

3075

30 September 1993

*Preliminary Geologic Mapping of Volcanic Centers*

3129

30 September 1993

*Geochemistry of Lathrop Wells*

R482/3252

30 September 1993

*Volcanism Status Report*

First draft complete; revised draft due 1 March 1993.

**Publications**

B. M. Crowe, et al.

*Volcanism Status Report*

First draft complete; revised draft due 1 March 1993.

**WBS 1.2.3.2.8.1      Rock-Varnish Dating Support for USGS Neotectonic Studies**

|                                       |  |
|---------------------------------------|--|
| <b>Objective</b>                      | This activity will provide rock-varnish dating support in various areas of surface site characterization activities including erosion, neotectonics, and paleoclimate.   |
| <b>Activities and Accomplishments</b> | <p>No progress during February because all effort was required to complete the Erosion topical report (See 1.2.5.2.2).</p> <p>C. Harrington began planning with USGS staff for the study of fault scarps along the Windy Wash, Stagecoach Road/Paintbrush Canyon, and Solitario Canyon Faults. Field studies and scoping studies for trying to date formation (exposure) of the scarps were discussed.</p> |
| <b>Planned Activities</b>             | No planned activities reported this month.   |
| <b>Problem Areas</b>                  | None   |
| <b>Milestone Progress</b>             | None   |
| <b>Publications</b>                   | None   |

**WBS 1.2.3.3.1.2.2 Water-Movement Tracer Tests**

|                                       |   |
|---------------------------------------|---|
| <b>Objective</b>                      | The objective of the water-movement tracer tests is to obtain measurements of chlorine isotope distributions to help quantify the percolation of precipitation in the unsaturated zone.   |
| <b>Activities and Accomplishments</b> | <p>Hydro Geo Chem submitted five YMP rock samples to Purdue University for chlorine-36 analysis as part of an interlaboratory comparison, and the Purdue results were within two standard deviations of those of LLNL and the University of Rochester. These results provided us with confidence in the reliability and reproducibility of the analyses over a wide range of concentrations. In addition, all 5 samples submitted to monitor background levels showed acceptably low, and reproducible, chlorine-36 results.</p> <p>Hydro Geo Chem submitted a suite of 14 rock samples to LLNL for chlorine-36 analysis. The rock samples were derived primarily from the Paintbrush nonwelded area that was intercepted by Neutron-access Boreholes UZ-N11, N37, and N53.</p> <p>Chlorine-36 results were also obtained for two shallow-rock samples from UZ-N55. Previous chlorine-36 analyses had indicated contamination of cuttings samples collected from the depth interval 165 to 265 ft; the purpose of the most recent analyses was to determine whether the contamination extended to the surface samples. The results were well above meteoric background levels, although not as high as those for the deeper samples. This is probably because of dilution of the high signal by the higher <i>in-situ</i> chloride content of these near-surface samples.</p> <p>Hydro Geo Chem began measuring chloride and bromide profiles on 64 samples from UZ-16; the depths of the samples ranged from surface to 1171 ft.</p> <p>J. Fabryka-Martin and M. Wickham of Hydro Geo Chem attended a three-day Vadose-Zone Workshop at the University of Arizona (17-19 March), which included presentations and demonstrations of techniques for measuring and modeling moisture movement in the unsaturated zone.</p> |
| <b>Planned Activities</b>             | Revise existing DPs; prepare new DPs; process soil samples for Cl/Br and chlorine-36/Cl ratios; process cuttings samples from UZ-16 and neutron-access boreholes; participate in planning activities for sample collection from ESF; collect additional soil samples from Yucca Mountain area as opportunities arise.   |
| <b>Problem Areas</b>                  | None  |
| <b>Milestone Progress</b>             | <p>3191<br/><i>Procedure for Chlorine-36 Analysis of Unsaturated Zone Samples</i><br/>30 September 1992<br/>99% complete</p> <p>3362<br/>30 November 1993<br/><i>Summary of Cl-36 Work</i></p>  |
| <b>Publications</b>                   | <p>J. Fabryka-Martin<br/><i>Summary of Cl-36 Work</i><br/>Conference paper, <i>Focus '93</i><br/>In preparation.</p>  |

### **WBS 1.2.3.3.1.2.5 Diffusion Tests in the ESF**

**Objective**

The objective of this task is to determine *in situ* the extent to which the nonsorbing tracers diffuse into the water-filled pores of the Topopah Spring welded unit.

**Activities and Accomplishments**

This task has been deferred because of lack of funding.

### WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-water Flow System (Reactive Tracer Testing)

#### Objective

Experiments will be conducted at the C-Well complex (holes UE-25c #1, UE-25c #2, and UE-25c #3) and other wells in the vicinity of Yucca Mountain using reactive tracers to characterize retardation and transport properties at a larger scale than currently used in laboratory experiments.

#### Activities and Accomplishments

B. Robinson revised the Los Alamos SQAP, which will be distributed for review. B. Robinson continued his duties as CCB Chair, and Z. Dash continued as a member of the CCB.

Code development for SORBEQ was completed and staff was preparing the documentation as a Los Alamos report .

We began using a new application, NONLIN\_LSQ. This code will allow us to perform nonlinear least-squares fits for any model in a stand-alone program. The application will successively invoke the model program, adjusting the specified parameter values until a fit is obtained. We envision that NONLIN\_LSQ will be used to invoke simulators such as FEHMN to obtain fits to laboratory and field experimental data.

The C-Well fractures selected for colloid transport experiments were cut into shapes appropriate for fitting with inlet and outlet flow ports. The manifolds, which are unique for each fracture specimen, were designed and the parts are ready to be machined.

Staff was preparing to determine the experimental conditions and procedures to carry out flow and transport tests on a fractured sample of Bandelier tuff.

A draft of a paper describing lithium batch sorption experiments was being prepared.

The column to be used for lithium column sorption experiments was being prepared, and the crushed core from Well C-2 was ready for packing.

We continued to explore using the flow cytometer to measure colloid concentrations in solution. Standards in deionized water and J-13 water were prepared, and the samples were tested. Although we are evaluating several techniques for measuring microsphere concentrations, we believe that the flow cytometer will significantly add to our ability to detect microspheres. It will make microsphere-transport field tests, which require that very low concentrations be detected, much more feasible in the future.

#### Planned Activities

Contribute to the SQA effort by serving as CCB Chair (B. Robinson).

Complete documentation of batch sorption experiments with lithium bromide.

Continue modeling studies using FEHMN to support the design of the field tests.

Pack column to be used in Li column tests, develop operating techniques for the experiments.

Manufacture manifolds for fractures to be used in colloid transport tests, and continue to develop techniques for flow and transport tests.

#### Problem Areas

None

**Milestone Progress**

3188  
31 March 1993  
*Documentation for SORBEQ*  
In technical review.

3194  
30 September 1992  
*Batch Sorption Experiments with Lithium*  
Rescheduled to March 1993 because of personnel reassignment.

T112  
22 June 1992  
*Final Documentation for FEHM*  
Rescheduled to June 1993 because of personnel reassignment.  
(Code has received conditional certification.)

3196  
27 July 1992  
*FRACNET Documentation*  
Rescheduled to August 1993 because of personnel reassignment.

**Publications**

B. A. Robinson  
*FRACNET—Fracture Network Model for Water Flow and Solute Transport (3196)*  
LA-series report  
In preparation.

B. A. Robinson  
*SORBEQ—A One-Dimensional Model for Simulating Column Transport Experiments (3188)*  
LA-series report  
In technical review.

B. A. Robinson  
*A Strategy for Validating a Conceptual Model for Radionuclide Migration in the Saturated Zone Beneath Yucca Mountain*  
Journal article, *Radioactive Waste Management and the Nuclear Fuel Cycle - Special issue on the Yucca Mountain Project*  
Submitted to YMPO (Russell Dyer).

W. L. Polzer and E. H. Essington  
*The Use of Selectivity Coefficients to Estimate Modified Langmuir Isotherm Parameters as a Function of Experimental Conditions*  
Journal article, *Radioactive Waste Management and the Nuclear Fuel Cycle - Special issue on the Yucca Mountain Project*  
Submitted to YMPO (Russell Dyer).

P. Reimus, R. Glass, and B. Robinson  
*Aperture Characteristics, Saturated Fluid Flow, and Tracer Transport Calculations for a Natural Fracture*  
Conference paper, *1993 High-Level Radioactive Waste Management Conference*  
Approved by YMPO.

**WBS 1.2.3.4.1.1 Ground-water Chemistry Model**

|                                       |  |
|---------------------------------------|--|
| <b>Objective</b>                      | The goal of this investigation is to provide conceptual and mathematical models of the ground-water chemistry at Yucca Mountain. These models will explain the present ground-water composition in relation to interactions of minerals and ground-water and will be used to predict ground-water compositions as a result of anticipated and unanticipated environments.  |
| <b>Activities and Accomplishments</b> | <p>Staff continued to review comments and revise the "Ground-water Chemistry Model" study plan, R0. Special attention was being given to sensitivity analysis and redox sections, as well as to the section on stable isotope constraints on water composition.</p> <p><b>Other Activities.</b> Staff continued modeling related to "most active ground-waters." M. Ebinger met with members of the Solubility (WBS 1.2.3.4.1.3) task to discuss aspects of current modeling. A letter report of the results of this exercise has been delayed until May 1993 in order to address needs of both the Sorption (WBS 1.2.3.4.1.2.1) and Solubility tasks.</p> <p>Modeling of pH and Eh stability continued.</p> |
| <b>Planned Activities</b>             | <p>Continue resolution of comments on study plan.</p> <p>Continue to model "most-active ground-waters" using input from the Radionuclide and Sorption tasks.</p> <p>USGS collaboration will continue.</p> <p>Discussions continued concerning water chemistry, stable isotope constraints on water composition, and the ground-water chemistry model.</p> <p>Continue support of QA efforts.</p>   |
| <b>Problem Areas</b>                  | None   |
| <b>Milestone Progress</b>             | <p>3415<br/>30 September 1993<br/><i>Letter report on Most-Active Ground-water Chemistry</i><br/>(input to Milestone 3349 [Dynamic Transport])</p>   |
| <b>Publicatlons</b>                   | None   |

### WBS 1.2.3.4.1.2.1 Batch Sorption Studies

**Objective**

The objective of this task is to provide sorption coefficients for elements of interest to predict radionuclide movements from the repository to the accessible environment.

**Activities and Accomplishments**

We performed batch sorption experiments to study the effect of organic coatings on metal sorption onto minerals in Yucca Mountain tuffs. Based on the results of Minai et al., we chose 3-(3,4-dihydroxyphenyl)-DL-aniline, DOPA, as the model organic compound and Al and Fe oxides (boehmite and goethite) as the solid phases. Isotherm results for DOPA sorption onto Al and Fe oxides showed that DOPA adsorbs strongly onto these solid phases.

We also began experiments to evaluate the effect of organic coatings on the sorption of cadmium (Cd). We obtained sorption isotherms for Cd via the batch sorption method, with initial CdCl<sub>2</sub> concentrations of 2, 4, 6, 8, and 10 x 10<sup>-5</sup> M. The solid-to-solution ratio in these batch experiments was 3-4 grams oxide/liter of solution. The adsorption isotherms for the Cd ion on pure and DOPA-coated oxide surfaces at pH 6.5 are given in Figure 1 (where the DOPA concentrations used for coating are given in molarity). The quantity of DOPA left in solution following sorption was very low.

Our results indicate that the sorption of Cd onto Fe oxide is enhanced by the presence of the organic coating; however, Cd sorption onto Al oxide decreases as the amount of organic coating increases. The enhancement or decrease of Cd sorption was small (20%).

Adsorption of Cd on Al & Fe Oxides at pH 6.5 with and without DOPA

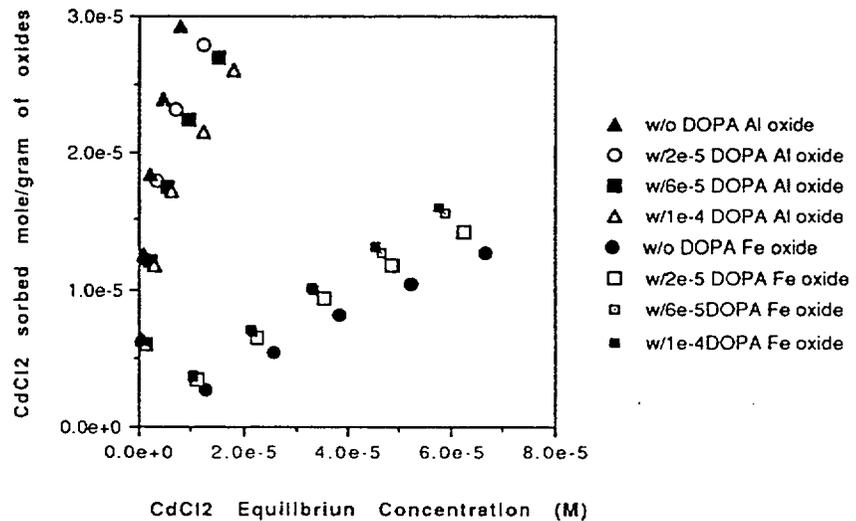


Fig. 1

We measured sorption of Np onto tuffs and pure minerals as a function of Np concentration, ground-water composition, and temperature and completed a set of batch sorption experiments using the following minerals: hematite, calcite, quartz, and clinoptilolite; and tuffs G4-270 and G4-1506. The tuff, quartz, and natural calcite samples were wet-sieved to obtain particles in the size range of 75 to 500  $\mu\text{m}$ , and we pretreated the solid phases for two weeks with the ground-water (J-13 or UE-25p #1) in the ratio of 1 g of solid to 20 ml of solution. The Np solution was contained in Oak-Ridge tubes (Fig. 2); the initial concentration was  $10^{-7}$  M; and the experiments were run at 25, 60, and 90°C. Preliminary results (Table I and II) indicated that for Np, temperature has a very limited effect on the batch sorption coefficients.

For all cases but calcite, the batch sorption coefficient for Np remained constant or increased very slightly as temperature increased. For calcite, the Np sorption distribution coefficient decreased with increasing temperature.

Table I. Np Sorption as a function of T in J-13 Ground-water

| Solid Phase    | Origin    | Kd (ml/g)   |             |             |
|----------------|-----------|-------------|-------------|-------------|
|                |           | 30°C        | 60°C        | 90°C        |
| Hematite       | synthetic | $\sim 10^3$ | $\sim 10^3$ | $\sim 10^3$ |
| Calcite        | Mexico    | 90          | 30          | 10          |
| Calcite        | synthetic | 50          | 30          |             |
| Clinoptilolite | Idaho     | 3           | 4           | 3           |
| Quartz         | Arkansas  | 0           | 0.4         | 3           |
| Tuff           | G4-270    | 1           | 1           | 1           |
| Tuff           | G4-1506   | 3           | 4           | 4           |

Table II. Np Sorption as a function of T in UE25p #1 Ground-water

| Solid Phase    | Origin    | Kd (ml/g)   |             |
|----------------|-----------|-------------|-------------|
|                |           | 30°C        | 60°C        |
| Hematite       | synthetic | $\sim 10^3$ | $\sim 10^3$ |
| Calcite        | synthetic | 50          | 30          |
| Clinoptilolite | Idaho     | 1           | 2           |
| Quartz         | Arkansas  | 0.1         | 4           |
| Tuff           | G4-270    | 1           | 3           |
| Tuff           | G4-1506   | 1           | 2           |

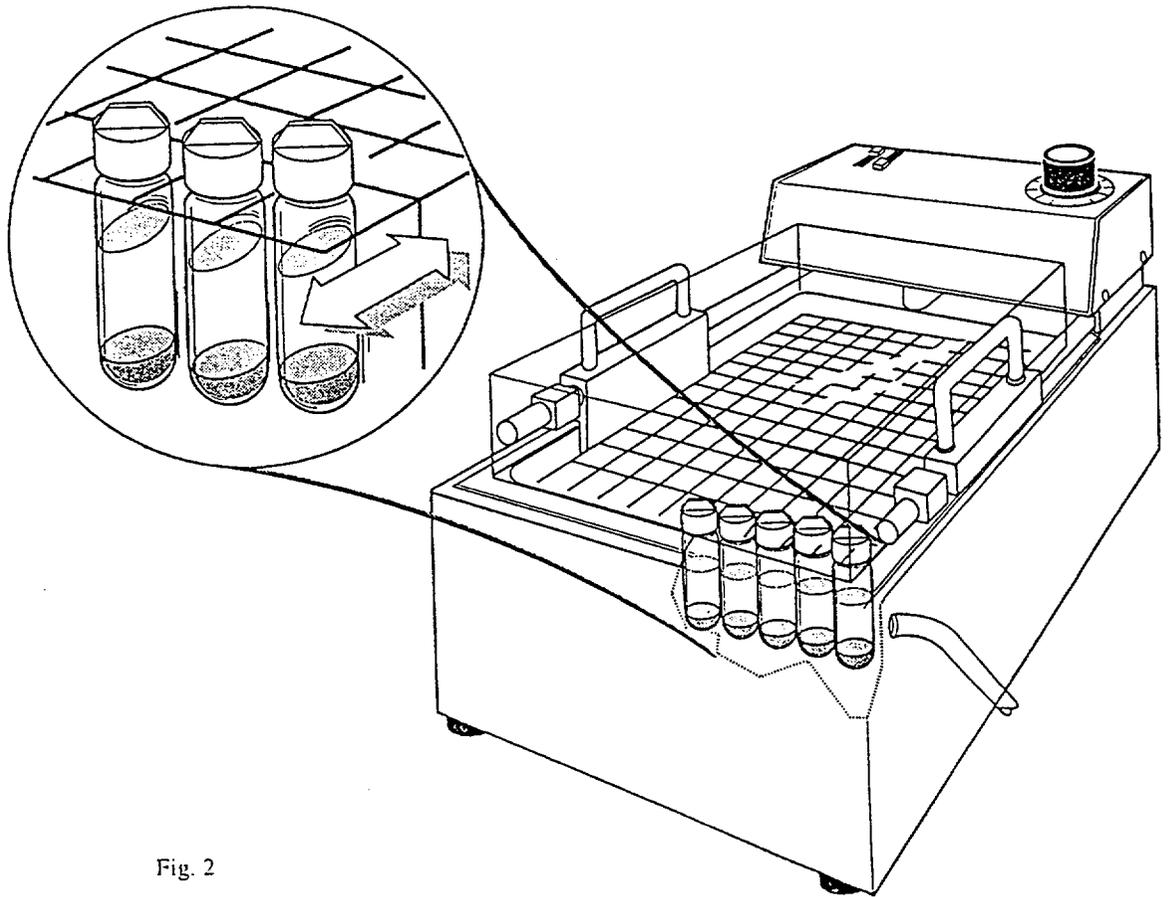


Fig. 2

**Planned Activities** Continue work in all areas discussed above.

**Problem Areas** None

**Milestone Progress**

3218  
30 September 1993  
*Effects of Water-Rock Ratios on Sorption Coefficients*

3345  
30 June 1993  
*Neptunium Sorption onto Feldspar*

3346  
30 September 1993  
*Sorption as a Function of Temperature*

**Publications**

P. S. Z. Rogers and A. Meijer  
*Dependence of Radio nuclide Sorption on Sample Grinding, Surface Area, and Water Composition*  
Conference paper, 1993 International High-level Waste Management Conference  
Approved by YMPO. (Milestone 3009)

### WBS 1.2.3.4.1.2.3 Sorption Models

**Objective**

The objective of this task is to provide sorption models for elements of interest to predict radionuclide movements from the repository to the accessible environment.

**Activities and Accomplishments**

Discussions with J. Leckie of Stanford University have sparked renewed interest in his surface-complexation approach to modeling of Np adsorption onto Yucca Mountain tuffs. We will supply him with existing batch sorption results and well-characterized samples of devitrified tuff from the Topopah Springs member, and Leckie will attempt to model Np sorption on these samples. The desired result is a model capable of calculating the change in sorption caused by changes in solution pH, composition, or competing cation content.

Leckie is also modeling (using the surface complexation approach) Np adsorption on the pure minerals silica, albite, gibbsite, and kaolinite, and experimental results for U adsorption on goethite and hematite are also being treated. Modeling of  $UO_2^{2+}$  adsorption on goethite and hematite continued, and the results will be included in the milestone report now in preparation. A separation procedure for cleanup of  $^{232}U$  from daughter products was tested and found acceptable.

P. Rogers and M. Hawley continued atomic force microscopy studies of natural goethite samples. As expected, several freshly cleaved surfaces of goethite crystals had surface coverings, and they could not remove these compounds without damaging the underlying surface. They plan to spend time looking at hematite surfaces, with the hope that less reactive, clean surfaces will be found. They will coordinate this work with a study of the surfaces of hematite crystals, separated from Topopah Spring tuff, which will be examined for natural surface coatings.

**Planned Activities**

Continue integration with J. Leckie.

Continue characterization of natural goethite surfaces and tests of surface cleaning methods.

Characterize the surfaces of hematite crystals separated from Topopah Spring tuff.

**Problem Areas**

None

**Milestone Progress**

3347  
30 September 1993  
*AFM Analysis of Hematite and Goethite*

**Publications**

None

**WBS 1.2.3.4.1.2.2 Biological Sorption and Transport**

|                                       |  |
|---------------------------------------|--|
| <b>Objective</b>                      | The purpose of this research is to determine whether microbial activity can influence the movement of plutonium in tuff. Because fluids are used extensively in the exploration of locations for a nuclear repository, those micro-organisms capable of utilizing drilling fluids as growth substrates are of special interest.  |
| <b>Activities and Accomplishments</b> | <p>Work is continuing at UC Berkeley on microbial mineral dissolution experiments. There does appear to be a slight difference in the growth of microorganisms on hematite, when compared to an iron free control. This difference does not appear to be statistically significant; however, experimental conditions will be modified to optimize the difference. For example, the energy source (succinate) concentration and the incubation temperature will be reduced. These changes will retard the growth of the microorganisms, thus enabling them to have a longer exposure time to the hematite.</p> <p>Work has continued on the crushed tuff column studies at Los Alamos. Currently columns are being refitted to eliminate leaks.</p>   |
| <b>Planned Activities</b>             | Continue soil column and mineral dissolution experiments.  |
| <b>Problem Areas</b>                  | None   |
| <b>Milestone Progress</b>             | <p>3080<br/>30 September 1992<br/><i>Report on Chelation; Retitled Preliminary Evidence of a Siderphore Plutonium Complex</i><br/>Completed; approved by YMPO on 18 April 1991.</p> <p>3092<br/>30 September 1992<br/><i>Report on Colloidal Agglomeration</i><br/>Draft completed. Milestone completion delayed until TPO decides on suitable publication vehicle. (Probably will be published as an LAMS report.)</p> <p>3176<br/>30 September 1992<br/><i>Procedure for Determination of Formation Constants</i><br/>Completed, Submitted to QA project leader 26 February 1993.<br/>(Does not require DOE review.)</p> <p>3177<br/>30 September 1992<br/><i>Procedure for Determination of Effects on Colloidal Agglomeration</i><br/>Completed; submitted to QA project leader<br/>(Does not require DOE review.)</p> |
| <b>Publications</b>                   | <p>L. E. Hersman, P. D. Palmer, and D. E. Hobart<br/><i>Preliminary Evidence of a Siderphore Plutonium Complex</i><br/>Conference proceedings, <i>Proceedings of the Fall Meeting of the Materials Research Society</i></p> <p>L. E. Hersman<br/><i>Report on Colloidal Agglomeration</i><br/>LA-series report.<br/>In preparation.</p>  |

### WBS 1.2.3.4.1.3 Radionuclide Retardation by Precipitation Processes

#### Objective

The objective of the solubility determination task is to determine the solubilities and speciation of important waste elements under conditions characteristic of the repository and along flow paths from the repository into the accessible environment.

#### Activities and Accomplishments

P. Palmer was recognized as the National Technician of the Year at the 205th National Meeting of the American Chemical Society in Denver, CO, March 28 - April 2, 1993. In addition to Palmer, D. Clark, S. Ekberg, D. Morris, H. Nitsche, and D. Tait represented this task at the meeting.

**Speciation.** We obtained results for our UV/V absorption study of  $\text{NpO}_2^+$  species in (bi)carbonate media. At least three species were observed consistently for 0.4 mM Np at 0.9 M (bi)carbonate concentrations from pH 8.4 to 13. This information will serve as a starting point for parallel NMR studies and bicarbonate-concentration and temperature-dependent UV/V experiments.

We continued PAS oxidation-state determinations of 250 nM Pu / bicarbonate solutions at pH = 8.5 to 9 at elevated (75°C) temperatures, and inconsistencies in results have forced us to consider the possibility of sample deterioration. We are concerned about photo-reduction of the Pu by the intense laser pulses operating at 450 nm (2.8 eV); to test this possibility, we have subjected a concentrated (1 mM) Pu(VI) carbonate solution to hours of laser irradiation. The results of this study are pending.

A technical review of "Evaluation of Alternative Detection Schemes for Actinide Speciation using Photoacoustic Spectroscopy" by Tait et al. (Milestone 3330), which describes the development phase of our photoacoustic spectrometer system has been completed. This milestone was forwarded to the TPO for policy review. Staff incorporated internal review comments on Milestone 3031, "Actinide(IV) and Actinide(VI) Carbonate Speciation Studies by PAS and NMR Spectroscopies" by Clark et al. This report was also forwarded to the TPO.

Carbon-13 NMR experiments on U(VI) and Np(V) carbonates continued. Ionic strength corrections were applied to Nuclear Energy Agency data used by Project EQ3/6 modelers and compared to our recent carbon-13 and oxygen-17 NMR data. This comparison showed that NMR did an outstanding job of working out thermodynamic binding constants and revealing which species were present in solution, albeit at higher concentrations. This data will be compared to low-concentration speciation data, which was collected using PAS.

**Solubility.** The Np undersaturation experiment at pH 8.5 was concluded by examining the last of the supernatant by adsorption spectroscopy. All of the Np(V) in the pH 8.5 solution was complexed by carbonate.

The oxidation-state assay for the Np experiment in UE-25p #1 at pH 8.5 and 60°C was completed, and no Np(IV) was found; however, 17% of the total Np may be in the hexavalent oxidation state ( $\text{NpO}_2^{2+}$ ). For the Am/Nd undersaturation experiments in UE-25p #1 water at 60°C, the initial solution concentrations at all pH values were comparable to those obtained at the end of the oversaturation experiments.

Milestone 3329, "Measured Solubilities and Speciations from Oversaturation Experiments of Neptunium, Plutonium, and Americium in UE-25p #1 Well Water from the Yucca Mountain Region" was revised in response to reviewer comments. Four Technical Data Information Forms were completed for Milestones 3010, "Measured

|   |   |
|---|---|
| <b>Activities and Accomplishments (cont.)</b> | Solubilities and Speciations of Neptunium, Plutonium, and Americium in a Typical Ground-water (J-13) from the Yucca Mountain Region," and 3329, "Measured Solubilities and Speciations from Oversaturation Experiments of Neptunium, Plutonium, and Americium in UE-25p #1 Well Water from the Yucca Mountain Region."  |
| <b>Planned Activities</b>                     | Continue work in all areas described above.   |
| <b>Problem Areas</b>                          | A cooling problem has prevented operation of the PAS system for the past several months.  |
| <b>Milestone Progress</b>                     | <p>3031<br/>30 September 1992<br/><i>Actinide(IV) and Actinide(VI) Carbonate Speciation Studies by NMR and PAS Spectroscopies</i><br/>Submitted to TPO.</p> <p>3329<br/>30 September 1992<br/><i>Measured Solubilities and Speciations from Oversaturation Experiments of Neptunium, Plutonium, and Americium in UE-25p #1 Well Water from the Yucca Mountain Region</i><br/>Technical review completed; reviewer comments returned to LBL.</p> <p>3330<br/>30 January 1993<br/><i>Evaluation of Alternative Detection Schemes in Photoacoustic Spectroscopy</i><br/>Submitted to TPO.</p> <p>3344<br/>30 September 1993<br/><i>Report on Comparison of Solubilities of Np, Am, and Pu Between J-13 and UE-25p #1 Waters</i><br/>On schedule.</p> <p>3350<br/>30 September 1993<br/><i>PAS Analysis of Pu(IV) Carbonate Systems</i><br/>On schedule.</p> <p>3351<br/>30 September 1993<br/><i>NMR Analysis of Np(V) and Pu(IV) Carbonate Systems</i><br/>On schedule.</p> <p>3363<br/>30 April 1993<br/><i>Radionuclide Solubility and Speciation Studies for the Yucca Mountain Site Characterization Project</i><br/>Completed.</p> |

**Publications**

D. L. Clark, D. E. Hobart, P. D. Palmer, J. C. Sullivan, and B. E. Stout  
*Carbon-13 NMR Characterization of Plutonyl(VI) Aqueous Carbonate Complexes*  
Journal article, *Journal of the American Chemical Society*  
In preparation.

D. L. Clark, C. D. Tait, D. E. Morris, D. E. Hobart, S. A. Ekberg, and P. D. Palmer  
*Actinide(IV) and Actinide(VI) Carbonate Speciation Studies by NMR and PAS Spectroscopies* (3031)  
LA-series report  
In preparation.

D. L. Clark, J. G. Watkin, D. E. Morris, and J. M. Berg  
*Molecular Models for Actinide Speciation*  
LA-series report  
In preparation.

H. Nitsche, R. C. Gatti, E. M. Standifer, S. C. Lee A. Miller, T. Prussin,  
R. S. Deinhammer, H. Maurer, K. Becraft, S. Leung, and S. A. Carpenter  
*Measured Solubilities and Speciations of Neptunium, Plutonium, and Americium in a Typical Ground-water (J-13) from the Yucca Mountain Region* (3010)  
LA-series report  
Approved by YMPO; accession numbers being obtained; camera-ready.

H. Nitsche, et al.  
*Radionuclide Solubility and Speciation Studies for the Yucca Mountain Site Characterization Project*  
Conference paper, *1993 International High-Level Waste Management Conference*  
Approved by YMPO. (Milestone 3363)

C. D. Tait, D. E. Morris, J. M. Berg and W. H. Woodruff  
*Evaluation of Alternative Detection Schemes in Photoacoustic Spectroscopy*  
Journal article, *Analytical Chemistry or Reviews of Scientific Instrumentation* (3330)  
In preparation.

C. D. Tait, S. A. Ekberg, P. D. Palmer, and D. E. Morris  
*Plutonium (IV) Carbonate Speciation Changes*  
Journal article, *Inorganic Chemistry* (3350)  
In internal review.

#### **NBS 1.2.3.4.1.4 Radionuclide Retardation by Dispersive, Diffusive, and Advective Processes**

##### **Objective**

The objectives of this task are to determine the rate of radionuclide movement along the potential flow paths to the accessible environment and to examine the effect of diffusion, adsorption, dispersion, anion exclusion, sorption kinetics, and colloid movements in the flow geometries and hydrologic conditions expected to exist along the flow path to the accessible environment in the scenarios used for perform assessment.

##### **Activities and Accomplishments**

We began two sets of experiments to continue study of the transport of Np through Yucca Mountain tuffs. In the first set, we studied the kinetics of Np sorption using wafers of intact tuff, which were placed in contact with a Np solution in water from Well J-13 or from UE-25p #1. To determine the uptake of Np by the wafer, aliquots were taken as a function of time. The wafers were made of tuffs G4-270 and G4-1532.

In the second set of experiments, we eluted a Np solution through crushed-tuff columns to determine whether Np sorption onto tuff is reversible, linear, and instantaneous in waters from J-13 and UE-25 p#1. Four crushed-tuff columns were prepared from tuffs G4-270 and G4-1506, and we established flow rates through them using water from J-13 and UE-25 p#1.

We also eluted tritiated water from J-13 and UE-25p #1 through columns of intact tuff G4-1531 to determine their hydrologic parameters. The flow rate for both of these columns was 0.05 ml/hr, and the porosity of tuff G4-1531 was 0.39. The cumulative activity recovered as a function of volume eluted may be found in Figures 1 and 2.

Considerable effort was spent preparing data for submission to the YMPO database. S. Weaver investigated how to electronically submit the data.

Intact Tuff Column G4-1531 with UE25 p#1 water

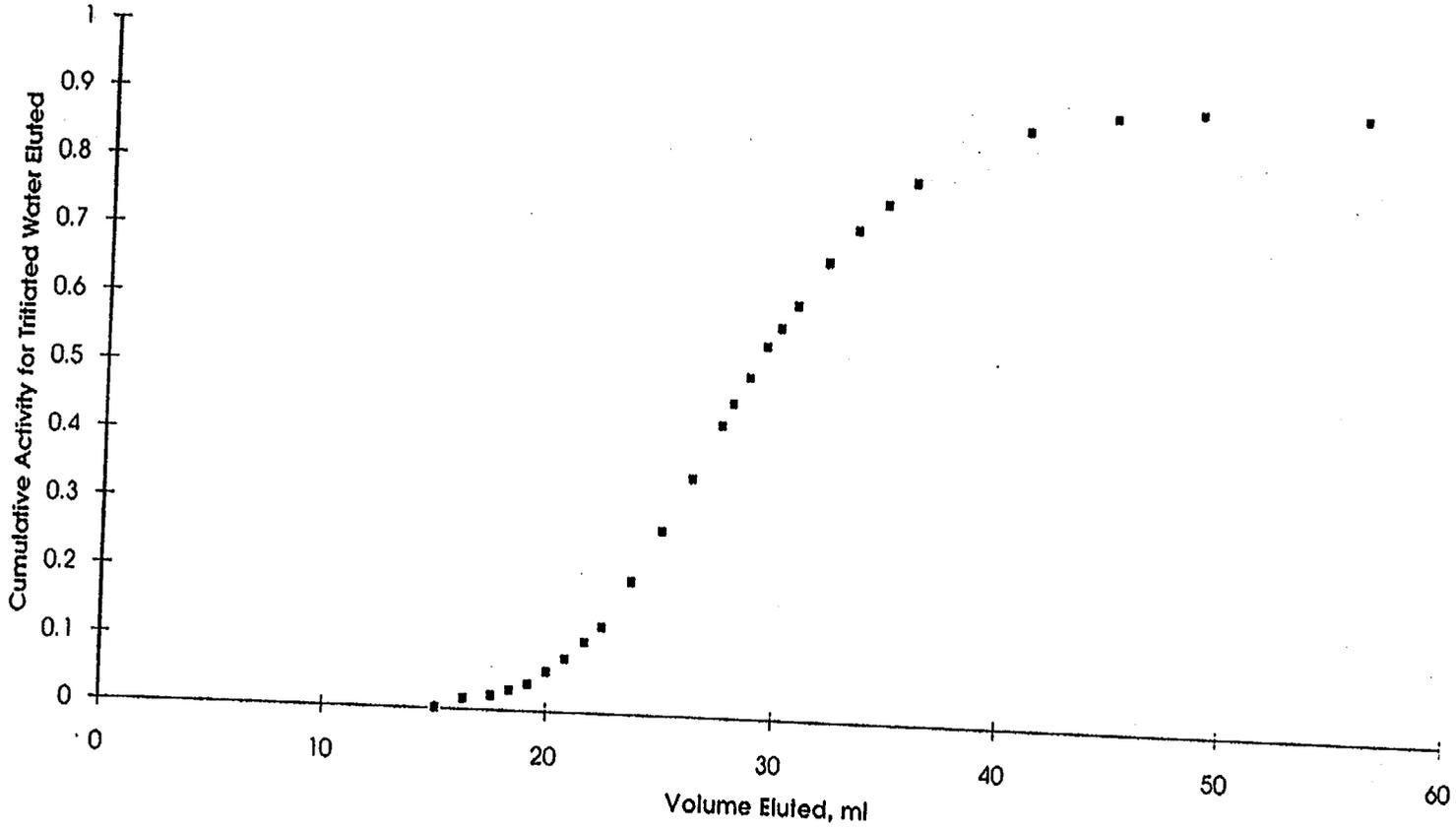


Fig. 1

Intact Tuff Column G4-1531 with J-13 water

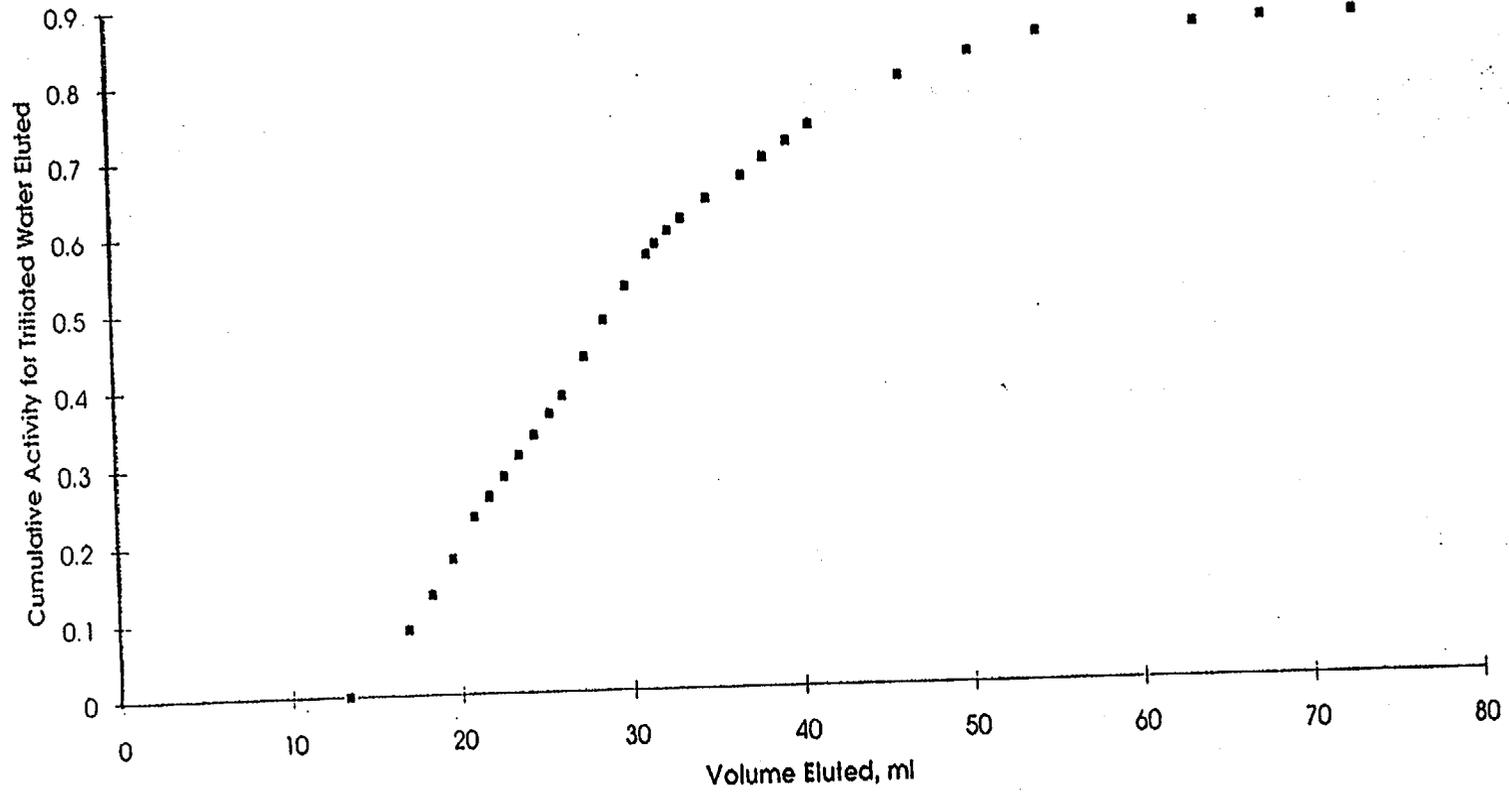


Fig. 2

I. Triay completed the first draft of the Colloid Workshop report entitled "Colloid-Facilitated Radionuclide Transport at Yucca Mountain." This report describes YMP colloid research, which will evaluate whether colloids will significantly increase radionuclide release from a potential repository at Yucca Mountain to the accessible environment. She identified research needs in the following areas: colloid sampling, colloid generation, colloid stability, radionuclide sorption onto colloids, and colloid migration. She also presented the colloid transport calculations that will be used to evaluate the data.

In planning strategy for colloid research, the following questions will be addressed:

*1. Are far-field naturally-occurring colloids present in the ground-water?*

Possible colloid studies to address this question include sampling and characterization of colloids to measure concentrations of inorganic colloids, organics, and microorganisms in waters from the saturated zone. Because of the relatively sparse vegetation at Yucca Mountain, we expect that organic colloids and microorganisms will not play a major role in the transport of colloids at Yucca Mountain. We must also determine the total organic carbon in the saturated zone ground-waters to address this question.

*2. Can colloids be formed in the near field at the proposed repository?*

Possible colloid studies to address this question include laboratory experiments that simulate near-field conditions, which would yield colloids that can carry radionuclides to the far field. The experiments will address formation of colloids from the waste form and the degradation of potential canister materials.

*3. Are the near- and far-field colloids stable in likely ground-waters (as a function of water chemistry and temperature)?*

Possible colloid studies to address this question include studying the stability of near-field colloids as a function of temperature; to address near-field colloid formation, we will study likely water chemistries in the unsaturated zone using colloids generated from laboratory experiments. The stability of far-field colloids (silica, zeolites, and clays) will be studied as a function of saturated water chemistry and temperature. Variations of Ca concentration to simulate the range of Ca concentrations at the Yucca Mountain Site will be undertaken. (Given the high near-field temperatures of the proposed repository that may result from possible thermal loads, it is expected that near-field colloids will not be stable.)

*4. Can near- and far-field colloids carry radionuclides? What is the capacity of the colloids to carry radionuclides? What is the mechanism for the reaction of radionuclides with the near- and far-field colloids to form radiocolloids?*

Possible colloid studies to address this question: Laboratory experiments that address the formation of near-field colloids can address all the questions for colloids that result from the waste form. For colloids that result from canister degradation and for far-field colloids, the most likely mechanism for radiocolloid formation is radionuclide sorption onto the colloid. The sorption behavior of actinides (Pu, Am, U, and Np) onto these colloids will be studied to determine radionuclide distributions between the colloids and the ground-waters and assess the reversibility of the sorption mechanism of radionuclides onto colloids. Spectroscopy studies will be used to identify the chemical reactions between the radionuclides and the colloids. Formation of humic or fulvic radiocolloids will be studied with the actinides and the organic fractions isolated from the far-field colloidal fraction in order to assess the importance of actinide-humate or fulvate species.

**5. Can the radiocolloids migrate over field-scale distances without being filtered?**

Possible colloid studies to address this question: The mobility of colloids through the medium at Yucca Mountain will be addressed using transport experiments. Laboratory-scale column experiments, which involve eluting well-characterized colloids (such as polystyrene spheres) and near-field and far-field radiocolloids through porous and fractured tuff columns, will be used to validate the colloid transport code CTCN. Elution of colloids through a large block (~ 1 m) of fractured tuff will be performed to bridge the gap between laboratory and field scales. Field-scale colloid transport will be studied by injecting polystyrene microspheres into the C-Wells, a group of boreholes located near the proposed repository at Yucca Mountain. These wells provide an opportunity to study colloid transport through saturated, fractured tuff, and the results will simulate formation of a radiocolloid that reaches the water table at Yucca Mountain. The C-Wells field experiments included injecting various tracers (including well-characterized colloids) into the saturated zone via an injection well and observing the appearance of these tracers in sampling wells at down-gradient locations. The C-Wells experiment will allow the validation of transport codes used to predict colloid transport through fractured tuff through large scales. When the transport code is validated, it can address the importance of colloid-facilitated radionuclide transport for performance assessment.

If the answer to any part of questions 1 to 4 is no, the remainder of the questions need not be answered. In other words, in order for colloids to facilitate radionuclide transport at Yucca Mountain, they must be present in stable suspensions in sufficient quantities, the radionuclides must be associated with the colloids (radiocolloid formation needs to occur), and the radiocolloids must be transported over field-scale distances.

The draft report for the Colloid Workshop (Milestone 3348) was under review by the members of the Geochemistry Integration Team. It will be refined following the Colloid Workshop.

|                           |  |
|---------------------------|--|
| <b>Planned Activities</b> | Work in all the above mentioned areas will continue. |
| <b>Problem Areas</b>      | None   |

**Milestone Progress**

3040

30 January 1993

*Kinetics of Sorption on Columns of Pure Minerals*

Completed on 30 October 1992; to be published in IHLWMC Proceedings.

3044

30 October 1993

*Measurement of Unsaturated Hydraulic Conductivity in Yucca Mountain Tuff*

Completed as Level IV Milestone in 1992; TPO requested that it be published, and a TIP review was initiated.

3065

*Techniques to Study Diffusion in Saturated Tuffs*

30 October 1992

Completed on 30 October 1992; to be published in IHLWMC Proceedings.

3348

30 September 1993

*Colloid Workshop Report*

3349

Summary Report on Np Transport through Yucca Mountain Tuffs

30 September 1993

On schedule.

**Publications**

A. Meijer

*Far-Field Transport of Carbon Dioxide: Retardation Mechanisms and Possible Validation Experiments*

Conference paper, *Focus '93 Site Characterization and Validation*

Submitted to TPO.

J. Conca

*Measurement of Unsaturated Hydraulic Conductivity in Yucca Mountain Tuff (3044)*

Conference paper, *Focus '93 Site Characterization and Validation*

In technical review.

I. R. Triay, K. H. Birdsell, A. J. Mitchell, and M. A. Ott

*Diffusion of Sorbing and Nonsorbing Radionuclides in Tuff*

Conference paper, *1993 International High-level Waste Management Conference*

Approved by YMPO.

I. R. Triay, M. A. Ott, A. J. Mitchell, and C. M. Overly

*Transport of Np through Yucca Mountain Tuffs*

Conference paper, *Proceedings of the fall meeting of the Materials Research Society, November 30 - December 4, 1992.*

Approved by YMPO.

I. R. Triay, B. A. Robinson, R. M. Lopez, A. J. Mitchell, and C. M. Overly

*Neptunium Retardation with Tuffs and Ground-waters from Yucca Mountain*

Conference paper, *1993 International High-level Waste Management Conference*

Approved by YMPO. (Milestone 3040)

**WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis**

|                                       |  |
|---------------------------------------|--|
| <b>Objective</b>                      | The objectives of this task are to construct a geochemical/geophysical model of Yucca Mountain and to use this model to examine the physical and chemical controls on radionuclide transport along flow paths to the assessable environment.   |
| <b>Activities and Accomplishments</b> | Three-dimensional grids for Yucca mountain were generated. These grids follow the stratigraphy closely and will be compared with previous three-dimensional runs on regular meshes. The advantage of our gridding technique is that the coarse grid can automatically be refined to a fine grid, while at the same time preserving the stratigraphy. As soon as we receive the newest three-dimensional stratigraphy from the USGS, we will discontinue using the SNL data we are now using. |
| <b>Planned Activities</b>             | <p>Begin calculations for <math>^{36}\text{Cl}</math> transport.</p> <p>Perform near-field, double-permeability calculations to test the performance of various thermal load designs.</p> <p>Build grids for YMP isothermal infiltration and transport calculations.</p>   |
| <b>Problem Areas</b>                  | None   |
| <b>Milestone Progress</b>             | <p>3052</p> <p>30 January 1993</p> <p><i>Baseline Documentation for TRACRN</i></p> <p>Received conditional certification; documentation is available from the Los Alamos software manager.</p> <p>Completed.</p>   |
| <b>Publications</b>                   | <p>K. Birdsell, K. Eggert, and B. Travis</p> <p>Three-Dimensional Simulations of Radionuclide Transport at Yucca Mountain</p> <p>Journal article, <i>Radioactive Waste Management and the Nuclear Fuel Cycle - Special issue on the Yucca Mountain Project</i></p> <p>Approved by YMPO.</p>  |

## **WBS 1.2.3.4.1.5.2 Demonstration of Applicability of Laboratory Data**

### **Objective**

The purpose of this study is to design and conduct experiments to evaluate the applicability of laboratory data and to test models used in the radionuclide transport program to determine far field radionuclide transport. Both intermediate- and field-scale experiments and natural analogs will be assessed for their potential to provide the required data.

### **Activities and Accomplishments**

This task has been deferred because of lack of funds.

### **Publications**

None

## WBS 1.2.5.2.2 Site Characterization Program

- Objective** The purpose of this task is to coordinate the regulatory Project requirements within the Los Alamos programmatic structure. The focus of this coordination effort is on the integration of the technical work within the regulatory framework.
- Management and Integration** The DOE topical report entitled "Evaluation of the Potentially Adverse Condition 'Evidence of Extreme Erosion during the Quaternary Period' at Yucca Mountain" was completed and published (DOE report YMP/92-41-TPR [March 1993]). C. Harrington provided significant input to the technical section of this report.
- Study Plans**
- Water Movement Test, R1 (8.3.1.2.2.2).** Review comments on Rev. 1 of the Study Plan were received from the YMPO in May 1992; they were addressed and returned to YMPO in December 1992. This study plan was approved on 10 February 1993 by the DOE; it was submitted to the NRC for a Phase I review on 18 February 1993.
- Diffusion Test in the Exploratory Studies Facility, R0 (8.3.1.2.2.5).** In April 1992, this study plan was accepted by DOE. In June 1992 it was submitted to the NRC for review.
- Testing of the C-Hole Sites With Reactive Tracers, R0 (8.3.1.2.3.1.7).** In February 1990, DOE/HQ issued the study plan (8.3.1.2.3.1) as a controlled document; it was then sent to the NRC for comments. The Los Alamos study plan (8.3.1.2.3.1.7) was approved. Staff reviewed NRC comments on the USGS study plan related to the first six C-wells activities and notified the DOE that they agreed with all NRC comments.
- Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1).** This study plan was returned in May 1992 from YMPO review; comments are now being addressed.
- Mineralogy, Petrology, and Chemistry of Transport Pathways, R0 (8.3.1.3.2.1).** In January 1992, we submitted revised NRC comments to T. Bjerstedt. In August 1992, YMPO requested that we word process the changes to be incorporated in the revision. That revision is in progress and staff is also responding to review comments from the State of Nevada received in January 1993.
- History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2).** The YMPO approved the study plan on 18 December 1991 and submitted it to the NRC on 31 January 1992. No further action has been required.
- Natural Analog Hydrothermal System in Tuff (8.3.1.3.3.1).** This is an out-year activity.
- Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3).** No progress during the recording period because of funding.
- Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3).** A new draft of the study plan combining studies 8.3.1.3.4.1 and 8.3.1.3.4.3) was submitted to YMPO for review in October 1992. Review comments were returned to Los Alamos in February 1993; these comments are being incorporated in the study plan.

**Study Plans  
(cont.)**

**Biological Sorption and Transport, R0 (8.3.1.3.4.2).** A revision addressing the Exploratory Shaft Design was submitted in September 1992. The study plan was approved by YMPO on 25 November 1992.

**Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2).** All YMPO comments on the study plan were resolved by the principal investigator in September 1992. Rev. 0 was submitted to YMPO for comment resolution, verification, and approval on 9 October 1992.

**Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1).** All YMPO comments on the study plan were resolved by the principal investigator in September 1992. This study plan was revised, incorporating YMPO and DOE review comments. It was returned to YMPO in March 1993.

**Diffusion, R0 (8.3.1.3.6.2).** All YMPO comments on the study plan were resolved by the principal investigator in September 1992. The study plan was revised in response to YMPO comments and returned to YMPO in November 1992.

**Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1).** This study plan was approved by the DOE and sent to the NRC for review in July 1992.

**Demonstration of the Applicability of Laboratory Data to Repository Transport Calculations, R0 (8.3.1.3.7.2).** This study plan is deferred because no funds were allocated.

**Gaseous Radionuclide Transport Calculations and Measurements, (8.3.1.3.8.1).** This study plan is deferred because no funds were allocated.

**Probability of Magmatic Disruption of the Repository, R0 (8.3.1.8.1.1).** A detailed technical review was completed in July 1992 by the NRC. In August 1992, a one-day video conference was held with the NRC to discuss their technical review comments. In response to those comments, this study plan was revised and submitted to YMPO for review in February 1993. It was accepted and sent to the NRC in March 1993 for review.

**Physical Processes of Magmatism and the Effects on the Repository, R0 (8.3.1.8.1.2).** A draft study plan was submitted to DOE for review in October 1992. The review comments were returned in January 1993 for comment resolution. Those comments are being addressed.

**Characterization of Volcanic Features, R0 (8.3.1.8.5.1).** This study plan was accepted by NRC on 4 September 1990. A minor revision was added in March 1993; this revision does not require a review by YMPO and the DOE.

**WBS 1.2.5.3.5      Technical Database Input****Objective**

The objective of this task is to coordinate input of technical data to the Project Technical Database (TDB) and the Automatic Technical Data Tracking System (ATDT).

**Activities and Accomplishments**

Submitted data on the following items to the TDB:

- Calcite Deposits in Drill Cores USW G-2 and USW GU-3/G-3 at Yucca Mountain, Nevada (LA000000000014.002).
- Geological Evaluation of Six Non-welded Tuff Sites in the Vicinity of Yucca Mountain, Nevada, for a Surface Based Test Facility for the Yucca Mountain Project (LA000000000015.002).
- Dehydration and Rehydration of a Tuff Vitrophyre (LA000000000017.002).
- Preliminary Assessment of Clinoptilolite K/Ar Results from Yucca Mountain, Nevada, USA; A Potential High-level Radioactive Waste Repository Site (LA000000000023.002).

**Planned Activities**

Resolve backlog issues of missing information on previous submittals to SEPDB.

Review data files to resolve difficulties and bring records up to date.

Determine if technical data needs to be logged into ATDT for current work on zeolites, saturated fluid flow, and other ongoing work of various principal investigators.

**Problem Areas**

None

**WBS 1.2.5.4.6      Development and Validation of Flow and Transport Models**

**Objective**                      Model testing is necessary to assess performance at Yucca Mountain. This task will conduct an experiment in a caisson facility to provide a baseline of confidence in models for transport.

**Activities and Accomplishments**      Final approval of the Special Work Permit for the caisson was received, and work began on installing the lower-boundary device on 17 March.

**Planned Activities**              Complete filling of the caisson. The lower-boundary device should be installed by 7 April.

**Problem Areas**                      None

**Milestone Progress**              3357  
30 September 1993  
*Caisson Experiments to Test Flow and Transport Models*

**Publications**                      E. P. Springer, M.D. Siegel, P. L. Hopkins, and R. J. Glass  
*Testing models of flow and transport in unsaturated porous media*  
Conference paper, *1993 High-Level Radioactive Waste Management Conference*  
Approved by YMPO.

**WBS 1.2.5.4.7      Supporting Calculations for Postclosure  
Performance Analyses**

**Objective**                      This task will provide documentation and results of calculations used in analyses of postclosure performance that supports design of repository, seals, and waste package and perform calculations of postclosure performance needed to support activities carried out under other performance assessment WBS elements.

**Activities and Accomplishments**                      Air-water diffusion terms were added to the computer code FEHM; this part of the code will be the subject of a new milestone entitled "Summary Report on Thermal Repository Calculations," due 30 September 1993.

**Planned Activities**                      No planned activities reported.

**Problem Areas**                      None

**Milestone Progress**                      4004  
30 September 1993  
*Summary Report on Thermal Repository Calculations*

**Publications**                      None

## **WBS 1.2.6                      Exploratory Studies Facility**

### **Objective**

These Exploratory Studies Facility (ESF) tasks address the issues and information needs associated with the ES-based characterization of Yucca Mountain to determine the suitability of permanently isolating high-level nuclear waste from biosphere in a geologic repository.

### **Activities and Accomplishments**

Staff scheduled and coordinated a meeting on consolidation of thermal testing in the ESF; it was attended by representatives of SNL, LLNL, CRWMS M&O, and Los Alamos. Staff met with representatives of the Colorado School of Mines to discuss mechanical methods for the mining of the ESF.

Staff continued to support activities pertaining to the use of tracers, fluids, and materials (TFM) at Yucca Mountain with emphasis on FY 1993 and starter-tunnel requirements. Staff was finalizing the Los Alamos TFM database. Staff requested information on waste-isolation impact and test-interference analysis for the TFMs from M&O. Staff participated in weekly field engineering/PA/QA meetings.

Staff attended a USGS-hosted meeting of CASY in Denver .

### **Planned Activities**

Staff will continue to focus on consolidating ESF thermal and mechanical testing and work with CRWMS M&O to develop mechanical mining techniques for the main test area of the ESF. Staff will work toward consolidating ESF thermal tests and developing integrated network and will continue to support Director of ED&D in the area of ESF testing in particular, testing for WBS 1.2.2 and 1.2.4. Staff will continue to gather information on TFM and coordinate IDS design.

Staff will meet 7-8 April at the Waste Isolation Pilot Plant (WIPP) to obtain information on IDS used at the WIPP site.

### **Publications**

N. Elkins

*Prioritization of ESF Testing and Integration with Design and Construction*  
Conference paper, 1993 International High-Level Radioactive Waste Management Conference

Approved by YMPO.

H. Kalia

*Control of Tracers, Fluids, and Materials for the Yucca Mountain Site Characterization Project*

Conference paper, 1993 International High-Level Radioactive Waste Management Conference

Approved by YMPO.

### **Problem Areas**

None

**WBS 1.2.6.8.4      Integrated Data System**

**Objective**                      The integrated data system (IDS) supports the Exploratory Studies Facility (ESF) test program by providing a central facility to automatically measure and control aspects of the ESF tests. The primary purposes of the IDS are to assist the principal investigators (PI's) in acquiring high-quality test data in a uniform, controlled fashion and to transfer those data to the PI's organizations for data management and analysis.

**Activities and Accomplishments**      No significant activities reported this month.

**Planned Activities**              No planned activities reported.

**Publications**                      H. Kalia  
*Acquisition of Test Data from the Exploratory Studies Facility for the Yucca Mountain Site Characterization Project*  
Conference paper, *Second International Symposium on Mine Mechanization and Automation*  
Approved by YMPO.

**Problem Areas**                      None

## **WBS 1.2.9.1.2 Technical Project Office Management**

### **Objective**

The objective of this task is to manage the Los Alamos Yucca Mountain Project Site Characterization Program.

### **Activities and Accomplishments**

The TPO attended TPO, TAG, CASY, and Program Review meetings.

The TPO presented a Los Alamos colloquium on YMP.

The TPO established weekly meetings with ES&H advisory staff and implemented a review of Los Alamos regulations, DOE orders, and DOE/YMP administrative procedures regarding ES&H requirements. A matrix is being developed to clarify how the Laboratory implements ES&H regulations and whether this implementation satisfies the requirements as interpreted by YMPO.

The TPO provided Los Alamos/YMP orientation to approximately 30 members of the Los Alamos staff.

**WBS 1.2.9.2.2**

**Project Control**

**Objective**

The objective of this task is to support management's efforts in planning, scheduling, and controlling the technical work. This task will develop, implement, and maintain computerized cost, schedule, and technical milestone data bases and develop strategies to meet management information requirements.

**Activities and Accomplishments**

Staff completed the resource requirements exercise for SAIC.

Staff completed the Los Alamos YMP Budget Submission and forwarded it to DOE/AL.

Staff submitted PACS status to YMPO on 11 February and 11 March.

Staff submitted the FY 1993 Basis of Estimates to YMPO.

**Planned Activities**

Download actual costs and forecasts from the Los Alamos central accounting system to our local workstation.

**Problem Areas**

None

## **WBS 1.2.11.2/3      Quality Assurance Program Development, Verification, and Engineering**

### **Objective**

The Quality Assurance (QA) Program supports Los Alamos Yucca Mountain Site Characterization Project participants and ensures that their efforts provide data and evidence admissible for the repository-licensing process.

### **WBS 1.2.11.2 Program Development**

**Program Development.** The annual YMP "All Hands" meeting was held on 26 February, and five speakers addressed the group. They discussed Laboratory QA, the regulatory arena, YMP quality assurance achievements, TCO duties, and general YMP news. The QAPL evaluated the Orientation Plan and sent suggested changes to the training coordinator. *The Quality Connection* was issued, covering topics for the first quarter of 1993. Staff submitted drafts of "Implementation Matrix (R1)," "Detailed Transition Plan (R2)," and "Impact Analysis (R1)" to YMPO. We anticipate completion of activities to implement the new QARD by August; our major emphasis will be on procedure revisions.

**Personnel.** C. Mechels was hired as Software Management Coordinator.

**Travel.** S. Bolivar, J. Day, and P. Gillespie attended a conflict resolution class in Las Vegas on 22 February. Meetings were also held with YMP/QAD and TCO personnel concerning QARD requirements. S. Bolivar attended the Total Quality Forum on 17-19 of February in Albuquerque.

**Procedure Revisions.** Twenty-one quality administrative procedures (QPs) were in various stages of revision. Issues concerning changes to the records system and the responsibilities of resident file custodians have been resolved, and the process will not be changed. The first two procedures containing changes as required by the QARD were being edited and will be released for formal review in the near future. Detailed technical procedures LANL-EES-DP-101, R2 (Sample/Specimen Collection, Identification, and Control for Mineralogy Studies); LANL-EES13-DP-606, R2 (Volcanism Field Studies); and LANL-EES13-DP-608, R1 (Procedure for Preparation of Splits and Powders from Soil Samples) were approved and distributed. Forty-three quality administrative procedures (QPs) must be revised to satisfy new QARD requirements.

**Training.** S. Bolivar and P. Gillespie attended the Requirements Traceability Network (RTN) training in Las Vegas on 25-26 February. Training requirements for the new records management procedure were discussed with our training consultant. A YMP orientation class was held 25 February and was attended by 24 people. S. Bolivar attended two classes of a video conference training course entitled "Radioactive Waste Management" on 3 and 31 March. Training requirements for the new records management procedure were discussed, and issues to be addressed and documented in a survey by our training consultant. The training database program was completed and was being tested.

**WBS 1.2.11.3  
Audits and Surveys**

**Audits and Surveys** Six audit reports were in various stages of completion. Corrective action reports CAR-YMP-92-058 and CAR-YM-93-018 were closed by YMPO. The conditions for lifting stop work order SWO-03 were evaluated by verification personnel, and based on their recommendations, SWO-03 was revised and reissued. The Trend Report for the last quarter of 1992 was issued. Five audit reports were completed, and eight deficiency reports were issued to the following organizations: CAR-92-10, Lawrence Berkeley Laboratory; AR-92-11, Hydro Geo Chem; AR-92-13, EES-4 & EES-15; AR-92-16, Test Coordination Office; and AR-92-17, EES-13 software). The 1993 audit schedule was released. The audit plan for the Test Coordination Office (AR-93-01) was approved and the audit was conducted 9-12 March.

**WBS 1.2.11.5  
Quality Engineering**

**Software.** The initial revision of the six software procedures has been completed; these documents will be reviewed internally for clarity. The Software Quality Assurance Plan is now being revised.

**Planned Activities**

The training coordinator will continue to develop a training class for QP-17.6. Outstanding 1992 audit reports will be completed; the majority of efforts will be directed at revising documents that outline our transition to the new QARD, as well as revising the procedures that will implement the QARD. Corrective actions for stop work order SWO-03 will be completed.

An audit of the Mineralogy/Petrology and Alteration History tasks will be conducted. Compilation of the 1992 Quality Assurance Status Report will continue. Training files for active personnel will be entered into the new database.

**Problem Areas**

None

**Publications**

S. Bolivar and J. Day  
*The Quality Assurance Liaison—Combined Technical and Quality Assurance Support*  
Conference abstract  
Approved by YMPO.

**WBS 1.2.12.2/2.5 1.2.13 Local Records Center Operations/Records Management and Document Control**

**Objective** The objective of this task is to satisfy the records management requirements of the YMP and NQA-1.

**Activities and Accomplishments** Two hundred and eleven records and/or record packages were received by the RPC; seven of these were rejected and returned to their originators for corrections.

Two hundred and fifteen records and/or record packages were submitted to the CRF. The CRF rejected one record package.

Staff attended the YMP Training Coordinators' meeting and participated in a class on performance-based training.

L. Sanders participated in a Technology Integration and Methodology Analysis (TIMA) Process Analysis/Outcomes Committee meeting in Las Vegas, NV, on 15-17 February.

**Planned Activities** No planned activities reported.

**Problem Areas** None

**WBS 1.2.15.2**

**Administrative Support**

**Objective**

The objective of this task is to provide administrative support for Group EES-13 and the YMPO.

**Activities and Accomplishments**

S. Klein, Los Alamos editor, reviewed and edited nine technical information products (TIPS); following TPO review and approval, she forwarded the TIPS to YMPO. She also prepared YMP weekly reports each week and monthly highlights for January and February. All reports were transmitted to the M&O and YMPO.

The editor completed and transmitted the January and February YMP Monthly Activity Reports.

The editor completed and transmitted the Los Alamos input to the 8th YMP Progress Report.

The editor prepared 40 view graphs for management presentation.

**Planned Activities**

S. Klein will continue to refine the TIP database.

**Problem Areas**

None

**WBS 1.2.15.3**

**Training**

**Objective**

The objective of this task is to fulfill the training requirements of the Yucca Mountain Project and maintain appropriate training records.

**Activities and Accomplishments**

Staff wrote procedure on selection of training materials and evaluation of training needs.

Staff began inputting information into the new training database.

Staff submitted 84 records packages to the RPC. These packages contained 1992 training files for all active YMP personnel.

A YMP orientation class was held on February 25, 1993; it was attended by 24 people.

**Planned Activities**

Staff is working toward maintaining dual storage of training files.

**Problem Areas**

None