



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

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: DECEMBER 31, 1992  
SUBJECT: OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE  
WEEK ENDING DECEMBER 11 and 18, 1992

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

nan

NOTE TO CHARLOTTE - Also enclosed: Sandia National Laboratories Monthly Status Report, 11/92; Los Alamos YMP Monthly Activity Report, 10/92; Lawrence Livermore National Laboratory YMP Status Report, 11/92; Preliminary Field Composite Borehole Logs, 10/ 23/92 & 11/18/92; Daily Operations Reports and Weekly Interactions Calendar w/Field Test Coordinator's Report, 11/30-12/4, and 12/14-18, 1992

*all enclosed in ship*

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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

*rec'd with letter dtd  
12/31/92*

DEC 23 1992

John W. Bartlett, Director, Civilian Radioactive Waste Management,  
HQ (RW-1) FORS

OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE WEEK ENDING  
DECEMBER 18, 1992

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

A. Site Characterization Planning

Field Operations)

The Site Manager and Field Operations Center (FOC) staff participated in and provided logistical support for five major tours this reporting period.

On Job Package (JP) 92-20, Exploratory Studies Facility (ESF) North Portal Ramp and Road, Reynolds Electrical & Engineering Co., Inc. (REECO), continued cut and fill at the ESF North Portal access road. They continue to haul offsite the topsoil from the pad area.

On JP 92-8, Soil and Rock Properties, Phase II Test Pits, REECO backfilled the following GSF pits: TP-1, TP-2, TP-3, TP-4, TP-5, TP-6, and TP-7. These pits were located along the planned access road to the North Portal.

On JP 92-3, UZ-16, the coring drill string broke at the threaded pin joint adjacent to the core barrel latch, leaving the outer core barrel with the bit and the inner core barrel in the hole. The LM-300 drill rig is now being used in fishing operations.

Regarding JP 91-9, Neutron Access Boreholes, Phase II, Borehole USW UZN-61 was cored to a depth of 98.68 feet and reamed to 69.08 feet as of December 15, 1992. The proposed total depth of this borehole is approximately 120 feet.

Drilling continues with the Joy 1 rig at NRG-6. As of December 15, 1992, it had been cored to a depth of 97.90 feet and reamed to 79.98 feet.

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*rec'd with letter dtd  
12/31/92*



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Sample Management Facility

Recovery of core from UE25 UZ-16, USW UZN-61, and UE25 NRG-6 continued. Three boxes of core specimens were shipped to the U.S. Geological Survey (USGS).

Site Investigations

The core depth of Borehole UE-25 UZ-16 is currently at 1197 feet and ream depth is at 1176 feet. Fishing operations are in progress to recover a 10-foot length of core barrel that twisted off on December 13, 1992.

Regulatory Interactions

Issue Resolution

Review of the Topical Report, "Erosion Rates at Yucca Mountain, Nevada," is complete. Comments were forwarded to the Plans and Procedures Department for transmittal to the document authors.

Advisory Committee on Nuclear Waste (ACNW) Interactions

The ACNW Working Group on Performance Assessment (PA) met on December 16, 1992. Presentations were provided by the U.S. Department of Energy (DOE) staff and representatives from Sandia National Laboratories (SNL) and Pacific Northwest Laboratories. Presentation topics included progress made during the Total System PA 1991 exercise, the current status of DOE's PA program, and plans for future activities.

ESF Task Force Activities

A milestone was met on December 16, 1992, when the Tunnel Boring Machine (TBM) Request for Proposal was released. The Change Control Board (CCB) approved the remainder of Design Package 1A on December 16, 1992. The following milestones represent the near-term plan for ESF activities:

- Release Remainder of Design
    - Package 1A for Construction
    - Planning
  - Receive TBM Vendor Proposals
  - Award Subcontract for Underground
    - Construction
  - Award TBM Contract
  - Start Excavating TBM Launch Chamber
- |                   |
|-------------------|
| December 21, 1992 |
| February 9, 1993  |
| March 1993        |
| April 1993        |
| April 2, 1993     |

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

No new SPs were submitted to the Yucca Mountain Site Characterization Project Office (YMPO) this week.

## STUDY PLAN BREAKDOWN

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|  |    |
|--|----|
| In Screening Review .....  | 0  |
| In YMPO and DOE/Headquarters (HQ) Review .....                               | 7  |
| Awaiting Comment Resolution .....  | 9  |
| Awaiting Author Revision .....   | 3  |
| In YMPO/HQ Verification Audit .....  | 9  |
| Preparing to Submit or Awaiting YMPO Approval .....                          | 1  |
| Awaiting Submission to the U.S. Nuclear<br>Regulatory Commission (NRC) ..... | 7  |
| NRC Phase 1 Review .....   | 15 |
| NRC Acceptance .....   | 28 |
| Total .....  | 79 |

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## SCP/SP Status:

|   |     |
|---|-----|
| Total SPs Assigned to Cover 106 Studies ..... | 104 |
| SPs Not Yet Submitted for Review .....        | 36  |
| SPs Submitted for Initial Review .....        | 68  |
| Revised SPs Submitted for Review .....        | 5   |
| Revised ESF SPs Submitted for Review .....    | 6   |
| Total SPs Submitted for Review .....          | 79  |

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## State of Nevada Comments Status:

|  |    |
|--|----|
| Received Comments from the State of Nevada .....   | 10 |
| Responses Transmitted to the State of Nevada ..... | 10 |

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## NRC Comments Status:

|  |    |
|--|----|
| Received Comments from NRC .....               | 17 |
| Responses Transmitted from OGD to DOE/HQ ..... | 16 |

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## Critical ESF SP Status:

The YMPO completed technical review of SP 8.3.1.2.2.4, "Characterization of the Yucca Mountain Unsaturated Zone Percolation ESF Study." A comment resolution meeting is scheduled for December 18, 1992.

The verification of comment resolution on SP 8.3.1.4.2.2, Revision 2, "Characterization of Structural Features Within the Site Area," should be completed by the end of this week.

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B. Project Planning and Control

All participant Planning and Control System (PACS) status data for November 1992 was received. The data was transferred to the participants' data bases and products were produced for distribution to the participants. All participant data were transferred to the project-level data base; project-level status reports for November 1992 were produced and distributed to DOE managers for review and action, as appropriate.

C. Quality Assurance Implementation

Determination of Importance and Grading Enhancement

Quality (Q) List and Q-List Procedure Development

SNL is reviewing the consolidated comments provided by the Assessment Team (AT) on their Items Important to Safety report.

Implementation

Classification criteria for the natural barrier system are being developed by the AT as the initial step in performing system-level classification.

The AT was assigned to scope out a phase-out plan for Administrative Procedure 6.17Q, Classification of Items. A subteam of the AT plans to present an approach to the AT in early January 1993.

The AT is reviewing the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) plan for determination of importance of items and activities.

D. Public Outreach and Institutional Activities

The Twenty-second Public Open House tour of Yucca Mountain, Nevada, was conducted on December 12, 1992, for approximately 200 people. Tour participants visited the Las Vegas Yucca Mountain Information Office (YMIO), the FOC, two laboratories, and the LM-300 drill rig.

A tour of Yucca Mountain was conducted by A. C. Robison, YMPO, on December 14, 1992, for NRC Commissioner Curtiss. Carl Gertz, Project Manager, gave a pretour briefing. The Institutional and External Affairs (IEA) staff assisted NRC staff in coordinating a media availability conference following Commissioner Curtiss' tour.

Other tours to Yucca Mountain this week included a tour on December 15, 1992, conducted by A. C. Robison, for approximately five Nevada legislators; and on December 16, 1992, for approximately 15 guests of the Nevada Nuclear Waste Study Committee Advisory Board. Carl Gertz gave a pretour briefing to each of these groups.

The IEA staff provided backup support to Carl Gertz and A. C. Robison for presentations to Nevada legislators December 16-17, 1992, in Las Vegas, Nevada.

James Blink, Lawrence Livermore National Laboratory (LLNL), provided an educational presentation on energy to the seventh grade class at Burkholder Junior High School on December 15, 1992, in Henderson, Nevada. Approximately 30 students attended the presentation.

On December 16, 1992, Lorraine Flint, Raytheon Services Nevada, gave an educational presentation to three eighth grade science classes at Orr Junior High School in Las Vegas. Ken Beall, Technical & Management Support Services (T&MSS), gave an educational presentation focusing on nuclear waste usage and disposal to the Community College of Southern Nevada in Las Vegas. Approximately 90 students attended each presentation.

The YMP sponsored a Girl Scouts Geology Merit Badge Workshop at the Las Vegas YMIO on December 12, 1992. Forty-six Girl Scouts attended the workshop. April Gil (YMPO), Diane Hattler (T&MSS), Claudia Newbury (YMPO), and Martha Pendleton (CRWMS M&O) staffed the work stations.

The CRWMS M&O staff met with the Boy Scouts Executive Director for the Boulder Dam Area Council on December 17, 1992, in Las Vegas to plan for further educational program expansion.

The IEA staff completed the ESF video. Also, they completed a short video compilation on work completed in fiscal year (FY) 1992 and to date in FY 1993 for Carl Gertz to use in a presentation to the NRC.

## II. ANALYSIS & VERIFICATION DIVISION

The staff attended the ACNW Working Group Meeting on PA for the High-Level Waste Management Program on December 16, 1992, in Bethesda, Maryland. Also, they attended the ACNW 49th Meeting December 17-18, 1992, in Bethesda. Topics of interest to the Office of Civilian Radioactive Waste Management (OCRWM) include: NRC staff evaluation of DOE's requested resolution to SCP Objection #1; report on the DOE Workshop on Use of Expert Judgment; and report on Total System PA meetings. The staff attended the OCRWM Director's presentation to the NRC Commissioners on December 18, 1992, in Rockville, Maryland.

The staff participated in several events: the DOE/NRC Technical Exchange on Total System PA December 14-15, 1992, in Rockville; a briefing to management on the status of the multipurpose canister study on December 15, 1992, in Washington, D.C.; and the Executive Committee meeting on Energy Policy Act and transition papers on December 18, 1992, in Washington, D.C.

### III. GENERAL INFORMATION ITEMS

#### Los Alamos National Laboratory (Los Alamos)

June Fabryka-Martin began evaluating the effect of testing of nuclear-powered rocket engines during the 1960s on the production of chlorine-36 in Area 25. Preliminary results indicate that  $^{36}\text{Cl}/\text{Cl}$  ratios in these soils may be elevated by as much as six orders of magnitude above natural background within a radius of 100 feet around the test sites, and an area of at least 1000 feet from the test site would be affected. This soil chloride may possibly be the source for the extremely high chlorine-36 values observed in cutting from USW UZN-55, although a transport mechanism is unknown at this time.

Jane Poths presented a talk entitled, "Surface Exposure Ages and Noble Gas Components of Volcanic Units at the Lathrop Wells Volcanic Center, Nevada," at the fall meeting of the American Geological Physical Union in San Francisco, California. She also chaired a symposium on dating young surfaces.

#### LLNL

The staff worked with YMPO and Los Alamos representatives to establish the collaborative activities necessary to address issues regarding flow, transport, rock-fluid interaction, and mineral stability. A better understanding of roles and efforts was developed from these consultations.

John Nitao is testing a prototype version of the Nonisothermal Unsaturated Flow and Transport (NUFT) code for nonisothermal radionuclide transport problems. NUFT, which can handle multiphase heat flow and aqueous-phase multiple species transport, was primarily developed outside of YMP. A description of NUFT was sent to James Duguid, CRWMS M&O, for inclusion in the report, "Review and Selection of Unsaturated Flow Models."

#### CRWMS M&O

The staff met with the YMPO Information Resource Management group to define the FY 1993 Technical Data Management task for the Integrated Resources Group. It was agreed that tasking will be initiated and tracked by way of a PACS entry under Work Breakdown Structure 1.2.5.3, Technical Data Management.

DEC 03 1992

The Reference Information Base document was removed from the CCB Controlled Document List and placed under Document Control.

#### USGS

Data was collected from a regular sequence of observations at 5-foot intervals and five samples on the west side of Fortymile Wash. Relationships exposed within the Calico Hills Formation indicate that the number of types of eruptive rocks that exist in the area is greater than previously recognized.

The staff met with SNL and Los Alamos staffs to finalize drilling specifications for YMP. In an attempt to expedite the drilling program and save money, proposed Wells USW H-7 and SD-6 were combined as a single well, as were Wells G-8 and WT-19.

#### 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 Linda Artis at (702) 794-7896 or Theresa Hirsch at (702) 794-7759 for additional information. Exhibits are coordinated by Kevin Rohrer at (702) 794-7769, 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> |
|--|---|------------------|---------------------|
| <b>A. <u>DOE/HQ Meetings</u></b>                   |   |                  |                     |
| Wednesday-<br>Thursday,<br>February 10-11,<br>1993 | First OCRWM<br>Quarterly Progress<br>Review | Las Vegas,<br>NV | C. Gertz            |
| <b>B. <u>CRWMS M&amp;O/DOE Meetings</u></b>        |   |                  |                     |
| Monday,<br>December 21                             | CRWMS M&O Program<br>Management Review      | Vienna,<br>VA    | C. Gertz            |
| Wednesday,<br>December 23                          | YMP Monthly<br>Management Meeting           | Las Vegas,<br>NV | C. Gertz            |
| <b>C. <u>Internal and DOE/NV Meetings</u></b>      |   |                  |                     |
| Wednesday,<br>January 20,<br>1993                  | DOE/NV Monthly<br>Program Review            | Las Vegas,<br>NV | C. Gertz            |

| <u>Date</u>  | <u>Event</u>  | <u>Location</u>      | <u>YMPO Contact</u> |
|--|---|----------------------|---------------------|
| <b>D. <u>NRC Interactions</u></b>  |   |                      |                     |
| March 1993<br>TBD  | NRC Site Visit (P)  | Las Vegas,<br>NV     | T. Bjerstedt        |
| Monday,<br>May 3, 1993   | Management Meeting<br>on Topical Report (P)                       | Las Vegas,<br>NV     | T. Bjerstedt        |
| Monday,<br>May 17, 1993  | Technical Exchange -<br>Program Planning and<br>Integration (P)   | Video-<br>Conference | T. Bjerstedt        |
| Tuesday,<br>May 18, 1993   | Technical Exchange -<br>OCRWM Technical<br>Baseline Documents (P) | Video-<br>Conference | T. Bjerstedt        |
| Tuesday,<br>June 8, 1993   | Technical Exchange -<br>Geophysics Integration<br>(P)             | Las Vegas,<br>NV     | T. Bjerstedt        |
| Wednesday<br>June 9, 1993  | Technical Exchange -<br>Volcanism (P)                             | Las Vegas,<br>NV     | T. Bjerstedt        |
| Thursday,<br>June 10, 1993   | NRC Management Meeting<br>for Interactions<br>Scheduling (P)      | Las Vegas,<br>NV     | T. Bjerstedt        |
| Wednesday,<br>July 28, 1993  | Technical Exchange -<br>ESF Title II Design (P)                   | TBD                  | T. Bjerstedt        |
| <b>E. <u>Nuclear Waste Technical Review Board (NWTRB) Interactions</u></b> |   |                      |                     |
| Tuesday-<br>Wednesday,<br>January 5-6,<br>1993                             | NWTRB Full Board<br>Meeting (P)                                   | Arlington,<br>VA     | J. Cooper           |
| February or<br>March 1993<br>TBD   | NWTRB HG&G Panel<br>Meeting (P)                                   | TBD                  | J. Cooper           |
| Tuesday-<br>Friday,<br>April 20-23,<br>1993                                | NWTRB Full Board<br>Meeting (P)                                   | Reno,<br>NV          | J. Cooper           |
| Tuesday-<br>Saturday,<br>June 1-12, 1993                                   | NWTRB International<br>Trip                                       | TBD                  | J. Cooper           |

| <u>Date</u>  | <u>Event</u>                    | <u>Location</u>  | <u>YMPO Contact</u> |
|--|---------------------------------|------------------|---------------------|
| E. <u>NWTRB Interactions</u> (Continued)           |                                 |                  |                     |
| Monday-<br>Thursday,<br>July 12-15,<br>1993        | NWTRB Full Board<br>Meeting (P) | Denver,<br>CO    | J. Cooper           |
| Tuesday-<br>Friday,<br>October 19-22,<br>1993      | NWTRB Full Board<br>Meeting (P) | Las Vegas,<br>NV | J. Cooper           |
| F. <u>ACNW Interactions</u>                        |                                 |                  |                     |
| Wednesday-<br>Thursday,<br>January 27-28,<br>1993  | ACNW 50th Meeting (P)           | Bethesda,<br>MD  | A. Gil              |
| Wednesday-<br>Thursday,<br>February 24-25,<br>1993 | ACNW 51st Meeting (P)           | Bethesda,<br>MD  | A. Gil              |
| Wednesday-<br>Thursday,<br>March 24-25,<br>1993    | ACNW 52nd Meeting (P)           | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>April 28-29,<br>1993    | ACNW 53rd Meeting (P)           | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>May 19-20,<br>1993      | ACNW 54th Meeting (P)           | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>June 23-24,<br>1993     | ACNW 55th Meeting (P)           | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>July 21-22,<br>1993     | ACNW 56th Meeting (P)           | TBD              | A. Gil              |

| <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,<br>1993    | ACNW 57th Meeting (P) | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>September 22-23,<br>1993 | ACNW 58th Meeting (P) | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>October 27-28,<br>1993   | ACNW 59th Meeting (P) | TBD             | A. Gil              |
| Monday-<br>Tuesday,<br>November 22-23,<br>1993      | ACNW 60th Meeting (P) | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>December 15-16,<br>1993  | ACNW 61st Meeting (P) | TBD             | A. Gil              |

| <u>Date</u>                                      | <u>Event</u>                                     | <u>Location</u>  | <u>Speaker</u> |
|--|--|------------------|----------------|
| G. <u>State and Public Interactions</u>          |  |                  |                |
| Thursday,<br>January 7,<br>1993                  | Nevada Development<br>Authority                  | Las Vegas,<br>NV | C. Gertz       |
| Thursday,<br>January 7,<br>1993                  | Nye County Task<br>Force Meeting                 | Pahrump,<br>NV   | P. Standish    |
| Monday,<br>January 11,<br>1993                   | Las Vegas Host<br>Lions Club                     | Las Vegas,<br>NV | T. Geer        |
| Tuesday-<br>Wednesday,<br>January 12-13,<br>1993 | Marion Earl<br>Elementary School                 | Las Vegas,<br>NV | A. Gil         |
| Wednesday,<br>January 13,<br>1993                | Association of<br>Professional<br>Mortgage Women | Las Vegas,<br>NV | J. Younker     |

DEC 23 1992

| <u>Date</u>   | <u>Event</u>                                    | <u>Location</u>    | <u>Speaker</u> |
|---|---|--------------------|----------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                    |                |
| Wednesday,<br>January 13,<br>1993                   | American Nuclear<br>Society (ANS)               | Schenectady,<br>NY | C. Gertz       |
| Thursday,<br>January 14,<br>1993                    | ANS   | Parsippany,<br>NJ  | C. Gertz       |
| Thursday,<br>January 14,<br>1993                    | Breakfast Lion's<br>Club                        | Las Vegas,<br>NV   | TBD            |
| Friday,<br>January 15,<br>1993                      | Dayton High School                              | Dayton,<br>NV      | T. Bjerstedt   |
| Saturday,<br>January 16,<br>1993                    | Girl Scout<br>Troop 319                         | Las Vegas,<br>NV   | A. Gil         |
| Thursday,<br>January 21,<br>1993                    | North Las Vegas<br>Chamber of Commerce          | Las Vegas,<br>NV   | C. Gertz       |
| Wednesday,<br>January 27,<br>1993                   | Cub Scout Pack #223                             | Las Vegas,<br>NV   | R. Arnold      |
| Tuesday,<br>February 2,<br>1993                     | Huffaker School                                 | Reno,<br>NV        | J. Blink       |
| Wednesday-<br>Thursday,<br>February 3-4,<br>1993    | Bijou Elementary<br>School                      | Lake Tahoe,<br>NV  | J. Blink       |
| Thursday,<br>February 4,<br>1993                    | Scottish Rite<br>Masons                         | Las Vegas,<br>NV   | P. Standish    |
| Wednesday,<br>February 10,<br>1993                  | Martin Luther<br>King, Jr. Elementary<br>School | Las Vegas,<br>NV   | R. Arnold      |
| Thursday,<br>February 11,<br>1993                   | Chemehuevi District<br>Round Table              | Las Vegas,<br>NV   | R. Arnold      |

| <u>Date</u>   | <u>Event</u>  | <u>Location</u>  | <u>Speaker</u> |
|---|---|------------------|----------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                  |                |
| Tuesday,<br>February 16,<br>1993                    | Construction<br>Specification<br>Institute            | Las Vegas,<br>NV | G. Fasano      |
| Tuesday,<br>February 23,<br>1993                    | University of Iowa                                    | Ames,<br>IA      | C. Gertz       |
| Tuesday,<br>March 2, 1993                           | Waste Management '93                                  | Tucson,<br>AZ    | C. Gertz       |
| Tuesday-<br>Wednesday,<br>March 23-24,<br>1993      | Henderson<br>Community College                        | Las Vegas,<br>NV | C. Gertz       |
| Tuesday,<br>May 4, 1993                             | Underground<br>Structures Colorado<br>School of Mines | Golden,<br>CO    | C. Gertz       |
| Monday,<br>June 14, 1993                            | Rapic Excavation and<br>Tunneling Conference          | TBD              | C. Gertz       |

| <u>Date</u> | <u>Event</u> | <u>Location</u> |
|-------------|--------------|-----------------|
|-------------|--------------|-----------------|

H. Exhibits Scheduled

None currently scheduled.

| <u>Date</u> | <u>Event</u> | <u>Escorts</u> |
|-------------|--------------|----------------|
|-------------|--------------|----------------|

I. Tours Scheduled

|                                |                             |                 |
|--------------------------------|-----------------------------|-----------------|
| Saturday,<br>January 16, 1993  | Public Open House (P)       | Various Escorts |
| Wednesday,<br>January 20, 1993 | Tonopah Middle School       | TBD             |
| Monday,<br>January 25, 1993    | Japan Electric Power        | P. Cloke        |
| Wednesday,<br>February 3, 1993 | Green Valley<br>High School | TBD             |
| Saturday,<br>February 20, 1993 | Public Open House (P)       | Various Escorts |

| <u>Date</u>                           | <u>Event</u>                             | <u>Escorts</u>  |
|---------------------------------------|--|-----------------|
| I. <u>Tours Scheduled</u> (Continued) |  |                 |
| Wednesday,<br>February 24, 1993       | Tonopah Middle School                    | TBD             |
| Thursday,<br>February 25, 1993        | Senior Tripsters                         | TBD             |
| Friday,<br>March 5, 1993              | Waste Management '93                     | TBD             |
| Thursday,<br>March 11, 1993           | Meadows School                           | TBD             |
| Thursday,<br>March 18, 1993           | Gabs School                              | TBD             |
| Wednesday,<br>March 24, 1993          | Thurman White Middle<br>School           | TBD             |
| Saturday,<br>March 27, 1993           | Public Open House (P)                    | Various Escorts |
| Thursday,<br>April 1, 1993            | Orr Junior High<br>School                | TBD             |
| Monday,<br>April 19, 1993             | Hydrology Field Trip                     | A. Flint        |
| Tuesday,<br>April 20, 1993            | Round Mountain<br>High School            | TBD             |
| Monday,<br>April 26, 1993             | High-Level Waste<br>Conference           | TBD             |
| Monday,<br>June 21, 1993              | Girl Scouts Wider<br>Opportunity Program | TBD             |



Carl P. Gertz  
Project Manager



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QA: N/A

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OFFICE OF GEOLOGIC DISPOSAL (OGD) WEEKLY HIGHLIGHTS FOR THE WEEK ENDING  
DECEMBER 11, 1992

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

A. Site Characterization Planning

Field Operations

The Site Manager and Field Operations Center staff participated in and provided logistical support for six major tours this reporting period. Approximately 375 visitors are expected to attend the public open house and site tour on December 12, 1992.

On Job Package (JP) 92-3, drilling activities continue with the LM-300 drill rig on Borehole UZ-16. As of December 8, 1992, the borehole had been cored to a depth of 1179.27 feet and reamed to 1171.82 feet.

On JP 91-9, Neutron Access Boreholes, Phase II, work was completed on USW UZN-59. Reynolds Electrical & Engineering Co., Inc. (REECO), is mobilizing the CME-850 drill rig and equipment to the next borehole, USW UZN-61, and is presently rigging up.

Drilling continues with the Joy 1 rig at NRG-6. As of December 8, 1992, it had been cored to a depth of 64.20 feet with the Odex casing at 63.50 feet.

On JP 92-20, North Exploratory Studies Facility (ESF) Portal Pad and Ramp, REECO continued placing fill on the access road, hauling topsoil from the access road, grading at the topsoil storage area, and excavating the rock storage pad.

Sample Management Facility

Recovery and processing of core from UE25 UZ-16, USW UZN-59, and UE25 NRG-6 continued. Drilling on USW UZN-61 began and drilling operations on UE25 NRG-6 continued. Supported the Sample Overview Committee meeting on December 8, 1992.

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Site Investigations

Regarding Borehole UZ-16, a deviation survey taken at 1149 feet recorded a borehole inclination of one degree and 50 minutes. The contact between the basal vitrophyre and the partially-welded tuff of the Topopah Spring (TSW2) was encountered at approximately 1130 feet. Fracturing in this lower portion of the TSW2 has resulted in reduced core recovery.

Regulatory InteractionsSite Characterization Progress Report (PR)

PR 6 has been printed and mailed from U.S. Department of Energy (DOE)/Headquarters (HQ) on December 8, 1992. PR 7 is now on an accelerated schedule at the direction of the Undersecretary. Comments on the review draft of PR 7 were received on December 7, 1992, and the camera-ready copy will be sent to DOE/HQ on December 14, 1992. Distribution of PR 7 is expected by December 31, 1992.

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

Plans for scheduling the production of the MGDS AO, Revision 2, with a May 1993 delivery date to the U.S. Nuclear Regulatory Commission (NRC), are underway. Revision 1 has been loaded into InfoSTREAMS; preparation of Revision 2 will be accomplished using the data base. Portfolios have been developed for each chapter of the MGDS AO.

Advisory Committee on Nuclear Waste (ACNW) Interactions

Preparations for the YMP presentations at the ACNW's Working Group on Performance Assessment (PA) are nearing completion. Representatives from Sandia National Laboratories (SNL) and Pacific Northwest Laboratories will speak on progress made during the Total System PA 1991 exercise, the current status of DOE's PA program, and plans for future activities.

ESF Task Force Activities

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

|                                     |                   |
|-------------------------------------|-------------------|
| Release Tunnel Boring Machine (TBM) |                   |
| Request for Proposal                | December 18, 1992 |
| Receive TBM Vendor Proposals        | January 1993      |
| Award Subcontract for Underground   |                   |
| Construction                        | March 1993        |
| Award TBM Contract                  | April 1993        |
| Start Excavating TBM Launch Chamber | April 2, 1993     |

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

The ESF revision of SP 8.3.1.2.2.4, Revision 1, "Characterization of the Yucca Mountain Unsaturated Zone in the ESF Study," was submitted to the Yucca Mountain Site Characterization Project Office (YMPO). Two SPs were approved by YMPO this week: SP 8.3.1.4.3.1, "Systematic Acquisition of Site-Specific Subsurface Information," and SP 8.3.4.2.4.3, "Geomechanical Attributes of the Waste Package Environment." One new SP was added to the tracking system this week: SP 8.3.4.2.4.5, "Characterization of the Effects of Man-Made Materials on Water Chemistry in the Postemplacement Environment."

STUDY PLAN BREAKDOWN

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|   |    |
|---|----|
| In Screening Review .....                           | 0  |
| In YMPO and DOE/HQ Review .....                     | 8  |
| Awaiting Comment Resolution .....                   | 9  |
| Awaiting Author Revision .....                      | 3  |
| In YMPO/HQ Verification Audit .....                 | 8  |
| Preparing to Submit or Awaiting YMPO Approval ..... | 1  |
| Awaiting Submission to the NRC .....                | 7  |
| NRC Phase 1 Review .....                            | 15 |
| NRC Acceptance .....                                | 28 |
| Total .....   | 79 |

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SCP/SP Status:

|   |     |
|---|-----|
| Total SPs Assigned to Cover 106 Studies ..... | 104 |
| SPs Not Yet Submitted for Review .....        | 36  |
| SPs Submitted for Initial Review .....        | 68  |
| Revised SPs Submitted for Review .....        | 5   |
| Revised ESF SPs Submitted for Review .....    | 6   |
| Total SPs Submitted for Review .....          | 79  |

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State of Nevada Comments Status:

|  |    |
|--|----|
| Received Comments from the State of Nevada .....   | 10 |
| Responses Transmitted to the State of Nevada ..... | 10 |

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NRC Comments Status:

|  |    |
|--|----|
| Received Comments from NRC .....               | 17 |
| Responses Transmitted from OGD to DOE/HQ ..... | 16 |

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Critical ESF SP Status:

The YMPO screening review of SP 8.3.1.2.2.4 was completed and technical reviews have been initiated.

The comment resolution meeting on SP 8.3.1.4.2.2, Revision 2, "Characterization of Structural Features Within the Site Area," was held on December 4, 1992. The verification draft should be submitted by the end of this week.

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B. Project Planning and Control

The participant Planning and Control System (PACS) cost/schedule status data for November 1992 was received and uploaded from the participant workstations to PACS. The new data was calculated through the PACS rollup in all participant data bases. The participant data was combined in the central PACS project-level data base.

The fiscal year 1993 work authorization documents, which were completed by YMPO, were received; packages are being prepared for distribution to the participants.

C. Quality Assurance (QA) Implementation

The SNL Audit YMP-93-03 was completed. Three Corrective Action Requests (CAR) are being issued: one deals with the lack of a Management Assessment; another deals with controlled document holders not making certain their documents are kept current; and the last deals with SNL not properly auditing augmented staff activity when that augmented staff has subcontracted work. None were considered significant; however, the last CAR may be a condition that is generic to other participants who use augmented staff.

Determination of Importance and Grading Enhancement

Quality (Q) List and Q-List Procedure Development

The SNL Items Important to Safety report has been reviewed by the Assessment Team (AT) and AT support staff. A set of consolidated comments are being reviewed prior to transmittal to SNL for their consideration.

Implementation

The AT is focusing on classification of the natural barrier system. An early classification will be done using existing basis information; new PA analyses for an in-depth classification will follow.

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The Office of Civilian Radioactive Waste Management (OCRWM) and YMP staffs continued discussions on the role and function of AP 6.17Q.

Results of the AT review of the level of analysis performed to determine impacts of surface-based testing on waste isolation, based on a sample analysis, indicate that more rigor is needed in these analyses.

#### D. Public Outreach and Institutional Activities

Carl Gertz, Project Manager, gave the State of the Project presentation to the U.S. Geological Survey (USGS) in Denver, Colorado, on December 7, 1992.

A tour to Yucca Mountain, Nevada, was conducted on December 7, 1992, for 11 guests of the University of Nevada, Las Vegas Cooperative Agreement Group. A tour to Yucca Mountain was also conducted on December 8, 1992, for 110 guests of the Bonanza/Cheyenne Las Vegas Rotary Club.

Sandra Majewski, Technical and Management Support Services (T&MSS), gave an educational presentation on geography and cartography to a third grade class at Crestwood Elementary School in Las Vegas, Nevada, on December 8, 1992. Approximately 40 students attended the presentation.

Richard Arnold, a consultant, provided educational presentations on Native American Indian culture on December 8, 1992, to one second grade class and one fourth grade class at the Katz Elementary School in Las Vegas; and on December 9, 1992, at the Indian Springs Elementary School in Indian Springs, Nevada. Approximately 140 students attended these presentations.

Maxwell Blanchard, YMPO, gave a technical presentation to the Savannah Chapter of the American Nuclear Society in Augusta, Georgia, on December 10, 1992. Approximately 65 people were in attendance.

Institutional and External Affairs staff coordinated staff support for a YMP exhibit, which was displayed at the American Geophysical Union conference in San Francisco, California, December 7-11, 1992. Approximately 550 people visited the exhibit.

## II. ANALYSIS & VERIFICATION DIVISION (AVD)

The staff attended the Technical Review Group (TRG) meeting on Defense Waste Processing Facility Waste Qualification Report, Volumes 5 and 2, December 8-9, 1992, in Washington, D.C. They participated in the Glass Compendium International TRG meeting on December 9, 1992, in Chicago, Illinois.

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A presentation on functions and responsibilities of the AVD was provided at the HQ QA audit kick-off meeting on December 7, 1992.

Draft responses to public comments on the Early Site Suitability Evaluation document were reviewed. Also, the RW-1 Briefing Book and Statement for the Record prepared for the Director's presentation to the Commissioners were reviewed.

### III. GENERAL INFORMATION ITEMS

#### Lawrence Livermore National Laboratory

Information combined from geochemical, waste form, and hydrology areas indicates that the water-to-fuel-surface ratio inside breached waste packages is likely to be low, the waste form itself may then dominate the water chemistry, and the wetted spent-fuel alteration rate may be high.

#### Raytheon Services Nevada

A DOE acceptance review of the last portion of the ESF Design Package 1A was completed.

#### T&MSS

The Working Paper on Calcite-Silica Deposits and the Topical Report for Erosion Rates at Yucca Mountain are currently in YMPO review.

#### USGS

Ten partial preliminary core logs for the UZN holes were compiled, focusing on the interval in the Paintbrush Tuff from the base of the Tiva Canyon Member downward to the Topopah Springs caprock. The elevations of stratigraphic contacts and unit thicknesses will be used in the development of structure contour and isopach maps of the units, and will be incorporated as constraints in the three-dimensional lithostratigraphic model of Yucca Mountain. Where two or more drillholes are located within 500 feet of each other, local stratigraphic variations and offsets across faults can be evaluated using these compiled core data.

The USGS and U.S. Bureau of Reclamation staffs completed comment resolution and revision of SP 8.3.1.4.2.2.4, concerning underground geologic mapping, in preparation for the accelerated schedule for mapping of the North Ramp facilities.

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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 Linda Artis at (702) 794-7896 or Theresa Hirsch at (702) 794-7759 for additional information. Exhibits are coordinated by Kevin Rohrer at (702) 794-7769, 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> |
|---|---|----------------------|---------------------|
| A. <u>DOE/HQ Meetings</u>   |   |                      |                     |
| No significant new meetings this week.  |   |                      |                     |
| B. <u>Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&amp;O)/DOE Meetings</u> |   |                      |                     |
| Monday,<br>December 21  | CRWMS M&O Program<br>Management Review                            | Vienna,<br>VA        | C. Gertz            |
| Wednesday,<br>December 23   | YMP Monthly<br>Management Meeting                                 | Las Vegas,<br>NV     | C. Gertz            |
| C. <u>Internal and DOE/NV Meetings</u>  |   |                      |                     |
| No significant new meetings this week.  |   |                      |                     |
| D. <u>NRC Interactions</u>  |   |                      |                     |
| Monday-<br>Tuesday,<br>December 14-15   | Technical Exchange -<br>Total System PA (P)                       | Rockville,<br>MD     | T. Bjerstedt        |
| March 1993<br>TBD   | NRC Site Visit (P)  | Las Vegas,<br>NV     | T. Bjerstedt        |
| Monday,<br>May 3,<br>1993   | Management Meeting<br>on Topical Report (P)                       | Las Vegas,<br>NV     | T. Bjerstedt        |
| Monday,<br>May 17,<br>1993  | Technical Exchange -<br>Program Planning and<br>Integration (P)   | Video-<br>Conference | T. Bjerstedt        |
| Tuesday,<br>May 18,<br>1993   | Technical Exchange -<br>OCRWM Technical<br>Baseline Documents (P) | Video-<br>Conference | T. Bjerstedt        |

| <u>Date</u>   | <u>Event</u>   | <u>Location</u>  | <u>YMPO Contact</u> |
|---|--|------------------|---------------------|
| D. <u>NRC Interactions</u> (Continued)                              |  |                  |                     |
| Tuesday,<br>June 8,<br>1993   | Technical Exchange -<br>Geophysics Integration<br>(P)        | Las Vegas,<br>NV | T. Bjerstedt        |
| Wednesday<br>June 9,<br>1993  | Technical Exchange -<br>Volcanism (P)                        | Las Vegas,<br>NV | T. Bjerstedt        |
| Thursday,<br>June 10,<br>1993                                       | NRC Management Meeting<br>for Interactions<br>Scheduling (P) | Las Vegas,<br>NV | T. Bjerstedt        |
| Wednesday,<br>July 28,<br>1993                                      | Technical Exchange -<br>ESF Title II Design (P)              | TBD              | T. Bjerstedt        |
| E. <u>Nuclear Waste Technical Review Board (NWTRB) Interactions</u> |  |                  |                     |
| Tuesday-<br>Wednesday,<br>January 5-6,<br>1993                      | NWTRB Full Board<br>Meeting (P)                              | Arlington,<br>VA | J. Cooper           |
| February or<br>March 1993<br>TBD                                    | NWTRB HG&G Panel<br>Meeting (P)                              | TBD              | J. Cooper           |
| Tuesday-<br>Friday,<br>April 20-23,<br>1993                         | NWTRB Full Board<br>Meeting (P)                              | Reno,<br>NV      | J. Cooper           |
| Tuesday-<br>Saturday,<br>June 1-12,<br>1993                         | NWTRB International<br>Trip                                  | TBD              | J. Cooper           |
| Monday-<br>Thursday,<br>July 12-15,<br>1993                         | NWTRB Full Board<br>Meeting (P)                              | Denver,<br>CO    | J. Cooper           |
| Tuesday-<br>Friday,<br>October 19-22,<br>1993                       | NWTRB Full Board<br>Meeting (P)                              | Las Vegas,<br>NV | J. Cooper           |

| <u>Date</u>  | <u>Event</u>   | <u>Location</u> | <u>YMPO Contact</u> |
|--|--|-----------------|---------------------|
| <u>F. ACNW Interactions</u>                        |  |                 |                     |
| Wednesday,<br>December 16                          | ACNW WG on PA -<br>Phase 2 HLW<br>Interactive PA<br>by NRC (P) | Bethesda,<br>MD | A. Gil              |
| Thursday-<br>Friday,<br>December 17-18             | ACNW 49th Meeting (P)  | Bethesda,<br>MD | A. Gil              |
| Wednesday-<br>Thursday,<br>January 27-28,<br>1993  | ACNW 50th Meeting (P)  | Bethesda,<br>MD | A. Gil              |
| Wednesday-<br>Thursday,<br>February 24-25,<br>1993 | ACNW 51st Meeting (P)  | Bethesda,<br>MD | A. Gil              |
| Wednesday-<br>Thursday,<br>March 24-25,<br>1993    | ACNW 52nd Meeting (P)  | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>April 28-29,<br>1993    | ACNW 53rd Meeting (P)  | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>May 19-20,<br>1993      | ACNW 54th Meeting (P)  | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>June 23-24,<br>1993     | ACNW 55th Meeting (P)  | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>July 21-22,<br>1993     | ACNW 56th Meeting (P)  | TBD             | A. Gil              |
| Wednesday-<br>Thursday,<br>August 25-26,<br>1993   | ACNW 57th Meeting (P)  | TBD             | A. Gil              |

| <u>Date</u>   | <u>Event</u>                                   | <u>Location</u>  | <u>YMPO Contact</u> |
|---|--|------------------|---------------------|
| F. <u>ACNW Interactions</u> (Continued)             |  |                  |                     |
| Wednesday-<br>Thursday,<br>September 22-23,<br>1993 | ACNW 58th Meeting (P)                          | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>October 27-28,<br>1993   | ACNW 59th Meeting (P)                          | TBD              | A. Gil              |
| Monday-<br>Tuesday,<br>November 22-23,<br>1993      | ACNW 60th Meeting (P)                          | TBD              | A. Gil              |
| Wednesday-<br>Thursday,<br>December 15-16,<br>1993  | ACNW 61st Meeting (P)                          | TBD              | A. Gil              |
| Monday,<br>December 14                              | NRC Commissioner<br>Curtis Pretour<br>Briefing | Las Vegas,<br>NV | C. Gertz            |
| Tuesday,<br>December 15                             | Burkholder Junior<br>High School               | Las Vegas,<br>NV | J. Blink            |

| <u>Date</u>                                      | <u>Event</u>                     | <u>Location</u>  | <u>Speaker</u> |
|--|----------------------------------|------------------|----------------|
| G. <u>State and Public Interactions</u>          |                                  |                  |                |
| Wednesday,<br>December 16                        | Orr Junior High<br>School        | Las Vegas,<br>NV | L. Flint       |
| Thursday,<br>January 7,<br>1993                  | Nevada Development<br>Authority  | Las Vegas,<br>NV | C. Gertz       |
| Monday,<br>January 11,<br>1993                   | Las Vegas Host<br>Lions Club     | Las Vegas,<br>NV | T. Geer        |
| Tuesday-<br>Wednesday,<br>January 12-13,<br>1993 | Marion Earl<br>Elementary School | Las Vegas,<br>NV | A. Gil         |

| <u>Date</u>   | <u>Event</u>  | <u>Location</u>    | <u>Speaker</u> |
|---|---|--------------------|----------------|
| G. <u>State and Public Interactions</u> (Continued) |   |                    |                |
| Wednesday,<br>January 13,<br>1993                   | Association of<br>Professional<br>Mortgage Women      | Las Vegas,<br>NV   | J. Younker     |
| Wednesday,<br>January 13,<br>1993                   | American Nuclear<br>Society (ANS)                     | Schenectady,<br>NY | C. Gertz       |
| Thursday,<br>January 14,<br>1993                    | ANS   | Parsippany,<br>NJ  | C. Gertz       |
| Saturday,<br>January 16,<br>1993                    | Girl Scout<br>Troop 319                               | Las Vegas,<br>NV   | A. Gil         |
| Tuesday,<br>February 23,<br>1993                    | University of Iowa                                    | Ames,<br>IA        | C. Gertz       |
| Tuesday,<br>May 4, 1993                             | Underground<br>Structures Colorado<br>School of Mines | Golden,<br>CO      | C. Gertz       |

| <u>Date</u>                  | <u>Event</u>          | <u>Location</u>  |
|------------------------------|-----------------------|------------------|
| H. <u>Exhibits Scheduled</u> |                       |                  |
| Saturday,<br>December 12     | Public Open House (P) | Las Vegas,<br>NV |

| <u>Date</u>               | <u>Event</u>                        | <u>Escorts</u>  |
|---------------------------|-------------------------------------|-----------------|
| I. <u>Tours Scheduled</u> |                                     |                 |
| Saturday,<br>December 12  | Public Open House (P)               | Various Escorts |
| Monday,<br>December 14    | NRC Commissioner<br>Curtis          | C. Gertz        |
| Tuesday,<br>December 15   | Legislative Tour                    | A. Robison      |
| Wednesday,<br>December 16 | NV Nuclear Waste<br>Study Committee | TBD             |

| <u>Date</u>                           | <u>Event</u>                   | <u>Escorts</u>  |
|---------------------------------------|--------------------------------|-----------------|
| I. <u>Tours Scheduled</u> (Continued) |                                |                 |
| Saturday,<br>January 16, 1993         | Public Open House (P)          | Various Escorts |
| Wednesday,<br>January 20, 1993        | Tonopah Middle School          | TBD             |
| Monday,<br>January 25, 1993           | Japan Electric Power           | P. Cloke        |
| Wednesday,<br>February 3, 1993        | Green Valley<br>High School    | TBD             |
| Saturday,<br>February 20, 1993        | Public Open House (P)          | Various Escorts |
| Wednesday,<br>February 24, 1993       | Tonopah Middle School          | TBD             |
| Thursday,<br>February 25, 1993        | Senior Tripsters               | TBD             |
| Friday,<br>March 5, 1993              | Waste Management '93           | TBD             |
| Thursday,<br>March 11, 1993           | Meadows School                 | TBD             |
| Thursday,<br>March 18, 1993           | Gabs School                    | TBD             |
| Wednesday,<br>March 24, 1993          | Thurman White Middle<br>School | TBD             |
| Saturday,<br>March 27, 1993           | Public Open House (P)          | Various Escorts |
| Thursday,<br>April 1, 1993            | Orr Junior High<br>School      | TBD             |
| Monday,<br>April 19, 1993             | Hydrology Field Trip           | A. Flint        |

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| <u>Date</u>                           | <u>Event</u>                             | <u>Escorts</u> |
|---------------------------------------|--|----------------|
| I. <u>Tours Scheduled</u> (Continued) |  |                |
| Tuesday,<br>April 20, 1993            | Round Mountain<br>High School            | TBD            |
| Monday,<br>April 26, 1993             | High-Level Waste<br>Conference           | TBD            |
| Monday,<br>June 21, 1993              | Girl Scouts Wider<br>Opportunity Program | TBD            |

YMP:VFI-1452

  
Carl P. Gertz  
Project Manager

INFORMAL MEMORANDUM

TO: Phil Justus  
FROM: Susan Jones *Susan*  
DATE: December 29, 1992

SUBJECT: DAILY OPERATIONS REPORTS AND WEEKLY INTERACTIONS CALENDAR

Enclosed for your information are copies of the Daily Operations Reports for Yucca Mountain Site Characterization Project drill holes USW NRG-6, USW UZ N61, and UE-25 UZ16 (enclosure 1). These reports were prepared by Raytheon Services Nevada and cover December 14-18, 1992.

A copy of the Weekly Interactions Calendar (enclosure 2) is enclosed for your information. It includes a section providing the status of boreholes, trenches, and test pits.

A copy of the field test coordinator's report (enclosure 3) summarizing activities of the previous week and forecasting the activities planned for the current week is also included for your information.

If you need additional information regarding these reports, please contact Dennis R. Williams at (702) 794-7968.

Enclosures:

1. Daily Operations Reports
2. Weekly Interactions Calendar
3. Field Test Coordinator's Report

cc w/encls:

S. E. LeRoy, M&O/Duke, Las Vegas, NV

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 21, 1992  
Page: 1 of 1

Job Package No.: 92-11  
Station: USW NRG-6, North Portal Ramp Borehole  
Drill Rig: JOY - 1  
Activity: Shut down for Christmas holidays.

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 18, 1992 (Rig Day 18)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION  |
|-----------------|---|
| 0800 - 0815     | Service and start up rig and equipment.   |
| 0815 - 0838     | Wait on orders from F.O.C. to start work. No emergency vehicle available.   |
| 0838 - 1107     | Continue ream cycle #6 from 106.41' to 124.25'.   |
| 1107 - 1152     | Trip out of the hole with Odex hammer.  |
| 1152 - 1222     | Lunch.  |
| 1222 - 1257     | Rig up and run deviation survey @ 120', found deviation to be 1 degree 15 minutes from vertical using a 3 degree tool.                                      |
| 1257 - 1330     | Make up new core bit, NRG6#13, serial #2S07749, a Christensen Strata Pac with 10 airways and 15 cutters (1/4" Dia.). Trip in the hole with coring assembly. |
| 1330 - 1405     | Core run #43 from 124.32' - 127.33' (21 min.), 3.0' Rec.  |
| 1405 - 1454     | Core run #44 from 127.33' - 131.33' (33 min.), 4.0' Rec.  |
| 1454 - 1535     | Core run #45 from 131.33' - 134.10' (18 min.), 2.8' Rec.  |
| 1535 - 1630     | Shut down and secure rig.   |

Average Air Rates:   Coring   406 SCFM  
                              Reaming   271 SCFM

Ending Depth:   Cored 134.10'   Reamed 124.25'   Drilled 0'  
Daily Footage:   Cored 9.78'    Reamed 17.84'   Drilled 0'

Drilling Rep:   Jerry Fulkerson, REECo  
A/E Rep:       Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 5-REECo; 3-SMF; 1-USGS  
Visitors On Site: RSN - Anthony; DOE - White; REECo - Mason

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

| BIT<br>#         | DRILLING RATE<br>(ft/hr) | FRAC FREQ<br>(/5 ft) | DEPTH/<br>GRAPHIC<br>LOG | USW NRG-6<br>LITHOLOGY/ REMARKS  | PAGE <u>3</u> of |
|------------------|--------------------------|----------------------|--------------------------|--|------------------|
|                  |                          |                      |                          |  |                  |
| 27               | 0                        | 20 0                 | 75                       | 5.7/5.7<br>100%  |                  |
| 28 NRG6-#8       | 1.1                      | 20 50                | 80                       | 2.9/2.9<br>100%  |                  |
| 29 12/11 NRG6-#7 | 0.7                      | 120 50               |                          |  |                  |
| 30 12/14 NRG6-#8 | 1.9                      |                      | 85                       | 7.5/7.5<br>100%  |                  |
| 31               | 3.5                      |                      |                          |  |                  |
| 32 NRG6-#9       | 0.2                      | 16                   | 90                       | 91.0-XX.XX Orange-pink argillitic pumice<br>fragments up to 1 cm across, up to 5%. |                  |
| 33 12/15         | 0.8                      |                      |                          |  |                  |
| 34 NRG6-#10      | 2.1                      | 9                    | 95                       | 10.3/10.3<br>100%  |                  |
| 35               | 1.7                      |                      |                          |  |                  |
| 36 NRG6-#11      | 4.5                      | 3                    | 100                      |  |                  |
| 37 12/16         | 3.3                      |                      |                          |  |                  |
| 38               | 2.3                      | 6                    | 105                      |  |                  |
| 39               | 3.0                      | 2                    |                          |  |                  |
| 40 NRG6-#12      | 3.5                      | 3                    | 110                      | 16.8/16.8<br>100%  |                  |
| 41 12/17         | 4.5                      | 5                    |                          |  |                  |
| 42               | 3.7                      |                      | 120                      |  |                  |

**RAYTHEON SERVICES NEVADA**  
**DAILY OPERATIONS REPORT**  
**YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
 Date: December 18, 1992  
 Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N61

Drill Rig: CME-850

Activity: Rigging down to move

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 17, 1992 (Rig Day 7)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0830     | Service rig and equipment. Unable to start air compressor.   |
| 0830 - 0916     | Repair and start air compressor.   |
| 0916 - 1005     | Core run #26 from 114.08' to 118.86' (38 mins) 4.5' Rec.   |
| 1005 - 1115     | Pull out of hole with core assembly, laying down core rods. Trip in hole with Odex hammer. Rig up to ream. |
| 1115 - 1200     | Begin ream cycle #9.   |
| 1200 - 1230     | Lunch.   |
| 1230 - 1255     | Ream cycle #9 from 98.68' - 118.86'.   |
| 1255 - 1330     | Pull out of hole with Odex hammer, laying down drill rods.   |
| 1330 - 1630     | Rig down to move.  |

NOTE: USW UZ N61 reach a total depth of 118.86' as per the direction of Lon Hofmann, Foothills Engineering/USGS.

NOTE: FINAL REPORT

Average Air Rates:     Coring     293 SCFM  
                               Reaming    300 SCFM

|                |               |                |            |
|----------------|---------------|----------------|------------|
| Ending Depth:  | Cored 118.86' | Reamed 118.86' | Drilled 0' |
| Daily Footage: | Cored 4.78'   | Reamed 20.18'  | Drilled 0' |

Drilling Rep: Neal Walker, REECo

A/E Rep: James Anthony

Personnel On Site: 1-RSN; 4-REECo; 1-USGS; 3-SMF; 3-Visitors

Visitors On Site: RSN - McClaskey, Cunningham; DOE - Tunnel

Field Report Prepared By: James Anthony

Office Report Prepared By: James Anthony

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 16, 1992  
Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N61

Drill Rig: CME-850

Activity: Tripping out of hole with coring assembly

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 15, 1992 (Rig Day 5)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION   |
|--------------------|--|
| 0800 - 0830        | Service and warm up rig and equipment.   |
| 0830 - 0905        | Pull out of hole with Odex hammer. Trip in hole with coring assembly. Rerun RSN #31, a Christensen Strata Pac. Rig up to core. |
| 0905 - 0946        | Core run #17 from 69.08' to 74.08' (34 mins) 5.0' Rec.   |
| 0946 - 1026        | Core run #18 from 74.08' to 79.08' (33 mins) 5.0' Rec.   |
| 1026 - 1153        | Core run #19 from 79.08' to 84.08' (79 mins) 5.0' Rec.   |
| 1153 - 1203        | Begin core run #20.  |
| 1203 - 1233        | Lunch.   |
| 1233 - 1343        | Core run #20 from 84.08' to 89.08' (72 mins) 5.0' Rec.   |
| 1343 - 1444        | Core run #21 from 89.08' to 94.08' (53 mins) 5.0' Rec.   |
| 1444 - 1546        | Core run #22 from 94.08' to 98.68' (55 mins) 4.6' Rec.   |
| 1546 - 1555        | Start pulling out of hole with coring assembly.  |
| 1555 - 1630        | Shut down and secure rig.  |

Average Air Rates:   Coring    319 SCFM  
                          Reaming   N/A SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 98.68' | Reamed 69.08' | Drilled 0' |
| Daily Footage: | Cored 29.60' | Reamed 0'     | Drilled 0' |

Drilling Rep: Neal Walker, REECO

A/E Rep: James Anthony

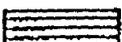
Personnel On Site: 1-RSN; 4-REECO; 1-USGS; 3-SMF; 3-Visitors

Visitors On Site: RSN - McClaskey; DOE - White; CLV/NV - Douglas

Field Report Prepared By: James Anthony  
Office Report Prepared By: James Anthony

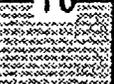
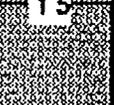
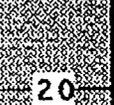
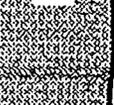
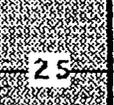
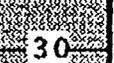
# YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT PRELIMINARY FIELD COMPOSITE BOREHOLE LOG

BOREHOLE ID: USW UZN-61  
 STUDY PLAN NO: B.3.1.2.2.1  
 CORE SIZE: HQ 2.4"  
 DRILL DATES: 12/9/92-  
 GROUND ELEV: 4200 (EST)  
 COORDINATES: N: 755,100' (EST.)  
 E: 561,100' (EST.)

-  ALLUVIUM
-  NON-WELDED
-  PARTIALLY WELDED
-  DENSELY WELDED
-  VITROPHYRE
-  BEDDED TUFF

TOTAL DEPTH:  
 ANGLE FROM VERT: NA BEARING: NA

Logging by Drilling Support Division, Drilling Support and Sample Management Dept, T&MSS

| DATES, CORE RUNS, LOSS | BIT   | DRILLING RATE (ft/hr) |    |     | FRAC FREQ (/5 ft) |     | DEPTH/ GRAPHIC LOG  | LITHOLOGY/ REMARKS   |
|------------------------|-------|-----------------------|----|-----|-------------------|-----|---|--|
|                        |       | 0                     | 10 | 20  | 0                 | 50  |   |  |
|                        |       | 20                    | 70 | 120 | 50                | 100 |   | Page <u>1</u> of <u>3</u>  |
| DC-1                   | 12/9  | 103.2                 |    |     | NO DATA           |     |   | 0.0 - 9.8 Alluvium   |
| DC-2                   |       | 33.9                  |    |     |                   |     |   |  |
| DC-3                   |       | 80.4                  |    |     |                   |     |   |  |
|                        |       | 40.2                  |    |     |                   |     |   |  |
| DC-5                   |       | 25.2                  |    |     |                   |     |   |  |
| DC-6                   |       | 12.3                  |    |     |                   |     |   |  |
| 1                      | 43    | 8.6                   |    |     | 27                |     |  | ALLUVIUM/BEDDED TUFF CONTACT @ 9.8<br>9.8 - 12.3 Tuff, ashflow: pale yellowish brown, partially welded; 30%-40% pumice, pale yellowish brown, vitric; +30% lithics.<br>BEDDED TUFF/TOPOPAH CAPROCK CONTACT @ 12.3<br>4.3/4.3<br>100%   |
| 2                      | 12/10 | 4.9                   |    |     | 41                |     |  | 12.3 - 18.5 Tuff, ashflow: blackish red, partially to densely welded, 3%-5% pumice, reddish brown; 10% sanidine phenocrysts, 5% phlogopite   |
| 3                      |       | 3.1                   |    |     |                   |     |  | 18.5 - 34.0 Tuff, ashflow: grayish red grading downward to pale red, moderate grading to partially welded, devitrified; 5-7% pumice, light gray (up to 10 cm), dark gray (5 cm) and pale red (2 cm), flattened (3:1); 12-15% phenocrysts of plagioclase, sanidine and mica; vapor phase mineralization, increasing with depth. |
| 4                      |       | 2.1                   |    |     | 27                |     |  |  |
| 5                      | 31    | 5.5                   |    |     |                   |     |  |  |
| 6                      |       | 3.2                   |    |     |                   |     |  | 12.8/12.8<br>100%  |
|                        | 12/11 | 3.8                   |    |     | 18                |     |  |  |
| 8                      |       | 5.8                   |    |     |                   |     |  |  |

| S  | M<br>LB | DRILLING RATE<br>(ft./hr) |       | FRAC FREQ<br>(/5 ft) |         | DEPTH/<br>GRAIN LOG | LITHOLOGY/<br>REMARKS  |
|----|---------|---------------------------|-------|----------------------|---------|---------------------|--|
|    |         | 0-20                      | 20-70 | 70-120               | 120-500 |                     |  |
| 8  |         | 5.8                       |       |                      | 16      | 30                  | 34.0-118.9 Tuff, ashflow, pale red, partially to moderately welded; 5-10% light gray pumice, 10-15% sanidine, 5-10% plagioclase, occasional phlogopite and small lithophysal cavities.<br><br>27.0/27.2<br>99%<br><br>15.0/15.0<br>100%<br><br>@71' Lithophysae increase in amount and size. |
| 9  |         | 6.0                       |       |                      | 19      | 35                  |  |
| 10 |         | 6.0                       |       |                      | 17      | 40                  |  |
| 11 |         | 5.9                       |       |                      | 21      | 45                  |  |
| 12 |         | 11.1                      |       |                      | 25      | 50                  |  |
| 13 |         | 7.9                       |       |                      | 29      | 55                  |  |
| 14 | 12/4    | 8.1                       |       |                      | 37      | 60                  |  |
| 15 |         | 5.6                       |       |                      | 22      | 65                  |  |
| 16 |         | 8.6                       |       |                      | 15      | 70                  |  |
| 17 | 12/15   | 8.8                       |       |                      | 9.1     | 75                  |  |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 21, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Shut down for Christmas Holidays

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum.  
3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 18, 1992 (Rig Day 135)**

**HOURS  
FROM - TO**

**OPERATIONS DESCRIPTION**

|             |  |
|-------------|--|
| 0800 - 0815 | Service and warm up equipment.   |
| 0815 - 0838 | No rig activity due to the lack of medical personnel area 25.  |
| 0838 - 0905 | Pull out of hole with overshot, no recovery.   |
| 0905 - 1055 | Rework fishing tool.   |
| 1055 - 1145 | Go in hole with overshot.  |
| 1145 - 1215 | Lunch  |
| 1215 - 1254 | Attempt to latch on to fish.   |
| 1254 - 1355 | Pull out of hole to check recovery, Recovered the spearhead base, spring pin and case rework of the head assembly. |
| 1355 - 1630 | Shut down and secure rig for Christmas Holidays.   |

|                 |                     |          |
|-----------------|---------------------|----------|
| <b>CORING:</b>  | Average air rate    | N/A SCFM |
|                 | Average vacuum rate | N/A SCFM |
| <b>REAMING:</b> | Average air rate    | N/A SCFM |
|                 | Average vacuum rate | N/A SCFM |

|                       |                       |                        |                  |
|-----------------------|-----------------------|------------------------|------------------|
| <b>Ending Depth:</b>  | <b>Cored</b> 1196.94' | <b>Reamed</b> 1176.05' | <b>Drilled</b> 0 |
| <b>Daily Footage:</b> | <b>Cored</b> 0        | <b>Reamed</b> 0        | <b>Drilled</b> 0 |

**Drilling Rep:** Richard Sowards, REECO

**A/E Rep:** David Putnam, RSN

**Personnel On Site:** 1-RSN; 7-REECO; 1-USGS; 2-SMF; 1-DOE

**Visitors On Site:** RSN - Anthony; REECO - McDaniel, Mason; DOE - White

**Field Report Prepared By:** David Putnam  
**Office Report Prepared By:** David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30

Date: December 18, 1992

Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Pull out of hole with overshot

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 17, 1992 (Rig Day 134)**

HOURS  
FROM - TO

**OPERATIONS DESCRIPTION**

|             |  |
|-------------|--|
| 0800 - 0815 | Service and warm up equipment.   |
| 0815 - 0842 | Wait on the crew to run the down hole camera.  |
| 0842 - 1255 | Rig up, run down hole camera, rig down. The spearhead on the inner barrel retrieving attachment is laying to one side and the top part is missing. |
| 1255 - 1335 | Construct fishing tool.  |
| 1335 - 1445 | Go in hole with overshot.  |
| 1445 - 1507 | Attempt to latch on to fish.   |
| 1507 - 1615 | Pull out of hole to check recovery.  |
| 1615 - 1630 | Shut down and secure rig.  |

|                |                     |          |
|----------------|---------------------|----------|
| <b>CORING:</b> | Average air rate    | N/A SCFM |
|                | Average vacuum rate | N/A SCFM |

|                 |                     |          |
|-----------------|---------------------|----------|
| <b>REAMING:</b> | Average air rate    | N/A SCFM |
|                 | Average vacuum rate | N/A SCFM |

|                       |                       |                        |                  |
|-----------------------|-----------------------|------------------------|------------------|
| <b>Ending Depth:</b>  | <b>Cored</b> 1196.94' | <b>Reamed</b> 1176.05' | <b>Drilled</b> 0 |
| <b>Daily Footage:</b> | <b>Cored</b> 0        | <b>Reamed</b> 0        | <b>Drilled</b> 0 |

Drilling Rep: Richard Sowards, REECO

A/E Rep: David Putnam, RSN

Personnel On Site: 1-RSN; 8-REECO; 1-USGS; 1-SMF; 1-DOE

Visitors On Site: RSN - Cunningham; REECO - Wonderly, McDaniel, Henze, Sorensen; DOE - Tunnell; CLV/State - Douglas; LLNL - Russell, Newman, Miller, Crites

Field Report Prepared By: David Putnam

Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 18, 1992  
Page: 1 of 1

Job Package No.: 92-11  
Station: USW NRG-6, North Portal Ramp Borehole  
Drill Rig: JOY - 1  
Activity: Reaming

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & Install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 17, 1992 (Rig Day 17)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION  |
|-----------------|---|
| 0800 - 0826     | Service and start up rig and equipment.   |
| 0826 - 0942     | Core run #41 from 114.65' - 119.65' (67 min.), 5.0' Rec.  |
| 0942 - 0958     | Rig up and run deviation survey @ 115', found deviation to be 1 degree 2 minutes from vertical using a 3 degree tool. |
| 0958 - 1124     | Core run #42 from 119.65' - 124.32' (75 min.), 4.6' Rec.  |
| 1124 - 1142     | Trip out of the hole with core rods to ream.  |
| 1142 - 1200     | Trip in the hole with Odex hammer.  |
| 1200 - 1230     | Lunch   |
| 1230 - 1322     | Continue trip in the hole with Odex hammer, jay into casing shoe, and make connection.                                |
| 1322 - 1615     | Ream cycle #6 from 79.98' to 106.41'.   |
| 1615 - 1630     | Shut down and secure rig.   |

Average Air Rates:   Coring     206 SCFM  
                              Reaming    269 SCFM

|                |               |                |            |
|----------------|---------------|----------------|------------|
| Ending Depth:  | Cored 124.32' | Reamed 106.41' | Drilled 0' |
| Daily Footage: | Cored 9.67'   | Reamed 26.43'  | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
A/E Rep: Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 5-REECo; 4-SMF; 1-USGS  
Visitors On Site: RSN - McClaskey, Cunningham; SAIC - Weeks; CLV/State - Douglas

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30

Date: December 17, 1992

Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Run TV camera

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum.  
3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 16, 1992 (Rig Day 133)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0815     | Service and warm up equipment.   |
| 0815 - 1005     | Construct fishing tool.  |
| 1005 - 1120     | Go in hole with friction type overshot fishing tool (4 9/16" OD by 4" ID), hit fill at 1178', tagged top of tool in hole at 1183'.           |
| 1120 - 1257     | Attempt to latch on to fish, circulate and rotate. Had compressor and Haz Vac running. (total air in - 23946 SCF, total air out - 38330 SCF) |
| 1257 - 1520     | Pull out of hole with fishing tool to check on recovery. No recovery. Pipe connections were very tight.                                      |
| 1520 - 1630     | Shut down and secure rig.  |

NOTE: TV camera arrived on location at 10:45 am

|          |                     |          |
|----------|---------------------|----------|
| CORING:  | Average air rate    | N/A SCFM |
|          | Average vacuum rate | N/A SCFM |
| REAMING: | Average air rate    | N/A SCFM |
|          | Average vacuum rate | N/A SCFM |

|                |                |                 |           |
|----------------|----------------|-----------------|-----------|
| Ending Depth:  | Cored 1196.94' | Reamed 1176.05' | Drilled 0 |
| Daily Footage: | Cored 0        | Reamed 0        | Drilled 0 |

Drilling Rep: Richard Sowards, REECO  
 A/E Rep: David Putnam, RSN  
 Personnel On Site: 1-RSN; 8-REECO; 1-USGS; 1-SMF; 1-DOE  
 Visitors On Site: RSN - McClaskey, Cunningham, Wright; REECO - Wonderly, McDaniel; SAIC - Beall  
 DOE - Williams

Field Report Prepared By: David Putnam  
 Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 17, 1992

Page: 1 of 1

**Job Package No.: 91-9, Phase 2 Revision 4**

**Station: USW UZ N61**

**Drill Rig: CME-850**

**Activity: Coring**

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 16, 1992 (Rig Day 6)**

**HOURS  
FROM - TO**

**OPERATIONS DESCRIPTION**

|             |   |
|-------------|---|
| 0800 - 0830 | Service and warm up rig and equipment.  |
| 0830 - 0852 | Finish pulling out of hole with coring assembly. Trip in hole with Odex hammer.       |
| 0852 - 0959 | Repair rotating head. Rig up to ream.   |
| 0959 - 1204 | Begin ream cycle #8.  |
| 1204 - 1234 | Lunch.  |
| 1234 - 1309 | Ream cycle #8 from 69.08' - 98.68'.   |
| 1309 - 1331 | Pull out of hole with Odex hammer. Trip in hole with coring assembly. Rig up to core. |
| 1331 - 1429 | Repair rotating head. Finish rigging up to core.                                      |
| 1429 - 1454 | Core run #23 from 98.68' to 103.90' (19 mins) 5.2' Rec.                               |
| 1454 - 1526 | Core run #24 from 103.90' to 109.00' (26 mins) 4.8' Rec.                              |
| 1526 - 1600 | Core run #25 from 109.00' to 114.08' (27 mins) 5.1' Rec.                              |
| 1600 - 1630 | Shut down and secure rig.   |

**Average Air Rates:**      Coring      324 SCFM  
    Reaming      310 SCFM

|                       |                      |                      |                   |
|-----------------------|----------------------|----------------------|-------------------|
| <b>Ending Depth:</b>  | <b>Cored 114.08'</b> | <b>Reamed 98.68'</b> | <b>Drilled 0'</b> |
| <b>Daily Footage:</b> | <b>Cored 15.40'</b>  | <b>Reamed 29.60'</b> | <b>Drilled 0'</b> |

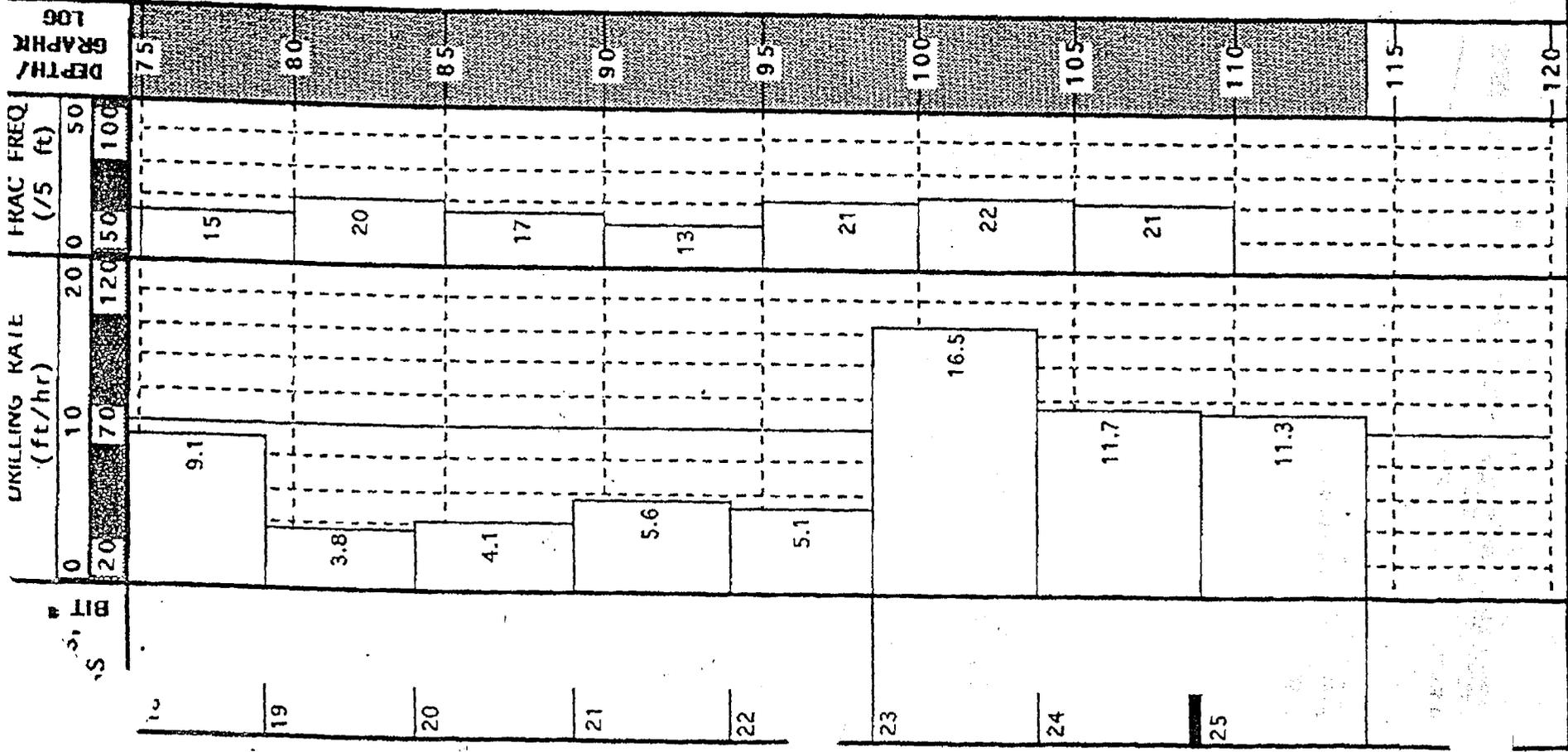
**Drilling Rep:** Neal Walker, REECo

**A/E Rep:** James Anthony

**Personnel On Site:** 1-RSN; 4-REECo; 1-USGS; 3-SMF; 1-Visitor

**Visitors On Site:** McClaskey - RSN

**Field Report Prepared By:** James Anthony  
**Office Report Prepared By:** James Anthony



29.6/29.6  
100%

15.4/15.1  
98%

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 17, 1992

Page: 1 of 1

Job Package No.: 92-11

Station: USW NRG-6, North Portal Ramp Borehole

Drill Rig: JOY - 1

Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 16, 1992 (Rig Day 16)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0823     | Service and start up rig and equipment.  |
| 0823 - 1015     | Core run #37 from 97.90' - 102.90' (92 min.), 5.0' Rec.  |
| 1015 - 1231     | Core run #38 from 102.90' - 107.90' (132 min.), 5.0' Rec.  |
| 1231 - 1327     | Pull out of the hole with core rods to change bit. Pull NRG6# 11. Make up NRG6#12, Christensen, surface set, diamond, 25 stones/carat, SN# 2 S34582, O.D. = 3.69", 8 airways 1/16" deep x 1/8" wide. Identical to NRG6# 11. Trip in hole with core rods. |
| 1327 - 1510     | Core run #39 from 107.90' - 112.90' (99 min.), 5.0' Rec.   |
| 1510 - 1525     | Rig up and run deviation survey @ 110', found deviation to be 1 1/4 degrees from vertical, using a 3 degree tool.  |
| 1525 - 1539     | Lay down kelly and swivel to tighten swivel packing.   |
| 1539 - 1619     | Core run #40 from 112.90' - 114.65' (30 min.), 1.8' Rec.   |
| 1619 - 1630     | Shut down and secure rig.  |

Average Air Rates: Coring 198 SCFM  
Reaming N/A SCFM

|                |               |               |            |
|----------------|---------------|---------------|------------|
| Ending Depth:  | Cored 114.65' | Reamed 79.98' | Drilled 0' |
| Daily Footage: | Cored 16.75'  | Reamed 00.00' | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
A/E Rep: Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 5-REECo; 3-SMF; 1-USGS; 1-DOE  
Visitors On Site: RSN - McClaskey, Cunningham, E. Wright; USGS - Striffler; CRWMS M&O - Bhattacharyyn, Nolting, Passalaalqva

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

| AS, #<br>ATES, #<br>SS | DRILLING RATE<br>(ft/hr) | FRAC FREQ<br>(/5 ft) | DEPTH/<br>GRAPHIC<br>LOG | USW NRG-6<br>LITHOLOGY/ REMARKS  | PAGE 3 of         |                   |
|------------------------|--------------------------|----------------------|--------------------------|--|-------------------|-------------------|
|                        |                          |                      |                          |  |                   |                   |
| 27                     | 1.1                      | 0                    | 75                       | 5.7/5.7<br>100%  |                   |                   |
| 28 NRG6-#8             | 0.7                      | 8                    | 80                       | 91.0-XX.XX Orange-pink argilllc pumice<br>fragments up to 1 cm across, up to 5%. |                   |                   |
| 29 12/11<br>NRG6-#7    | 1.9                      | 12                   |                          |  | 2.9/2.9<br>100%   |                   |
| 30 12/14<br>NRG6-#8    | 3.5                      | 16                   |                          |  | 7.5/7.5<br>100%   |                   |
| 31                     | 0.2                      | 9                    |                          |  |                   |                   |
| 32 NRG6-#9             | 0.8                      | 3                    |                          |  | 10.3/10.3<br>100% |                   |
| 33 12/15               | 1.7                      | 6                    |                          |  |                   |                   |
| 34                     | 2.1                      | 2                    |                          |  |                   |                   |
| 35                     | 1.7                      |                      |                          |  |                   |                   |
| 36 NRG6-#11            | 4.5                      |                      |                          |  | 106               |                   |
| 37 12/16<br>NRG6-#11   | 3.3                      |                      |                          |  | 110               |                   |
| 38                     | 2.3                      |                      |                          |  | 115               | 16.8/16.8<br>100% |
| 39                     | 3.0                      |                      |                          |  |                   |                   |
| 40                     | 3.5                      |                      | 120                      |  |                   |                   |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 16, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Run TV camera

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum.  
3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 15, 1992 (Rig Day 132)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0815     | Service and warm up equipment.   |
| 0815 - 0830     | Lay down latching coupling with the pin end missing.                                       |
| 0830 - 0920     | Locate fishing tools to recover core barrel.   |
| 0920 - 1055     | Assemble overshot with grapples.   |
| 1055 - 1145     | Go in the hole with the overshot.  |
| 1145 - 1154     | Set down on and attempt to latch on to fish.   |
| 1154 - 1254     | Pull out of hole to check on recovery. No recovery.  |
| 1254 - 1310     | Redress overshot.  |
| 1310 - 1350     | Go in hole with overshot.  |
| 1350 - 1421     | Set down on and attempt to latch on to the fish (Injected 9744 SCFM air).                  |
| 1421 - 1533     | Pull out of hole to check on recovery. No recovery. Top of core barrel latch is bent over. |
| 1533 - 1630     | Shut down and secure rig.  |
| <b>CORING:</b>  | Average air rate                      N/A SCFM   |
|                 | Average vacuum rate                N/A SCFM  |
| <b>REAMING:</b> | Average air rate                      N/A SCFM   |
|                 | Average vacuum rate                N/A SCFM  |

|                |                |                 |           |
|----------------|----------------|-----------------|-----------|
| Ending Depth:  | Cored 1196.94' | Reamed 1176.05' | Drilled 0 |
| Daily Footage: | Cored 0        | Reamed 0        | Drilled 0 |

Drilling Rep: Richard Sowards, REECO  
A/E Rep: David Putnam, RSN  
Personnel On Site: 1-RSN; 8-REECO; 1-USGS; 2-SMF  
Visitors On Site: RSN - McClaskey, Wright, Cunningham; REECO - Wonderly, McDaniel, Witt, Patton; SAIC - McCormick; DOE - Long, White; CLV/State - Douglas

Field Report Prepared By: David Putnam  
Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA**  
**DAILY OPERATIONS REPORT**  
**YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
 Date: December 16, 1992  
 Page: 1 of 1

Job Package No.: 92-11  
 Station: USW NRG-6, North Portal Ramp Borehole  
 Drill Rig: JOY - 1  
 Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 15, 1992 (Rig Day 15)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0820     | Service and start up rig and equipment.  |
| 0820 - 1018     | Core run #33 from 87.58' - 88.96' (109 min.), 1.4' Rec.  |
| 1018 - 1115     | Pull out of the hole with core rods to change bit. Pull NRG6#9. Make up NRG6#10, Christensen, surface set diamond, 25 stones/carat, SN# 2 S34565, O.D. = 3.69", 8 airways 1/16" deep x 1/8" wide. Trip in hole with core rods.                               |
| 1115 - 1326     | Core run #34 from 88.96' - 92.90' (115 min.), 3.9' Rec.  |
| 1326 - 1500     | Core run #35 from 92.90' - 95.28' (86 min.), 2.4' Rec.   |
| 1500 - 1529     | Pull out of the hole with core rods to change bit. Pull NRG6#10. Make up NRG6#11, Christensen, surface set diamond, 25 stones/carat, SN# 2 S34561, O.D. = 3.69", 8 airways 1/16" deep x 1/8" wide. Bit is identical to NRG6#10. Trip in hole with core rods. |
| 1529 - 1615     | Core run #36 from 95.28' - 97.90' (35 min.), 2.6' Rec.   |
| 1615 - 1630     | Shut down and secure rig.  |

Average Air Rates: Coring 188 SCFM  
 Reaming N/A SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 97.90' | Reamed 79.98' | Drilled 0' |
| Daily Footage: | Cored 10.32' | Reamed 00.00' | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
 A/E Rep: Richard W. Wright, RSN  
 Personnel On Site: 1-RSN; 5-REECo; 3-SMF; 1-USGS; 1-DOE  
 Visitors On Site: RSN - McClaskey, Cunningham, E. Wright; REECo - Berry; USGS - Striffler; CLV/State - Douglas

Field Report Prepared By: Richard W. Wright  
 Office Report Prepared By: Richard W. Wright

| S<br>BIT # | DRILLING RATE<br>(ft/hr) |          |           | TIME TAKEN<br>(/5 ft) |           | DEPTH/<br>GRAPHIC<br>LOG | USW U/LN-61<br>LITHOLOGY/<br>REMARKS      |
|------------|--------------------------|----------|-----------|-----------------------|-----------|--------------------------|---|
|            | 0<br>20                  | 10<br>70 | 20<br>120 | 0<br>50               | 50<br>100 |                          |   |
| 9          | 5.8                      |          |           | 16                    |           | 30                       | 27.0/27.2<br>99%<br><br>15.0/15.0<br>100% |
| 10         | 6.0                      |          |           | 19                    |           | 35                       |   |
| 11         | 5.9                      |          |           | 17                    |           | 40                       |   |
| 12         | 11.1                     |          |           | 21                    |           | 45                       |   |
| 13         | 7.9                      |          |           | 25                    |           | 50                       |   |
| 14         | 8.1                      |          |           | 29                    |           | 55                       |   |
| 15         | 5.6                      |          |           | 37                    |           | 60                       |   |
| 16         | 8.6                      |          |           |                       |           | 65                       |   |
|            |                          |          |           |                       |           | 70                       |   |
|            |                          |          |           |                       |           | 75                       |   |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 15, 1992  
Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N61

Drill Rig: CME-850

Activity: Tripping out of hole with Odex hammer

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 14, 1992 (Rig Day 4)**

**HOURS  
FROM - TO**

**OPERATIONS DESCRIPTION**

|             |   |
|-------------|---|
| 0800 - 0830 | Safety meeting at sub-dock.   |
| 0830 - 0900 | Service rig and equipment, unable to start air compressor.                            |
| 0900 - 1026 | Repair and start air compressor.  |
| 1026 - 1117 | Core run #14 from 54.08' to 59.08' (37 mins) 5.0' Rec.                                |
| 1117 - 1157 | Begin core run #15.   |
| 1157 - 1227 | Lunch.  |
| 1227 - 1250 | Core run #15 from 59.08' to 64.08' (54 mins) 5.0' Rec.                                |
| 1250 - 1340 | Core run #16 from 64.08' to 69.08' (35 mins) 5.0' Rec.                                |
| 1340 - 1402 | Pull out of hole with coring assembly. Trip in hole with Odex hammer. Rig up to ream. |
| 1402 - 1558 | Ream cycle #7 from 40.08' - 69.08'.   |
| 1558 - 1630 | Shut down and secure rig.   |

Average Air Rates:      Coring      199 SCFM  
                                 Reaming      228 SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 69.08' | Reamed 69.08' | Drilled 0' |
| Daily Footage: | Cored 15.00' | Reamed 29.00' | Drilled 0' |

Drilling Rep: Neal Walker, REECo

A/E Rep: James Anthony

Personnel On Site: 1-RSN; 4-REECo; 1-USGS; 3-SMF; 1-Visitor

Visitors On Site: McClaskey - RSN

Field Report Prepared By: James Anthony

Office Report Prepared By: James Anthony

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 15, 1992  
Page: 1 of 1

Job Package No.: 92-11  
Station: USW NRG-6, North Portal Ramp Borehole  
Drill Rig: JOY - 1  
Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' (±50') and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 14, 1992 (Rig Day 14)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0858     | Safety meeting, service and start up rig and equipment.  |
| 0858 - 0935     | Pull NRG6#7, make up NRG6#8, SN# 0S37499, a used one step carbonado, with 4 airways, 1/8" wide x 1/16" deep. Run one stabilizer at casing shoe and one string stabilizer 40' above core bit. |
| 0935 - 1135     | Core run #30 from 80.13' - 85.41' (90 min.), 5.3' Rec.   |
| 1135 - 1201     | Attempt to core but circulation stops as torque and vibration increases on bottom.   |
| 1201 - 1231     | Lunch  |
| 1231 - 1254     | Pull out of the hole with core rods. Bit is heat damaged. Lay down NRG6#8, make up NRG6#6, a used surface set diamond.   |
| 1254 - 1357     | Core run #31 from 85.41' - 85.64' (63 min.), 0.2' Rec.   |
| 1357 - 1431     | Pull out of the hole with core rods to change bit. Pull NRG6#6, make up NRG6#9, Acker, surface set diamond, SN# 50409, 4 airways 1/8" x 1/8". Trip in hole with core rods.                   |
| 1431 - 1459     | Tag tight hole @ 80.26' and ream under gauge hole from 80.26' - 85.64'.  |
| 1459 - 1607     | Core run #32 from 85.64' - 87.58' (61 min.), 2.0' Rec.   |
| 1607 - 1630     | Shut down and secure rig.  |

Average Air Rates:     Coring     216 SCFM  
                              Reaming    N/A SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 87.58' | Reamed 79.98' | Drilled 0' |
| Daily Footage: | Cored 7.45'  | Reamed 00.00' | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECO  
A/E Rep: Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 5-REECO; 3-SMF; 1-USGS  
Visitors On Site: RSN - McClaskey, Cunningham, E. Wright; REECO - Wonderly, McDaniel, Hurtado; USGS - Striffler; SAIC - McCorimick; Baker Oil Tools/Tri-State - Rodgers

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

| DATE<br>WELLS,<br>TESTS,<br>LOSS | DRILLING RATE<br>(ft/hr) | FRAC FREQ<br>(/5 ft) | DEPTH/<br>GRAPHIC<br>LOG | USW NRG-6<br>LITHOLOGY/ REMARKS |
|----------------------------------|--------------------------|----------------------|--------------------------|---------------------------------|
|                                  |                          |                      |                          |                                 |
| 27                               | 1.1                      | 20                   | 75                       | 5.7/5.7<br>100%                 |
| 28 NRG6-#5                       | 0.7                      | 8                    | 80                       | 2.9/2.9<br>100%                 |
| 29 12/11<br>NRG6-#6              | 1.9                      | 12                   |                          |                                 |
| 30 12/14<br>NRG6-#7              | 3.5                      |                      | 85                       |                                 |
| 31                               | 0.2                      |                      | 90                       |                                 |
| 32 NRG6-#8                       |                          |                      | 95                       |                                 |
|                                  |                          |                      | 100                      |                                 |
|                                  |                          |                      | 105                      |                                 |
|                                  |                          |                      | 110                      |                                 |
|                                  |                          |                      | 115                      |                                 |
|                                  |                          |                      | 120                      |                                 |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 15, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Attempt to recover core barrel

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 14, 1992 (Rig Day 131)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0830     | Service and warm up equipment. Safety meeting.   |
| 0830 - 0900     | Connect kelly hose to the top drive. Disconnect the return hose at the sample collector and check for obstructions. Blow through the return hose, had good blow with one compressor.         |
| 0900 - 1030     | Ream cycle #77 to 1176.05'. Attempted to circulate hole clean, vacuum reached the 15" limit. Terminated ream cycle #77 at 1176.05'.  |
| 1030 - 1050     | Lay down one joint of dual wall drill pipe, picked up a 10', 5' and 2.5' dual wall drill pipe sub.   |
| 1050 - 1220     | Go in the hole with the core assembly. Ran RSN #13RR Christensen Strata Pac bit, SN 2S-28390, 18 cutters, 10 airways. Tagged fill at 1170.00' (9.27' fill).                                  |
| 1220 - 1251     | Core run #250 from 1179.27' to 1181.88' (8 min), 1.2' Rec.   |
| 1251 - 1335     | Core run #251 from 1181.88' to 1189.88' (17 min), 3.5' Rec.  |
| 1335 - 1448     | Core run #252 from 1189.88' to 1196.94' (9 min), N/A   |
| 1448 - 1600     | Could not pull the inner barrel. Pull out of hole with core assembly to recover core. Core assembly parted at the top of the core barrel and the bottom of the top stabilizer on the barrel. |
| 1600 - 1630     | Shut down and secure rig.  |

|                 |                     |           |
|-----------------|---------------------|-----------|
| <b>CORING:</b>  | Average air rate    | 333 SCFM  |
|                 | Average vacuum rate | 1232 SCFM |
| <b>REAMING:</b> | Average air rate    | 1383 SCFM |
|                 | Average vacuum rate | 1421 SCFM |

|                |                |                 |           |
|----------------|----------------|-----------------|-----------|
| Ending Depth:  | Cored 1196.94' | Reamed 1176.05' | Drilled 0 |
| Daily Footage: | Cored 17.67'   | Reamed 0.44'    | Drilled 0 |

Drilling Rep: Richard Sowards, REECO

A/E Rep: David Putnam, RSN

Personnel On Site: 1-RSN; 6-REECO; 1-USGS; 2-SMF; 1-DOE

Visitors On Site: RSN - McClaskey, Wright; REECO - Wonderly, McDaniel; SAIC - McCormick, Peck; DOE - Long; NRC Tour(9); BOT/Tri-State - Rodgers

Field Report Prepared By: David Putnam

Office Report Prepared By: David Putnam

WEEKLY INTERACTIONS CALENDAR

STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/18/92

| <u>DATE/LOC.</u>             | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|------------------------------|---|-------------------------------------|------------------------------|----------------------------------|---|
| 12/14-15/92<br>Rockville, MD | NRC TE: Total System<br>Performance<br>Assessment       | Boak<br>(Pahwa-M&O)                 | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL<br>PNL                | Discuss the DOE TSPA<br>(methodology, results,<br>lessons, learned, future<br>plans), and NRC IPE.<br><b>Strategy session by<br/>telecon on 11/24/92.</b> |
| 12/16/92<br>Bethesda, MD     | ACNW WG on PA -<br>Phase 2 HLW<br>Interactive PA by NRC | Boak<br>(Van Luik-M&O)              | Gil<br>(LeRoy-M&O)           | M&O<br>SNL<br>PNL                | Will discuss progress of<br>Phase 2 PA effort. Also<br>will hear briefing from<br>DOE on status of TSPA.  |
| 12/17-18/92<br>Bethesda, MD  | ACNW 49th Meeting                                       |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 1/5-6/93<br>Arlington, VA    | NWTRB Full Board<br>Meeting                             | Harrison<br>(Benton-M&O)            | Cooper<br>(Hoffman-M&O)      | M&O<br>SNL                       | M&O waste package<br>issues and 2001 roadmap.<br>YMPO interim storage<br>plans, SNL dual purpose<br>casks.  |
| 1/12/93<br>Carlsbad, NM      | Tour of WIPP Site<br><b>**</b>                          | Boak<br>(Van Luik-M&O)              | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL                       | Previously scheduled<br>10/28/92.   |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

ENCLOSURE 2

WEEKLY INTERACTIONS CALENDAR

STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/18/92

| <u>DATE/LOC.</u>                  | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u>         | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|-----------------------------------|---|---|------------------------------|----------------------------------|---|
| 1/13/93<br>Albuquerque, NM        | NRC observation of<br>DOE Meeting on<br>Performance<br>Assessment | Boak<br>(Van Luik-M&O)                      | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL                       | NRC staff to observe<br>interaction between YMPO<br>and WIPP PA staff.<br>Rescheduled from<br>10/27/92.   |
| 1/27-28/93<br>Bethesda, MD        | ACNW 50th Meeting   |   | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 2/24-25/93<br>Bethesda, MD        | ACNW 51st Meeting   |   | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 2/93 or 3/93<br>Location TBD      | NWTRB HG&G Panel<br>Meeting                                       |   | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |
| 3/93<br>Date TBD<br>Las Vegas, NV | NRC Site Visit  | Sullivan<br>(Statton-M&O)<br>(Sandifer-M&O) | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>USGS                      | NRC will observe<br>trenching activities and<br>ESF Construction<br>Activities. The TRB,<br>ACNW, and affected units<br>of government will be<br>invited. |
| 3/24-25/93<br>Location TBD        | ACNW 52nd Meeting<br>TBD  |   | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 4/20-23/93<br>Reno, NV            | NWTRB Full Board<br>Meeting                                       |   | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

WEEKLY INTERACTIONS CALENDAR

STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/18/92

| <u>DATE/LOC.</u>                             | <u>TOPIC</u>   | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|--|--|-------------------------------------|------------------------------|----------------------------------|---|
| 4/28-29/93<br>Location TBD                   | ACNW 53rd Meeting<br>TBD   |                                     | Gil<br>(LeRoy-M&O)           | M&O                              | Agenda TBD.   |
| 5/3/93<br>Las Vegas, NV                      | Mgmt. Meeting on<br>Topical Report                                     | Jones<br>(Lugo-M&O)                 | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Discuss use of DOE<br>Topical Reports and NRC<br>Draft Topical Report<br>Review Plan. Rescheduled<br>from 2/11/93.                                |
| 5/17/93<br>Las Vegas, NV &<br>Washington, DC | NRC Video Conference<br>TE on Program<br>Planning and Integration      | Royer<br>(Schutt-M&O)               | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Discuss process for<br>technical guidance/<br>direction to projects by<br>OCRWM HQ and the role<br>of Systems Planning and<br>Integration Branch. |
| 5/18/93<br>Las Vegas, NV &<br>Washington, DC | NRC Video-Conference<br>TE on OCRWM<br>Technical Baseline<br>Documents | Royer<br>(Schutt-M&O)               | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Provide NRC opportunity<br>to discuss OCRWM's<br>treatment of NRC<br>requirement in 10CFR 60,<br>71 and 72.                                       |
| 5/19-20/93<br>Location TBD                   | ACNW 54th Meeting<br>TBD   |                                     | Gil<br>(LeRoy-M&O)           | M&O                              | Agenda TBD.   |
| 6/1-12/93<br>Location TBD                    | NWTRB International<br>Trip<br>**                                      |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

## WEEKLY INTERACTIONS CALENDAR

### STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/18/92

| <u>DATE/LOC.</u>           | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|----------------------------|---|-------------------------------------|------------------------------|----------------------------------|---|
| 6/8/93<br>Las Vegas, NV    | NRC TE on Geophysics<br>Integration                 | Tynan<br>(Agnew-M&O)                | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Discuss DOE progress in<br>resolving SCA comments<br>51, 52 and 59 as related to<br>integration of planned<br>geophysical activities with<br>other site characterization<br>activities. |
| 6/9/93<br>Las Vegas, NV    | NRC TE on Volcanism                                 | Cooper<br>(Jerez-M&O)               | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>LANL                      | Discuss DOE volcanism<br>studies as detailed in<br>LANL report.   |
| 6/10/93<br>Las Vegas, NV   | NRC Mgmt. Meeting<br>for Interactions<br>Scheduling | Jones<br>(LeRoy-M&O)                | Bjerstedt<br>(LeRoy-M&O)     |                                  | Negotiate DOE/NRC<br>interactions for July-<br>December 1993.   |
| 6/23-24/93<br>Location TBD | ACNW 55th Meeting<br>TBD                            |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 7/12-15/93<br>Denver, CO   | NWTRB Full Board<br>Meeting                         |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |
| 7/21-22/93<br>Location TBD | ACNW 56th Meeting<br>TBD                            |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 7/28/93<br>Location TBD    | NRC TE on ESF Title<br>II Design                    | Petrie<br>(Sandifer-M&O)            | Bjerstedt<br>(LeRoy-M&O)     |                                  | Discuss the alternative that<br>was chosen for ESF Title<br>II Design and discuss<br>analysis and design<br>methods that were used.   |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

WEEKLY INTERACTIONS CALENDAR

STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/18/92

| <u>DATE/LOC.</u>             | <u>TOPIC</u>                | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u> |
|------------------------------|-----------------------------|-------------------------------------|------------------------------|----------------------------------|-----------------|
| 8/25-26/93<br>Location TBD   | ACNW 57th Meeting<br>TBD    |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.     |
| 9/22-23/93<br>Location TBD   | ACNW 58th Meeting<br>TBD    |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.     |
| 10/19-22/93<br>Las Vegas, NV | NWTRB Full Board<br>Meeting |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.     |
| 10/27-28/93<br>Location TBD  | ACNW 59th Meeting<br>TBD    |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.     |
| 11/22-23/93<br>Location TBD  | ACNW 60th Meeting<br>TBD    |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.     |
| 12/15-16/93<br>Location TBD  | ACNW 61st Meeting<br>TBD    |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.     |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

WEEKLY INTERACTIONS CALENDAR

DRILLING, TRENCHING, AND TEST PIT ACTIVITIES  
12/11/92

| <u>DESIGNATION</u>                                     | <u>PLANNED START DATE</u> | <u>PLANNED END DATE</u> | <u>BACKFILL DATE</u> | <u>YMPO SITE CONTACT</u> | <u>COMMENTS</u>  |
|--|---------------------------|-------------------------|----------------------|--------------------------|--|
| Fran Ridge<br>Test Pit No. 1                           | 8/24/92                   | 11/30/92                | N/A                  | Girdley                  | Fracture network mapping in pit completed.   |
| Lathrop Wells Cinder<br>Cone Volcanic<br>Trenching     | 9/8/92                    | 9/16/92                 | 9/16/93              | Cooper                   | Continuation of the volcanic studies.  |
| Unsaturated Zone<br>Borehole No. 16                    | 5/27/92                   | 3/24/93                 | N/A                  | Long                     | Unsaturated zone site characterization and vertical seismic profiling.   |
| Neutron-Access<br>Boreholes Phase II<br>(12 boreholes) | 8/3/92                    | TBD                     | N/A                  | Girdley                  | Core taken from these holes will be used by USGS for determination of moisture content and to construct tritium profiles.                                |
| North Ramp<br>Geologic-6                               | 11/16/92                  | 2/12/93                 | N/A                  | Girdley                  | Borehole to provide core to determine stratigraphic and engineering rock characteristics near planned ESF North Access Ramp. Estimated total depth 1100. |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**



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

WBS 1.2.3  
QA: N/A

DEC 23 1992

J. Russell Dyer, YMP, NV  
Winfred A. Wilson, YMP, Mercury, NV, M/S 717

FIELD TEST COORDINATOR'S REPORT FOR THE WEEK ENDING DECEMBER 18, 1992

UZ-16

Scope of Activity: A borehole approximately 1700 feet in depth will be drilled using the LM-300 drilling system. The primary purpose of the hole will be for vertical seismic profile testing, although other tests such as air permeability, hydrogeochemistry, and matrix hydrologic properties are also being planned. Drilling is scheduled from May 1992 through March 1993, following pad construction in March 1992.

Status as of December 18, 1992: Borehole UZ-16 continues to be drilled with the LM-300 drill rig. Coring continued from 1179.27 feet to 1196.94 feet and the borehole was reamed from 1175.61 feet to 1176.05 feet. Unstable hole conditions were encountered below 1170 feet. Due to this condition the reaming cycle in progress was interrupted at a depth of 1176.05 feet and a coring cycle was initiated. On December 14, 1992, during coring operations, the core bit, inner and outer core barrel assembly, and stabilizer broke off downhole. As of the end of shift on Friday, December 18, 1992, attempts to retrieve this equipment were unsuccessful. A downhole camera was utilized to assist in these efforts.

NEUTRON-ACCESS BOREHOLES

Scope of Activity: Approximately 24 shallow boreholes will be drilled/cored for neutron logging by the U.S. Geological Survey (USGS) in order to evaluate natural infiltration. Core taken from these holes will be used by USGS for determination of moisture content and to construct tritium profiles. The drilling operation utilizes an Odex drilling system, which produces HQ core and a cased hole having a diameter of approximately six inches. The drilling program is being implemented in two phases, each consisting of 12 boreholes that will take several months to complete.

Status as of December 18, 1992: Drilling of borehole USW UZN-61 with the CME-850 drill rig was completed on December 17, 1992. Total hole depth cored and reamed was 118.86 feet. This completes the series of neutron access boreholes located in Abandoned Wash which included boreholes USW UZN-57, 58, 59, and 61.

DEC 23 1992

NRG-6

Scope of Activity: A borehole approximately 1100 feet in depth will be drilled using the Joy 225 drilling system. The primary purpose of this hole is to provide core for determination of stratigraphy and engineering characteristics of the rocks at or near the planned Exploratory Studies Facility North Access Ramp. Drilling is scheduled from November through December 1992.

Status as of December 18, 1992: Commencement of drilling on borehole USW NRG-6 with the Joy 1 drill rig began on November 23, 1992. SF6 tracer gas was injected during drilling operations. By the end of shift on December 18, 1992, coring had reached a depth of 134.10 feet and a ream depth of 124.25 feet. Deviation surveys are summarized as follows:

| <u>Date Survey Conducted (1992)</u> | <u>Maximum Depth Surveyed (Feet)</u> | <u>Deviation of Hole from Vertical (Degrees-Minutes)</u> | <u>Type of Tool</u> |
|-------------------------------------|--------------------------------------|--|---------------------|
| 12-16                               | 110                                  | 1 degree 15 minutes                                      | 3 degree            |
| 12-17                               | 115                                  | 1 degree 2 minutes                                       | 3 degree            |
| 12-18                               | 120                                  | 1 degree 15 minutes                                      | 3 degree            |

Deviations of the borehole from vertical thus far are within specified tolerance.

#### QUATERNARY FAULTING WITHIN THE SITE AREA INVESTIGATIONS

Scope of Activity: Pavements and trenches will be excavated to provide exposures of Quaternary deposits and faults for mapping by geologists from the USGS as described in Study Plan 8.3.1.17.4.6 Quaternary Faulting in the Site Area. Planned activities include excavation of new trenches and modification of existing trenches on the Windy Wash fault, Solitario Canyon fault, and Stagecoach Road fault, and modification of existing exposures of the Paintbrush Canyon fault west of Busted Butte in the sand ramps by developing pavements.

Status as of December 18, 1992: Geologic mapping, sampling, and interpretation continues on trench excavations completed during previous weeks in Midway Valley, Solitario Canyon, and along Stagecoach Road.

#### MIDWAY VALLEY INVESTIGATIONS

Scope of Activity: Test pits and trenches are being excavated to provide exposures for mapping by geologists from the U.S. Geological Survey and Geomatrix Consultants, Inc., in the the Midway Valley area east of Yucca Mountain. The focus of this investigation is a determination of the location and recency of faulting near prospective surface facilities.

DEC 23 1992

Status as of December 18, 1992: No field activities were performed during this period.

#### SOIL AND ROCK PROPERTIES

Scope of Activity: Objectives of this investigation are to characterize the soil and rock conditions that will influence or be influenced by the construction of the Exploratory Studies Facility surface and subsurface access facilities. This activity is comprised of a total of 32 test pits and one drill hole (NRG-1). Ongoing Phase II activities include 41 additional test pits and pavement clearing at NRG-1.

Status as of December 18, 1992: No field activities were performed during this period.

#### CHARACTERIZATION OF STRUCTURAL FEATURES IN THE SITE AREA

Scope of Activity: Objectives of this investigation are to conduct prototype work for development of equipment and techniques for shaft mapping in the Exploratory Studies Facility. Developmental work is to be completed in an enlarged and deepened circular test pit on the east side of Fran Ridge. The area around the pit disturbed during the original excavation will be cleaned to the rock surface for use in pavement studies for Surface Fracture Network Studies.

Status as of December 18, 1992: Survey targets, installed on the pit walls during geologic mapping operations at the enlarged Fran Ridge Test Pit on November 17-19, 1992, were surveyed December 14, 1992.

#### VOLCANISM EXCAVATIONS

Scope of Activity: Test pits and trenches will be excavated at the Lathrop Wells Volcanic Center and at the Cima volcanic field in order to test alternative models of eruptive histories of cinder cone volcanic activity. The excavations will provide exposures of volcanic materials (lava flows, pyroclastic deposits) and soils for examination and collection of samples. Planned activities include collection of samples for age determinations by multiple methods, description and collection of samples for evaluation of soil development on volcanic units, exposure of contact relations to aid stratigraphic studies for mapping of volcanic centers, and collection of samples for petrologic analysis.

Status as of December 18, 1992: No field activities were performed during this period.

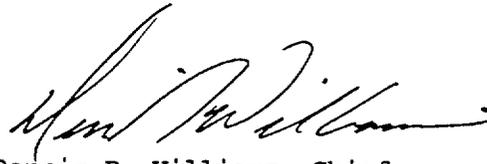
DEC 23 1992

BOREHOLE SECURITY

Scope of Activity: Objectives of this activity are the locking and securing of boreholes drilled during site characterization efforts and tracking of testing conducted in individual boreholes. Over 200 boreholes will be secured during the next several months.

Status as of December 18, 1992: No field activities were performed during this period.

If you have any questions, please contact Kenneth J. Skipper at 794-7944.



Dennis R. Williams, Chief  
Site Investigations Branch  
Regulatory & Site Evaluation Division

RSED:KJS-1654

cc:

- J. R. Summerson, HQ (RW-22) FORS
- R. W. Craig, HSGS, Las Vegas, NV
- ~~K. J. Skipper, USBR, YMP, NV~~
- L. E. Shephard, SNL, 6310, Albuquerque, NM
- B. W. Distel, M&O/WCC, Las Vegas, NV
- R. K. St. Clair, M&O/TRW, Las Vegas, NV
- J. H. Peck, SAIC, Las Vegas, NV
- C. L. Lugo, SAIC, Las Vegas, NV
- R. P. Nance, SAIC, Las Vegas, NV
- R. T. Simms, SAIC, Las Vegas, NV
- R. R. Schneider, SAIC, Las Vegas, NV
- C. P. Gertz, YMP, NV
- W. R. Dixon, YMP, NV
- W. A. Girdley, YMP, NV
- R. C. Long, YMP, NV
- J. T. Sullivan, YMP, NV
- M. C. Tynan, YMP, NV
- L. F. Quering, YMP, NV
- J. T. Gardiner, YMP, NV
- A. C. Williams, YMP, NV



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

WBS 1.2.3.5  
QA: N/A

**DEC 17 1992**

Carl H. Johnson, State of Nevada, Carson City, NV  
Phillip Niedzielski-Eichner, Nye County, Chantilly, VA  
Dennis A. Bechtel, Clark County, Las Vegas, NV  
Albert C. Douglas, City of Las Vegas, Las Vegas, NV  
~~Philip S. Justus, NRC, Las Vegas, NV~~

- DAILY OPERATIONS REPORTS AND WEEKLY INTERACTIONS CALENDAR

Enclosed for your information are copies of the Daily Operations Reports for Yucca Mountain Site Characterization Project drill holes USW NRG-6, UE-25 UZ16, and USW UZ N59 (enclosure 1). These reports were prepared by Raytheon Services Nevada and cover November 30, 1992, to December 4, 1992.

A copy of the Weekly Interactions Calendar (enclosure 2) is enclosed for your information. It includes a section providing the status of boreholes, trenches, and test pits.

A copy of the field test coordinator's report (enclosure 3) summarizing activities of the previous week and forecasting the activities planned for the current week is also included for your information.

If you need additional information regarding these reports, please contact Dennis R. Williams at (702) 794-7968.

RSED:DRW-1500

*for J. Timothy Sullivan*  
J. Russell Dyer, Director  
Regulatory & Site Evaluation Division

Enclosures:

1. Daily Operations Reports
2. Weekly Interactions Calendar
3. Field Test Coordinator's Report

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 7, 1992

Page: 1 of 1

Job Package No.: 92-11

Station: USW NRG-6, North Portal Ramp Borehole

Drill Rig: JOY - 1

Activity: Trip out of the hole with Odex hammer

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 4, 1992 (Rig Day 8)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION                       |
|-----------------|--|
| 0800 - 0830     | Service and start up rig and equipment.      |
| 0830 - 1200     | Continue ream cycle #4 from 30.60'.          |
| 1200 - 1230     | Lunch  |
| 1230 - 1600     | Complete ream cycle #4 from 25.75' - 55.81'. |
| 1600 - 1630     | Shut down and secure rig.                    |

Average Air Rates:   Coring   N/A SCFM  
                               Reaming   275 SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 55.83' | Reamed 55.81' | Drilled 0' |
| Daily Footage: | Cored 0.00'  | Reamed 25.21  | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECO  
 A/E Rep: Richard W. Wright, RSN  
 Personnel On Site: 1-RSN; 6-REECO; 3-SMF  
 Visitors On Site: Lindquist, Cunningham - RSN; Tepper - USGS; Wonderly, McDaniel - REECO

Field Report Prepared By: Richard W. Wright  
 Office Report Prepared By: Richard W. Wright

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 7, 1992

Page: 1 of 1

**Job Package No.: 91-9, Phase 2 Revision 4**

**Station: USW UZ N59**

**Drill Rig: CME-850**

**Activity: Reaming**

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 4, 1992 (Rig Day 6)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION   |
|--------------------|--|
| 0800 - 0830        | Service and warm up rig and equipment.   |
| 0830 - 0940        | Core run #18 from 80.33' to 83.01' (45 mins) 2.5' Rec.                                       |
| 0940 - 1000        | Core run #19 from 83.01' to 85.33' ( 8 mins) 2.3' Rec.                                       |
| 1000 - 1036        | Core run #20 from 85.33' to 90.33' (27 mins) 5.0' Rec.                                       |
| 1036 - 1058        | Core run #21 from 90.33' to 95.33' (13 mins) 4.0' Rec.                                       |
| 1058 - 1120        | Core run #22 from 95.33' to 100.33' (12 mins) 4.6' Rec.                                      |
| 1120 - 1141        | Core run #23 from 100.33' to 105.33' (13 mins) 4.2' Rec.                                     |
| 1141 - 1200        | Core run #24 from 105.33' to 110.33' (11 mins) 2.9' Rec.                                     |
| 1200 - 1230        | Lunch.   |
| 1230 - 1255        | Wait on weather.   |
| 1255 - 1257        | Start core run #25.  |
| 1257 - 1352        | Wait on weather.   |
| 1352 - 1412        | Core run #25 from 110.33' to 114.77' (5 mins) 2.0' Rec.                                      |
| 1412 - 1430        | Core run #26 from 114.77' to 117.48' (9 mins) 2.2' Rec.                                      |
| 1430 - 1500        | Core run #27 from 117.48' to 118.82' (2 mins) 1.0' Rec.                                      |
| 1500 - 1550        | Pull out of hole laying down coring assembly. Trip in hole with Odex hammer. Rig up to ream. |
| 1550 - 1630        | Shut down and secure rig.  |

**NOTE:** USW UZ N59 reached a total depth of 118.82' as per the direction of Lorrie Flint, RSN/USGS.

**Average Air Rates:**     Coring     313 SCFM  
                                  Reaming    N/A SCFM

|                       |                      |                      |                   |
|-----------------------|----------------------|----------------------|-------------------|
| <b>Ending Depth:</b>  | <b>Cored 118.82'</b> | <b>Reamed 75.33'</b> | <b>Drilled 0'</b> |
| <b>Daily Footage:</b> | <b>Cored 38.49'</b>  | <b>Reamed 0'</b>     | <b>Drilled 0'</b> |

**Drilling Rep:** Neal Walker, REECo  
**A/E Rep:** James Anthony  
**Personnel On Site:** 1-RSN; 4-REECo; 1-USGS; 3-SMF; 2-Visitors  
**Visitors On Site:** RSN - Lindquist, Cunningham

**Field Report Prepared By:** James Anthony  
**Office Report Prepared By:** James Anthony

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 7, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Coring

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 4, 1992 (Rig Day 125)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0815     | Service and warm up equipment.   |
| 0815 - 0835     | Rig up and run deviation survey at 1128', found deviation to be 2 degrees 15 minutes from vertical with a 3 degree tool.   |
| 0835 - 0850     | Run USGS fluid sampler to 1149', no fluid recovery.  |
| 0850 - 1005     | Shut unit down to change oil in the engines.   |
| 1005 - 1330     | Ream cycle #76 from 1128.99' to 1149.00'.  |
| 1330 - 1355     | Rig up and run deviation survey at 1149.00', found deviation to be 1 degree 50 minutes from vertical with a 3 degree tool. |
| 1355 - 1502     | Go in hole with core assembly. Ran RSN bit #12RR, a Christensen Strata Pac with 18 - 5/16" cutters and 12 airways.         |
| 1502 - 1537     | Core run #245 from 1149.13' to 1156.48' (9 min), 7.0' Rec.   |
| 1537 - 1615     | Core run #246 from 1156.48' to 1159.50' (21 min), 3.0' Rec.  |
| 1615 - 1630     | Shut down and secure rig.  |

**CORING:** Average air rate 372 SCFM  
Average vacuum rate 1259 SCFM

**REAMING:** Average air rate 791 SCFM  
Average vacuum rate 1413 SCFM

Ending Depth: Cored 1159.50' Reamed 1149.00' Drilled 0  
Daily Footage: Cored 10.37' Reamed 20.01' Drilled 0

Drilling Rep: Richard Sowards, REECO  
A/E Rep: David Putnam, RSN  
Personnel On Site: 1-RSN; 7-REECO; 1-USGS; 3-SMF  
Visitors On Site: RSN - Lindquist, Cunningham

Field Report Prepared By: David Putnam  
Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 4, 1992  
Page: 1 of 1

Job Package No.: 92-11

Station: USW NRG-6, North Portal Ramp Borehole

Drill Rig: JOY - 1

Activity: Reaming

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 3, 1992 (Rig Day 7)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0843     | Service and start up rig and equipment.  |
| 0843 - 0957     | Core run #16 from 50.00' - 54.54' (57 min.), Rec. 4.5'.  |
| 0957 - 1030     | Core run #17 from 54.54' - 55.83' (18 min.), Rec. 1.3'.  |
| 1030 - 1100     | Lay down 10' joints of core rod and pull out of the hole with core assembly.   |
| 1100 - 1200     | Break down Odex hammer and adjust air flow.  |
| 1200 - 1230     | Lunch  |
| 1230 - 1305     | Trip in hole with Odex hammer.   |
| 1305 - 1510     | Begin ream cycle #4 from 25.75' - 30.60', Unable to jay Odex hammer into casing shoe.  |
| 1510 - 1620     | Pull out of the hole and inspect hammer. Pull casing up one foot and hold with casing clamp. Trip back in hole with Odex hammer and jay into shoe. |
| 1620 - 1630     | Shut down and secure rig.  |

Average Air Rates:      Coring      500 SCFM  
                                 Reaming      383 SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 55.83' | Reamed 30.60' | Drilled 0' |
| Daily Footage: | Cored 7.41'  | Reamed 0.0'   | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
A/E Rep: Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 7-REECo; 3-SMF  
Visitors On Site: Lindquist - RSN; Tepper, Striffler - USGS; Wonderly, Limon - Reeco; Douglas - CLV/state

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

| CORE<br>'NS,<br>'TES,<br>LOSS | CORE # | DRILLING RATE<br>(ft/hr) |       |        | FRAC FREQ<br>(/5 ft) |        | DEPTH/<br>GRAPHIC<br>LOG | USW NRG-6<br>LITHOLOGY/ REMARKS |
|-------------------------------|--------|--------------------------|-------|--------|----------------------|--------|--------------------------|---------------------------------|
|                               |        | 0-20                     | 20-70 | 70-120 | 0-50                 | 50-100 |                          |                                 |
| 8                             | 12/1   |                          | 10.9  |        |                      | 30     |                          |                                 |
| 9                             |        |                          | 12.0  |        | 4                    | 35     |                          |                                 |
| 10                            |        |                          | 10.3  |        | 13                   | 40     | 16.8/16.8<br>100%        |                                 |
| 11                            |        | 2.0                      |       |        | 5                    | 45     |                          |                                 |
| 12                            |        | 2.0                      |       |        |                      | 50     | 7.4/7.4<br>100%          |                                 |
| 13                            | 12/2   |                          | 4.6   |        |                      | 55     | 5.8/5.8<br>100%          |                                 |
| 14                            |        |                          | 5.3   |        | 3                    |        |                          |                                 |
| 15                            |        |                          | 3.8   |        | 9                    |        |                          |                                 |
| 12/3                          |        |                          | 4.8   |        |                      | 60     |                          |                                 |
|                               |        |                          | 4.3   |        |                      | 65     |                          |                                 |
| 17                            |        |                          |       |        |                      | 70     |                          |                                 |
|                               |        |                          |       |        |                      | 75     |                          |                                 |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 4, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Run deviation survey

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum.  
3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 3, 1992 (Rig Day 124)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0820     | Service and warm up equipment.   |
| 0820 - 1135     | Ream cycle #75 from 1109.06' to 1128.99'.  |
| 1135 - 1200     | Attempted to run a deviation survey at 1128', hit an obstruction in the dual wall drill pipe.    |
| 1200 - 1230     | lunch  |
| 1230 - 1340     | Go in hole with core assembly, hit obstruction at 960', fell through, ran to 1128', had 1' fill. |
| 1340 - 1430     | Core run #243 from 1129.13' to 1139.14' (29 min), 6.5' Rec.                                      |
| 1430 - 1452     | Core run #244 from 1139.14' to 1149.13' (11 min), 5.0' Rec.                                      |
| 1452 - 1615     | Pull out of hole with core assembly.   |
| 1615 - 1630     | Shut down and secure rig.  |

**CORING:** Average air rate 622 SCFM  
Average vacuum rate 1139 SCFM

**REAMING:** Average air rate 843 SCFM  
Average vacuum rate 1399 SCFM

Ending Depth: Cored 1149.13' Reamed 1128.99' Drilled 0  
Daily Footage: Cored 20.00' Reamed 19.93' Drilled 0

Drilling Rep: Richard Sowards, REECO  
A/E Rep: David Putnam, RSN  
Personnel On Site: 1-RSN; 9-REECO; 1-USGS; 3-SMF  
Visitors On Site: RSN - Lindquist; SAIC - McCormick; REECO - Wonderly; CLV/State - Douglas; Hughes/Christensen - Corley

Field Report Prepared By: David Putnam  
Office Report Prepared By: David Putnam

| CORE RUNS, DATES | CORE LOSS | DRILLING RATE (ft/hr) |     |      | FRAC FREQ (/5 ft) |     | DEPTH GRAPHIC LOG | LITHOLOGY/REMARKS  |
|------------------|-----------|-----------------------|-----|------|-------------------|-----|-------------------|--|
|                  |           | 0                     | 10  | 20   | 0                 | 50  |                   |  |
|                  |           | 20                    | 70  | 120  | 50                | 100 |                   |  |
|                  |           |                       |     | 17.4 | 11                |     | 1025              |  |
| 223              |           |                       |     |      | 7                 |     | 1030              |  |
|                  |           |                       |     | 33.0 |                   |     | 1035              |  |
|                  |           | 20.1/18.9             | 94% |      |                   | 41  |                   |  |
| 224              | 11/18/92  |                       |     | 12.0 |                   | 41  | 1040              | 1043.0 - 1060.0 ashflow, tuff: reddish orange to orangish brown, becoming more vitric; occasional veinlets and microveinlets filled mainly with silica and zeolites; 5% lithics, mm to 2 cm white to light gray to gray; 5% sanidine and 1 % biotite phenocrysts   |
|                  |           |                       |     | 16.2 | 11                |     | 1045              |  |
| 226              |           |                       |     |      |                   | 24  | 1050              |  |
|                  |           | 16.6/16.0             | 96% | 21.0 |                   |     | 1055              |  |
| 227              | 11/19/92  |                       |     | 4.2  |                   | 28  | 1060              | 1060.0 - 1111.2 ashflow, tuff: brickred to brown mottled orange to pale yellow; occasional microveinlets filled mainly with silica and zeolites; 3% sanidine and about 1% biotite phenocrysts; matrix altering to goethite + MnO; 5% lithic fragments, light gray to white rhyolite lithics, some display flow banding; other lithics, gray to dark gray rhyolite with up to 10% biotite, many of these clasts display alteration rims |
| 228              |           |                       |     | 10.8 |                   | 28  | 1065              |  |
|                  |           |                       |     |      | 7                 |     | 1070              |  |
| 229              |           |                       |     | 6.0  |                   |     |                   |  |
| 230              |           |                       |     | 3.6  |                   |     |                   |  |



**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 4, 1992  
Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N59

Drill Rig: CME-850

Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 3, 1992 (Rig Day 5)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION  |
|-----------------|---|
| 0800 - 0830     | Service and warm up rig and equipment.  |
| 0830 - 0919     | Core run #13 from 57.33' to 60.33' (27 mins) 3.0' Rec.  |
| 0919 - 1006     | Core run #14 from 60.33' to 65.33' (39 mins) 5.0' Rec.  |
| 1006 - 1054     | Core run #15 from 65.33' to 70.33' (40 mins) 5.0' Rec.  |
| 1054 - 1140     | Core run #16 from 70.33' to 75.33' (37 mins) 5.0' Rec.  |
| 1140 - 1152     | Could not pull inner core barrel. Pull out of hole with coring assembly and recover core and barrel.                            |
| 1152 - 1200     | Start trip in hole with Odex hammer.  |
| 1200 - 1230     | Lunch.  |
| 1230 - 1245     | Finish trip in hole with Odex hammer. Rig up to ream.   |
| 1245 - 1439     | Ream cycle #9 from 46.36' - 75.33'.   |
| 1439 - 1508     | Pull out of hole with Odex hammer. Trip in hole with coring assembly. Rerun RSN #31, Serial #2S25773, a Christensen Strata Pac. |
| 1508 - 1550     | Core run #17 from 75.33' to 80.33' (28 mins) 5.0' Rec.  |
| 1550 - 1630     | Shut down and secure rig.   |

Average Air Rates:   Coring     242 SCFM  
                              Reaming   255 SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 80.33' | Reamed 75.33' | Drilled 0' |
| Daily Footage: | Cored 23.00' | Reamed 28.97' | Drilled 0' |

Drilling Rep: Neal Walker, REECo

A/E Rep: James Anthony

Personnel On Site: 1-RSN; 4-REECo; 1-USGS; 3-SMF; 4-Visitors

Visitors On Site: RSN - Lindquist, REECo - Wonderly, Lemon; CLV/NV - Douglas

Field Report Prepared By: James Anthony

Office Report Prepared By: James Anthony

FROM: SAMPLE MGMT. FACILITY

TO: RSN, EDDIE WRIGHT

DEC 4, 1992 8:55AM #606 P.08

USW ULN-58

FRM -

LITHOLOGY/ REMARKS

| CORE RUNS, TESTS, BIT | DRILLING RATE (ft/hr) |      | HVAC FEED (/5 ft) |    | DEPTH GRAPHK LOG | REMARKS           |
|-----------------------|-----------------------|------|-------------------|----|------------------|-------------------|
|                       | 0                     | 10   | 20                | 50 |                  |                   |
| 17                    | 20                    | 70   | 120               | 50 | 100              | 23.0/23.0<br>100% |
|                       |                       | 10.7 | 14                |    | 80               |                   |
|                       |                       |      |                   |    | 75               |                   |
|                       |                       |      |                   |    | 85               |                   |
|                       |                       |      |                   |    | 90               |                   |
|                       |                       |      |                   |    | 95               |                   |
|                       |                       |      |                   |    | 100              |                   |
|                       |                       |      |                   |    | 105              |                   |
|                       |                       |      |                   |    | 110              |                   |
|                       |                       |      |                   |    | 115              |                   |
|                       |                       |      |                   |    | 120              |                   |

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 3, 1992  
Page: 1 of 1

Job Package No.: 92-11

Station: USW NRG-6, North Portal Ramp Borehole

Drill Rig: JOY - 1

Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 2, 1992 (Rig Day 6)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION   |
|-----------------|--|
| 0800 - 0820     | Service and start up rig and equipment.  |
| 0820 - 0830     | Pull out of the hole with core rods.   |
| 0830 - 1200     | Repair valve on hydraulic system preventing hydraulic chuck and pull-down system from working.   |
| 1200 - 1230     | Lunch.   |
| 1230 - 1247     | Trip in hole with core assembly.   |
| 1247 - 1257     | Attempt core run #13. Bit would not drill.   |
| 1257 - 1315     | Pull out of the hole with core rods.   |
| 1315 - 1346     | Make up new bit; NRG6#3, a Christensen Strata Pak, SN# L12367, 8 airways and twelve 1/2" PDC cutters. Trip in hole with core assembly. |
| 1346 - 1440     | Core run #13 from 42.59' - 44.97' (31 min.), Rec. 2.4'.  |
| 1440 - 1536     | Core run #14 from 44.97' - 48.25' (37 min.), Rec. 3.3'.  |
| 1536 - 1620     | Core run #15 from 48.25' - 50.00' (28 min.), Rec. 1.7'.  |
| 1620 - 1630     | Shut down and secure rig.  |

Average Air Rates:      Coring      483 SCFM  
                                 Reaming      N/A SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 50.00' | Reamed 25.75' | Drilled 0' |
| Daily Footage: | Cored 7.41'  | Reamed 0.0'   | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
A/E Rep: Richard W. Wright, RSN  
Personnel On Site: 1-RSN; 7-REECo; 3-SMF; 1-DOE  
Visitors On Site: E. Wright, Lindquist - RSN; Tepper, Striffler - USGS; Cooley, Wonderly - Reeco; McCormick - SAIC; Estes - RBI.

Field Report Prepared By: Richard W. Wright  
Office Report Prepared By: Richard W. Wright

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 3, 1992

Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N59

Drill Rig: CME-850

Activity: Coring

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 2, 1992 (Rig Day 4)**

| <b>HOURS<br/>FROM - TO</b> | <b>OPERATIONS DESCRIPTION</b>   |
|----------------------------|---|
| 0800 - 0830                | Service and warm up rig and equipment.  |
| 0830 - 1000                | Core run #8 from 40.36' to 45.36' (69 mins) 5.0' Rec.   |
| 1000 - 1030                | Core run #9 from 45.36' to 46.36' (23 mins) 1.0' Rec.   |
| 1030 - 1104                | Pull out of hole with coring assembly. Trip in hole with Odex hammer. Rig up to ream.   |
| 1104 - 1118                | Change filters in dust collector.   |
| 1118 - 1205                | Begin ream cycle #8.  |
| 1205 - 1235                | Lunch.  |
| 1235 - 1307                | Ream cycle #8 from 26.36' - 46.36'.   |
| 1307 - 1324                | Pull out of hole with Odex hammer. Trip in hole with coring assembly. Run RSN #31, Serial #2S25773, a Christensen Strata Pac. |
| 1324 - 1345                | Attach safety chain from swivel to opposite side of derrick.  |
| 1345 - 1444                | Core run #10 from 46.36' to 50.33' (44 mins) 4.0' Rec.  |
| 1444 - 1537                | Core run #11 from 50.33' to 55.33' (41 mins) 5.0' Rec.  |
| 1537 - 1600                | Core run #12 from 55.33' to 57.33' (15 mins) 2.0' Rec.  |
| 1600 - 1630                | Shut down and secure rig.   |

**Average Air Rates:**      Coring      271 SCFM  
    Reaming      283 SCFM

|                       |                     |                      |                   |
|-----------------------|---------------------|----------------------|-------------------|
| <b>Ending Depth:</b>  | <b>Cored 57.33'</b> | <b>Reamed 46.36'</b> | <b>Drilled 0'</b> |
| <b>Daily Footage:</b> | <b>Cored 16.97'</b> | <b>Reamed 20.00'</b> | <b>Drilled 0'</b> |

**Drilling Rep:** Neal Walker, REECo  
**A/E Rep:** James Anthony  
**Personnel On Site:** 1-RSN; 4-REECO; 1-USGS; 3-SMF; 3-Visitors  
**Visitors On Site:** RSN - Lindquist, Wright; DOE - Tunnell

**Field Report Prepared By:** James Anthony  
**Office Report Prepared By:** James Anthony

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 3, 1992  
Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Reaming

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 2, 1992 (Rig Day 123)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION  |
|--------------------|---|
| 0800 - 0818        | Service and warm up equipment.  |
| 0818 - 0842        | Ream down and circulate hole clean.   |
| 0842 - 0905        | Rig up and run deviation survey at 1109', found deviation to be 2 degrees 15 minutes from vertical with a 3 degree tool. Tool had free water on the bottom. |
| 0905 - 0945        | Ran bailer to check for water. Bailer was dry on the bottom, had condensation on the top 2/3 of the bailer body.  |
| 0945 - 1055        | Go in hole with core assembly. Ran RSN bit #22, a Christensen Strata Pac, SN 0117806, 12 - 1/2" cutters and 10 airways.                                     |
| 1055 - 1246        | Core run #241 from 1109.31' to 1119.43' (87 min), 5.7' Rec.   |
| 1246 - 1440        | Core run #242 from 1119.43' to 1129.13' (103 min), 6.9' Rec.  |
| 1440 - 1545        | Pull out of hole with core assembly.  |
| 1545 - 1615        | Rig up to ream.   |
| 1615 - 1630        | Shut down and secure rig.   |

**CORING:** Average air rate 555 SCFM  
Average vacuum rate 1165 SCFM

**REAMING:** Average air rate N/A SCFM  
Average vacuum rate N/A SCFM

Ending Depth: Cored 1129.13' Reamed 1109.06' Drilled 0  
Daily Footage: Cored 19.82' Reamed 0 Drilled 0

Drilling Rep: Richard Sowards, REECO  
A/E Rep: David Putnam, RSN  
Personnel On Site: 1-RSN; 7-REECO; 2-USGS; 3-SMF  
Visitors On Site: RSN - Lindquist, Wright; SAIC - McCormick; REECO - Wonderly; DOE - Williams; SAIC - Peck

Field Report Prepared By: David Putnam  
Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30  
Date: December 2, 1992  
Page: 1 of 1

Job Package No.: 92-03  
Station: UE-25 UZ16  
Drill Rig: LM300  
Activity: Reaming

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: December 1, 1992 (Rig Day 122)**

| HOURS FROM - TO | OPERATIONS DESCRIPTION  |
|-----------------|---|
| 0800 - 0818     | Service and warm up equipment.                                      |
| 0818 - 1055     | Finish Core run #239 from 1098.44' to 1106.68' (225 min), 5.7' Rec. |
| 1055 - 1150     | Core run #240 from 1106.68' to 1109.31' (43 min), 5.2' Rec.         |
| 1150 - 1200     | Pull out of hole with core assembly.                                |
| 1200 - 1230     | Lunch.  |
| 1230 - 1330     | Pull out of hole with core assembly.                                |
| 1330 - 1350     | Clean top head drive.   |
| 1350 - 1615     | Ream cycle #74 from 1089.04' to 1109.06'.                           |
| 1615 - 1630     | Shut down and secure rig.   |

**CORING:** Average air rate 369 SCFM  
Average vacuum rate 1155 SCFM

**REAMING:** Average air rate 815 SCFM  
Average vacuum rate 1401 SCFM

Ending Depth: Cored 1109.31' Reamed 1109.06' Drilled 0  
Daily Footage: Cored 7.36' Reamed 20.02' Drilled 0

Drilling Rep: Richard Sowards, REECO  
A/E Rep: David Putnam, RSN  
Personnel On Site: 1-RSN; 6-REECO; 2-USGS; 3-SMF  
Visitors On Site: RSN - Lindquist; SAIC - Pysto; REECO - McDaniel, Wonderly  
Mason; CLV/State - Douglas

Field Report Prepared By: David Putnam  
Office Report Prepared By: David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs

Date: December 2, 1992

Page: 1 of 1

Job Package No.: 92-11

Station: USW NRG-6, North Portal Ramp Borehole

Drill Rig: JOY - 1

Activity: Coring

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: December 1, 1992 (Rig Day 5)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION  |
|--------------------|---|
| 0800 - 0830        | Service and start up rig and equipment.                                   |
| 0830 - 0851        | Work on air manifold.   |
| 0851 - 0954        | Core run #8 from 25.75' - 30.99' (29 min.), Rec. 5.2'.                    |
| 0954 - 1046        | Core run #9 from 30.99' - 36.17' (26 min.), Rec. 5.2'.                    |
| 1046 - 1200        | Core run #10 from 36.17' - 41.17' (29 min.), Rec. 5.0'.                   |
| 1200 - 1230        | Lunch   |
| 1230 - 1247        | Make connection.  |
| 1247 - 1427        | Coupler on hydraulic pump for vacuum unit broke. Repair same.             |
| 1427 - 1516        | Core run #11 from 41.17' - 42.06' (29 min.), Rec. 0.9'.                   |
| 1516 - 1530        | Attempt core run #12. Bit would not drill.                                |
| 1530 - 1547        | Pull out of the hole and inspect bit. Run back in the hole with same bit. |
| 1547 - 1603        | Core run #12 from 42.06' - 42.59' (16 min.), Rec. 0.5'.                   |
| 1603 - 1630        | Shut down and secure rig.   |

Average Air Rates:   Coring   365 SCFM  
                               Reaming   N/A SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 42.59' | Reamed 25.75' | Drilled 0' |
| Daily Footage: | Cored 16.84' | Reamed 0.0'   | Drilled 0' |

Drilling Rep: Jerry Fulkerson, REECo  
 A/E Rep: Richard W. Wright, RSN  
 Personnel On Site: 1-RSN; 7-REECo; 3-SMF  
 Visitors On Site: Cunningham, Lindquist - RSN; Tepper, Striffler - USGS; Mason, McDaniel, Wonderly - Reeco; Douglas - CLV/State

Field Report Prepared By: Richard W. Wright  
 Office Report Prepared By: Richard W. Wright & Don M. Cunningham

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 2, 1992  
Page: 1 of 1

**Job Package No.: 91-9, Phase 2 Revision 4**

**Station: USW UZ N59**

**Drill Rig: CME-850**

**Activity: Coring**

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: December 1, 1992 (Rig Day 3)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION  |
|--------------------|---|
| 0800 - 0830        | Service and warm up rig and equipment.  |
| 0830 - 0846        | Trip in hole with Odex hammer. Rig up to ream.  |
| 0846 - 0852        | Ream cycle #6 from 12.22' - 13.02'.   |
| 0852 - 0905        | Pull out of hole with Odex hammer. Trip in hole with drive sampler.   |
| 0905 - 0912        | Drive sample #8 from 13.02' - 13.11' (3 mins) 0.0' Rec.   |
| 0912 - 0930        | Rig up core barrel. Trip in hole with coring assembly. Run RSN #30, Serial #2S25774, a Christensen carbonado.   |
| 0930 - 0958        | Core run #1 from 13.11' to 15.36' (20 mins) 2.3' Rec.   |
| 0958 - 1013        | Tighten connection on air line. Work on dust collector.   |
| 1013 - 1103        | Core run #2 from 15.36' to 20.36' (38 mins) 5.0' Rec.   |
| 1103 - 1143        | Core run #3 from 20.36' to 25.36' (34 mins) 5.0' Rec.   |
| 1143 - 1200        | Core run #4 from 25.36' to 26.36' (7 mins) 1.0' Rec.  |
| 1200 - 1230        | Lunch.  |
| 1230 - 1308        | Pull out of hole with coring assembly. Trip in hole with Odex hammer. Rig up to ream.   |
| 1308 - 1405        | Ream cycle #7 from 13.02' - 26.36'.   |
| 1405 - 1424        | Pull out of hole with Odex hammer. Trip in hole with coring assembly. Run new bit RSN #43, Serial #2S27752, a Christensen carbonado, surface set, 15 stones/ct., 10 air courses (1/4"W x 3/16"D). |
| 1424 - 1449        | Core run #5 from 26.36' to 30.36' (17 mins) 4.0' Rec.   |
| 1449 - 1518        | Core run #6 from 30.36' to 35.36' (21 mins) 5.0' Rec.   |
| 1518 - 1600        | Core run #7 from 35.36' to 40.36' (30 mins) 5.0' Rec.   |
| 1600 - 1630        | Shut down and secure rig.   |

**Average Air Rates:** Coring 242 SCFM  
Reaming 247 SCFM

**Ending Depth:** Cored 40.36' Reamed 26.36' Drilled 0'  
**Daily Footage:** Cored 27.34' Reamed 14.14' Drilled 0'

**Drilling Rep:** Neal Walker, REECo  
**A/E Rep:** James Anthony  
**Personnel On Site:** 1-RSN; 4-REECo; 1-USGS; 3-SMF; 2-Visitors  
**Visitors On Site:** RSN - Lindquist; CLV/NV - Douglas

**Field Report Prepared By:** James Anthony  
**Office Report Prepared By:** James Anthony

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30

Date: December 1, 1992

Page: 1 of 1

Job Package No.: 92-03

Station: UE-25 UZ16

Drill Rig: LM300

Activity: Coring

Objectives: 1) Mobilize drill rig. 2) Continuous core/drive sample from ground level to 50' minimum. 3) Vacuum drill 22 inch hole and set 16" OD casing to total depth. 4) Cement casing to surface. 5) Continuously core and ream to 1663'. 6) Prepare final location and elevation survey. 7) Install wellhead box

**REPORT FOR: November 30, 1992 (Rig Day 121)**

**HOURS  
FROM - TO**

**OPERATIONS DESCRIPTION**

|             |   |
|-------------|---|
| 0800 - 0909 | Service and warm up equipment. Safety meeting.  |
| 0909 - 1029 | Core run #237 from 1096.38' to 1096.98' (58 min), 0.6' Rec.   |
| 1029 - 1245 | Core run #238 from 1096.98' to 1098.44' (126 min), 1.4' Rec.  |
| 1245 - 1345 | Pull out of hole with core assembly.  |
| 1345 - 1444 | Go in the hole with the core assembly. Ran RSN bit #21, a new Christensen surface set diamond bit, SN 2S-28387, 10 airways, 15 stones/ct. |
| 1444 - 1615 | Core run #239 from 1098.44' to 1101.95' (91 min), did not pull core.  |
| 1615 - 1630 | Shut down and secure rig.   |

|                |                     |           |
|----------------|---------------------|-----------|
| <b>CORING:</b> | Average air rate    | 358 SCFM  |
|                | Average vacuum rate | 1186 SCFM |

|                 |                     |          |
|-----------------|---------------------|----------|
| <b>REAMING:</b> | Average air rate    | N/A SCFM |
|                 | Average vacuum rate | N/A SCFM |

|                       |                       |                        |                  |
|-----------------------|-----------------------|------------------------|------------------|
| <b>Ending Depth:</b>  | <b>Cored</b> 1101.95' | <b>Reamed</b> 1089.04' | <b>Drilled</b> 0 |
| <b>Daily Footage:</b> | <b>Cored</b> 5.57'    | <b>Reamed</b> 0        | <b>Drilled</b> 0 |

**Drilling Rep:** Richard Sowards, REECO

**A/E Rep:** David Putnam, RSN

**Personnel On Site:** 1-RSN; 7-REECO; 1-USGS; 2-SMF

**Visitors On Site:** RSN - Anthony, McClaskey; SAIC - Peck; REECO - McDaniel, Wonderly

**Field Report Prepared By:** David Putnam

**Office Report Prepared By:** David Putnam

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

**Report Time:** 7:30 hrs  
**Date:** December 1, 1992  
**Page:** 1 of 1

**Job Package No.:** 92-11

**Station:** USW NRG-6, North Portal Ramp Borehole

**Drill Rig:** JOY - 1

**Activity:** Coring

**Objectives:** 1) Mobilize drill rig & drilling system. 2) Continuous core with PQ-3, HQ-3, or NQ-3 wire line coring system to a total depth of approximately 1100' ( $\pm 50'$ ) and inject SF<sub>6</sub> tracer gas. 3) Run geophysical logs 4) Remove Odex casing except 10' & install Cal-Seal surface plug. 5) Demobilize equipment. 6) Prepared final location and elevation survey.

**REPORT FOR: November 30, 1992 (Rig Day 4)**

| HOURS<br>FROM - TO | OPERATIONS DESCRIPTION  |
|--------------------|---|
| 0800 - 0900        | Safety meeting.   |
| 0900 - 0930        | Service and start up rig and equipment.                               |
| 0930 - 0944        | Rig up to core.   |
| 0944 - 1014        | Core run #7 from 22.11' - 25.75' (20 min.) 3.7' Rec.                  |
| 1014 - 1030        | Pick up Odex hammer assembly.   |
| 1030 - 1113        | Replace rubber in rotating head.                                      |
| 1113 - 1130        | Straighten ream hole to 11.74'.                                       |
| 1130 - 1200        | Make connection with drill pipe and casing and work on rotating head. |
| 1200 - 1230        | Lunch   |
| 1230 - 1252        | Work on rotating head.  |
| 1252 - 1440        | Ream cycle #3 from 11.74' - 25.75'.                                   |
| 1440 - 1500        | Pull out of the hole with Odex hammer assembly.                       |
| 1500 - 1530        | Strap weld cross over to swivel to prevent kelly from backing out.    |
| 1530 - 1607        | Trip in hole with core assembly.                                      |
| 1607 - 1630        | Shut down and secure rig.   |

**NOTE:** Drill pipe torqued up during ream cycle and had to be heated in order to break on every connection.

**Average Air Rates:** Coring 334 SCFM  
Reaming 374 SCFM

|                       |                     |                      |                   |
|-----------------------|---------------------|----------------------|-------------------|
| <b>Ending Depth:</b>  | <b>Cored 25.75'</b> | <b>Reamed 25.75'</b> | <b>Drilled 0'</b> |
| <b>Daily Footage:</b> | <b>Cored 03.64'</b> | <b>Reamed 14.03'</b> | <b>Drilled 0'</b> |

**Drilling Rep:** Jerry Fulkerson, REECo

**A/E Rep:** Richard W. Wright, RSN

**Personnel On Site:** 1-RSN; 7-REECo; 3-SMF

**Visitors On Site:** McClaskey, Cunningham, Davis - RSN; Striffler - USGS; Walker, Van Gorder, McDaniel, Joyce, Saxon, Wonderly - Reeco

**Field Report Prepared By:** Richard W. Wright  
**Office Report Prepared By:** Richard W. Wright

**RAYTHEON SERVICES NEVADA  
DAILY OPERATIONS REPORT  
YUCCA MOUNTAIN PROJECT**

Report Time: 7:30 hrs  
Date: December 1, 1992  
Page: 1 of 1

Job Package No.: 91-9, Phase 2 Revision 4

Station: USW UZ N59

Drill Rig: CME-850

Activity: Coring

Objectives: 1) Mobilize drill rig & drilling system. 2) Continuous core with wire line coring system to a total depth of approximately  $\pm 120'$ . 3) Ream down core track while coring with 6-inch bit & 5.5-inch O.D. Odex steel casing. 4) Demobilize equipment. 5) Prepared final location and elevation survey.

**REPORT FOR: November 30, 1992 (Rig Day 2)**

| <b>HOURS<br/>FROM - TO</b> | <b>OPERATIONS DESCRIPTION</b>                          |
|----------------------------|--|
| 0800 - 1500                | Move in and rig up equipment.                          |
| 1500 - 1522                | Trip in hole with Odex hammer. Rig up to ream.         |
| 1522 - 1530                | Ream cycle #5 from 10.55' - 12.22'.                    |
| 1530 - 1537                | Pull out of hole with Odex hammer. Run drive sampler.  |
| 1537 - 1600                | Drive sample #7 from 12.57' - 13.02' (3 min) 0.4' Rec. |
| 1600 - 1630                | Shut down and secure rig.                              |

Average Air Rates: Coring N/A SCFM  
Reaming 322 SCFM

|                |              |               |            |
|----------------|--------------|---------------|------------|
| Ending Depth:  | Cored 13.02' | Reamed 12.22' | Drilled 0' |
| Daily Footage: | Cored 0.45'  | Reamed 1.67'  | Drilled 0' |

Drilling Rep: Neal Walker, REECo  
A/E Rep: James Anthony  
Personnel On Site: 1-RSN; 4-REECo; 1-USGS; 3-SMF; 1-Visitors  
Visitors On Site: RSN - McClaskey

Field Report Prepared By: James Anthony  
Office Report Prepared By: James Anthony

## WEEKLY INTERACTIONS CALENDAR

## STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/4/92

| <u>DATE/LOC.</u>             | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u>  | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|------------------------------|---|--------------------------------------|------------------------------|----------------------------------|---|
| 12/14-15/92<br>Rockville, MD | NRC TE: Total System<br>Performance<br>Assessment       | Boak<br>(Pahwa-M&O)                  | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL<br>PNL                | Discuss the DOE TSPA<br>(methodology, results,<br>lessons, learned, future<br>plans), and NRC IPE.<br><b>Strategy session by<br/>telecon on 11/24/92.</b> |
| 12/16/92<br>Bethesda, MD     | ACNW WG on PA -<br>Phase 2 HLW<br>Interactive PA by NRC | Boak<br>(Van Luik-M&O)               | Gil<br>(LeRoy-M&O)           | M&O<br>SNL<br>PNL                | Will discuss progress of<br>Phase 2 PA effort. Also<br>will hear briefing from<br>DOE on status of TSPA.<br><br>Agenda TBD.                               |
| 12/17-18/92<br>Bethesda, MD  | ACNW 49th Meeting                                       |                                      | Gil<br>(LeRoy-M&O)           |                                  |   |
| 1/5-6/93<br>Arlington, VA    | NWTRB Full Board<br>Meeting                             | <b>Harrison<br/>(Benton-M&amp;O)</b> | Cooper<br>(Hoffman-M&O)      | M&O<br>SNL                       | <b>M&amp;O waste package<br/>issues and 2001 roadmap.<br/>YMPO interim storage<br/>plans, SNL dual purpose<br/>casks.</b>                                 |
| 1/12/93<br>Carlsbad, NM      | Tour of WIPP Site<br><b>**</b>                          | Boak<br>(Van Luik-M&O)               | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL                       | Previously scheduled<br>10/28/92.   |

BOLD INDICATES REVISIONS AND NEW INFORMATION

\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC

## WEEKLY INTERACTIONS CALENDAR

### STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/4/92

| <u>DATE/LOC.</u>                             | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|--|---|-------------------------------------|------------------------------|----------------------------------|---|
| 1/13/93<br>Albuquerque, NM                   | NRC observation of<br>DOE Meeting on<br>Performance<br>Assessment | Boak<br>(Van Luik-M&O)              | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>SNL                       | NRC staff to observe<br>interaction between<br>YMPO and WIPP PA<br>staff. Rescheduled from<br>10/27/92. |
| 1/27-28/93<br>Bethesda, MD                   | ACNW 50th Meeting   |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 2/11/93<br>Las Vegas, NV &<br>Washington, DC | NRC Video-<br>Conference Mgmt.<br>Meeting on Topical<br>Report    | Jones<br>(Lugo-M&O)                 | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Discuss use of DOE<br>Topical Reports and<br>NRC Draft Topical<br>Report Review Plan.                   |
| 2/24-25/93<br>Bethesda, MD                   | ACNW 51st Meeting   |                                     | Gil<br>(LeRoy-M&O)           |                                  | Agenda TBD.   |
| 2/93 or 3/93<br>Location TBD                 | NWTRB HG&G Panel<br>Meeting                                       |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |

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**WEEKLY INTERACTIONS CALENDAR**

**STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/4/92**

| <u>DATE/LOC.</u>                             | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u>         | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>   |
|--|---|---|------------------------------|----------------------------------|---|
| 3/93<br>Date TBD<br>Las Vegas, NV            | NRC Site Visit  | Sullivan<br>(Statton-M&O)<br>(Sandifer-M&O) | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>USGS                      | NRC will observe trenching activities and ESF Construction Activities. The TRB, ACNW, and affected units of government will be invited. |
| 4/20-23/93<br>Reno, NV                       | NWTRB Full Board Meeting                                      |   | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.   |
| 4/28-29/93<br>Location TBD                   | ACNW Meeting<br>TBD   |   | Gil<br>(LeRoy-M&O)           | M&O                              | Agenda TBD.   |
| 5/17/93<br>Las Vegas, NV &<br>Washington, DC | NRC Video Conference TE on Program Planning and Integration   | Royer<br>(Schutt-M&O)                       | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Discuss process for technical guidance/direction to projects by OCRWM HQ and the role of Systems Planning and Integration Branch.       |
| 5/18/93<br>Las Vegas, NV &<br>Washington, DC | NRC Video-Conference TE on OCRWM Technical Baseline Documents | Royer<br>(Schutt-M&O)                       | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | Provide NRC opportunity to discuss OCRWM's treatment of NRC requirement in 10CFR 60, 71 and 72.   |
| 5/19-20/93<br>Location TBD                   | ACNW Meeting<br>TBD   |   | Gil<br>(LeRoy-M&O)           | M&O                              | Agenda TBD.   |

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## WEEKLY INTERACTIONS CALENDAR

### STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/4/92

| <u>DATE/LOC.</u>          | <u>TOPIC</u>  | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u>  |
|---------------------------|---|-------------------------------------|------------------------------|----------------------------------|--|
| 6/1-12/93<br>Location TBD | NWTRB International<br>Trip<br>**                   |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.  |
| 6/8/93<br>Las Vegas, NV   | NRC TE on<br>Geophysics Integration                 | Tynan<br>(Agnew-M&O)                | Bjerstedt<br>(LeRoy-M&O)     | M&O                              | <b>Discuss DOE progress in resolving SCA comments 51, 52 and 59 as related to integration of planned geophysical activities with other site characterization activities.</b> |
| 6/9/93<br>Las Vegas, NV   | NRC TE on Volcanism                                 | Cooper<br>(Jerez-M&O)               | Bjerstedt<br>(LeRoy-M&O)     | M&O<br>LANL                      | <b>Discuss DOE volcanism studies as detailed in LANL report.</b>   |
| 6/10/93<br>Las Vegas, NV  | NRC Mgmt. Meeting<br>for Interactions<br>Scheduling | Jones<br>(LeRoy-M&O)                | Bjerstedt<br>(LeRoy-M&O)     |                                  | <b>Negotiate DOE/NRC interactions for July-December 1993.</b>  |
| 7/12-15/93<br>Denver, CO  | NWTRB Full Board<br>Meeting                         |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.  |
| 7/28/93<br>Location TBD   | NRC TE on ESF Title<br>II Design                    | Petrie<br>(Sandifer-M&O)            | Bjerstedt<br>(LeRoy-M&O)     |                                  | <b>Discuss the alternative that was chosen for ESF Title II Design and discuss analysis and design methods that were used.</b>   |

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WEEKLY INTERACTIONS CALENDAR

STATUS OF DOE NWTRB, ACNW, AND NRC MEETINGS FOR WEEK ENDING 12/4/92

| <u>DATE/LOC.</u>             | <u>TOPIC</u>                | <u>TECHNICAL LEAD<br/>(SUPPORT)</u> | <u>CONTACT<br/>(SUPPORT)</u> | <u>PARTICIPANT<br/>(SUPPORT)</u> | <u>COMMENTS</u> |
|------------------------------|-----------------------------|-------------------------------------|------------------------------|----------------------------------|-----------------|
| 10/19-22/93<br>Las Vegas, NV | NWTRB Full Board<br>Meeting |                                     | Cooper<br>(Hoffman-M&O)      |                                  | Agenda TBD.     |

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**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**

WEEKLY INTERACTIONS CALENDAR

DRILLING, TRENCHING, AND TEST PIT ACTIVITIES  
12/4/92

| <u>DESIGNATION</u>                               | <u>PLANNED START DATE</u> | <u>PLANNED END DATE</u> | <u>BACKFILL DATE</u> | <u>YMPO SITE CONTACT</u> | <u>COMMENTS</u>   |
|--|---------------------------|-------------------------|----------------------|--------------------------|---|
| Midway Valley Investigations                     | 10/27/92                  | 11/20/92                | 11/20/92             | Sullivan                 | Trench MWV-T7 will be excavated within ESF North access site area.  |
| Fran Ridge Test Pit No. 1                        | 8/24/92                   | 9/15/92                 | N/A                  | Girdley                  | Fracture network mapping underway.  |
| Lathrop Wells Cinder Cone Volcanic Trenching     | 9/8/92                    | 9/16/92                 | 9/16/93              | Cooper                   | Continuation of the volcanic studies.   |
| Unsaturated Zone Borehole No. 16                 | 5/27/92                   | 3/24/93                 | N/A                  | Long                     | Unsaturated zone site characterization and vertical seismic profiling.  |
| Neutron-Access Boreholes Phase II (12 boreholes) | 8/3/92                    | TBD                     | N/A                  | Girdley                  | Core taken from these holes will be used by USGS for determination of moisture content and to construct tritium profiles. |

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WEEKLY INTERACTIONS CALENDAR

DRILLING, TRENCHING, AND TEST PIT ACTIVITIES

12/4/92

| <u>DESIGNATION</u>       | <u>PLANNED START DATE</u> | <u>PLANNED END DATE</u> | <u>BACKFILL DATE</u> | <u>YMPO SITE CONTACT</u> | <u>COMMENTS</u>  |
|--------------------------|---------------------------|-------------------------|----------------------|--------------------------|--|
| North Ramp Geologic<br>6 | 11/16/92                  | 2/12/93                 | N/A                  | Williams                 | Borehole to provide core to determine stratigraphic and engineering rock characteristics near planned ESF North Access Ramp. Estimated total depth 1100. |

**BOLD INDICATES REVISIONS AND NEW INFORMATION**

**\*\* = MEETINGS THAT ARE CLOSED TO THE PUBLIC**



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

WBS 1.2.3  
QA: N/A

**DEC 14 1992**

J. Russell Dyer, YMP, NV  
Winfred A. Wilson, YMP, Mercury, NV, M/S 717

FIELD TEST COORDINATOR'S REPORT FOR THE WEEK ENDING DECEMBER 4, 1992

UZ-16

Scope of Activity: A borehole approximately 1700 feet in depth will be drilled using the LM-300 drilling system. The primary purpose of the hole will be for vertical seismic profile testing, although other tests such as air permeability, hydrogeochemistry, and matrix hydrologic properties are also being planned. Drilling is scheduled from May 1992 through March 1993, following pad construction in March 1992.

Status as of December 4, 1992: Borehole UZ-16 continues to be drilled with the LM-300 drill rig. Coring continued from 1096.38 feet to 1159.50 feet and the borehole was reamed from 1089.04 feet to 1149.00 feet. On December 2, 1992, a deviation survey was run at a depth of 1109.00 feet using a 3 degree tool. Deviation of the hole was found to be 2 degrees and 15 minutes off vertical. When the deviation tool was retrieved, moisture was noted on the bottom of the tool. A bailer was run into the hole immediately following the deviation survey. However, when retrieved, no water was recovered in the sampler. The wetting is believed to have been caused by condensation inside the dual wall pipe. On December 3, 1992, the deviation tool was inserted into the hole after reaming to a depth of 1128.99 feet. At a depth of 960 feet, the deviation tool encountered an obstruction blocking off the hole. The deviation tool was removed from the hole and core string inserted. The core string was used to push the obstruction to the bottom of the hole. It was determined to core the next interval down to a depth of 1149.13 feet prior to conducting the deviation survey at 1128.00 feet. The deviation survey run on December 4, 1992, at the 1128 foot depth showed deviation of the hole to be 2 degrees and 15 minutes from vertical using a 3 degree tool. Following the ream cycle conducted to 1149.00 feet, a deviation survey was run December 4, 1992, using a 3 degree tool and the deviation was 1 degree 50 minutes from vertical. The deviation surveys have shown that no additional cumulative deviation of the borehole from vertical can be detected. Deviation surveys will continue to be conducted following reaming cycles to monitor this condition.

DEC 14 1992

## NEUTRON-ACCESS BOREHOLES

Scope of Activity: Approximately 24 shallow boreholes will be drilled/cored for neutron logging by the U.S. Geological Survey (USGS) in order to evaluate natural infiltration. Core taken from these holes will be used by USGS for determination of moisture content and to construct tritium profiles. The drilling operation utilizes an Odex drilling system, which produces HQ core and a cased hole having a diameter of approximately six inches. The drilling program is being implemented in two phases, each consisting of 12 boreholes that will take several months to complete.

Status as of December 4, 1992: Borehole USW-UZN-59 is being drilled with the CME-850 drill rig. The borehole was advanced by the end of shift Friday, November 20, 1992, to a core depth of 118.2 feet and ream depth of 75.33 feet. Boreholes USW-UZN-57, -58, -59 along with future borehole USW-UZN-61 are located in Abandoned Wash.

## NRG-6

Scope of Activity: A borehole approximately 1100 feet in depth will be drilled using the Joy 225 drilling system. The primary purpose of this hole is to provide core for determination of stratigraphy and engineering characteristics of the rocks at or near the planned Exploratory Studies Facility (ESF) North Access Ramp. Drilling is scheduled from November through December 1992.

Status as of December 4, 1992: Commencement of drilling on Borehole USW NRG-6 with the Joy 1 drill rig began on November 23, 1992. SF6 tracer gas was injected during drilling operations. By the end of shift on December 4, 1992, coring had reached a depth of 55.83 feet and a ream depth of 55.81 feet.

## QUATERNARY FAULTING WITHIN THE SITE AREA INVESTIGATIONS

Scope of Activity: Pavements and trenches will be excavated to provide exposures of Quaternary deposits and faults for mapping by geologists from the USGS as described in Study Plan 8.3.1.17.4.6 Quaternary Faulting in the Site Area. Planned activities include excavation of new trenches and modification of existing trenches on the Windy Wash fault, Solitario Canyon fault, and Stagecoach Road fault, and modification of existing exposures of the Paintbrush Canyon fault west of Busted Butte in the sand ramps by developing pavements.

Status as of December 4, 1992: Geologic mapping, sampling and interpretation continues on trench excavations completed during previous weeks in Midway Valley, Solitario Canyon, and along Stagecoach Road. Photogrammetric targets installed in trenches CF-1 and T-8 located in Crater Flats were verified to have been vandalized. These targets will be reestablished at a future date and subsequent photographic and survey work performed.

DEC 14 1992

#### MIDWAY VALLEY INVESTIGATIONS

Scope of Activity: Test pits and trenches are being excavated to provide exposures for mapping by geologists from the U.S. Geological Survey and Geomatrix Consultants, Inc., in the Midway Valley area east of Yucca Mountain. The focus of this investigation is a determination of the location and recency of faulting near prospective surface facilities.

Status as of December 4, 1992: Backfilling was completed, by the end of shift, of trenches and test pits in Midway Valley identified to be within the ESF north portal ramp pad footprint and construction staging areas following verification that data collecting activities had been completed.

#### SOIL AND ROCK PROPERTIES

Scope of Activity: Objectives of this investigation are to characterize the soil and rock conditions that will influence or be influenced by the construction of the Exploratory Studies Facility surface and subsurface access facilities. This activity is comprised of a total of 32 test pits and one drill hole (NRG-1). Ongoing Phase II activities include 41 additional test pits and pavement clearing at NRG-1.

Status as of December 4, 1992: No field activities were performed during this period.

#### CHARACTERIZATION OF STRUCTURAL FEATURES IN THE SITE AREA

Scope of Activity: Objectives of this investigation are to conduct prototype work for development of equipment and techniques for shaft mapping in the Exploratory Studies Facility. Developmental work is to be completed in an enlarged and deepened circular test pit on the east side of Fran Ridge. The area around the pit disturbed during the original excavation will be cleaned to the rock surface for use in pavement studies for Surface Fracture Network Studies.

Status as of December 10, 1992: Survey targets installed on the pit walls during geologic mapping operations at the enlarged Fran Ridge test pit on November 17-19, 1992, are to be surveyed the week of December 7, 1992.

DEC 14 1992

VOLCANISM EXCAVATIONS

Scope of Activity: Test pits and trenches will be excavated at the Lathrop Wells Volcanic Center and at the Cima volcanic field in order to test alternative models of eruptive histories of cinder cone volcanic activity. The excavations will provide exposures of volcanic materials (lava flows, pyroclastic deposits) and soils for examination and collection of samples. Planned activities include collection of samples for age determinations by multiple methods, description and collection of samples for evaluation of soil development on volcanic units, exposure of contact relations to aid stratigraphic studies for mapping of volcanic centers, and collection of samples for petrologic analysis.

Status as of December 4, 1992: No field activities were performed during this period.

BOREHOLE SECURITY

Scope of Activity: Objectives of this activity are the locking and securing of boreholes drilled during site characterization efforts and tracking of testing conducted in individual boreholes. Over 200 boreholes will be secured during the next several months.

Status as of December 4, 1992: No field activities were performed during this period.

If you have any questions, please contact Kenneth J. Skipper at 794-7944.



Dennis R. Williams, Acting Chief  
Site Investigations Branch  
Regulatory & Site Evaluation Division

RSED:KJS-1455



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

WBS 1.2.3.5  
QA: N/A

NOV 18 1992

Carl H. Johnson, State of Nevada, Carson City, NV  
Phillip Niedzielski-Eichner, Nye County, Chantilly, VA  
Dennis A. Bechtel, Clark County, Las Vegas, NV  
Albert C. Douglas, City of Las Vegas, Las Vegas, NV  
~~Philip S. Justus, NRC, Las Vegas, NV~~

PRELIMINARY FIELD COMPOSITE BOREHOLE LOGS

For your information, enclosed is a copy of the Preliminary Field Composite Borehole Log for borehole USW UZN-35 which was developed by the Drilling Support and Sample Management Department of Technical and Management Support Services. Drilling of the borehole was completed on October 23, 1992.

If you need additional information regarding the log, please contact Uel S. Clanton at (702) 794-7943.

*J. Timothy Sullivan for*

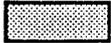
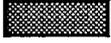
J. Russell Dyer, Director  
Regulatory & Site Evaluation Division

RSED:USC-1034

Enclosure:  
Preliminary Field Composite  
Borehole Log

# YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT PRELIMINARY FIELD COMPOSITE BOREHOLE LOG

BOREHOLE ID: USW UZN-35  
 STUDY PLAN NO: 8.3.1.2.2.1  
 CORE SIZE: HQ 2.4"  
 DRILL DATES: 10/13/92 - 10/23/92  
 GROUND ELEV: 4245.37'  
 COORDINATES: N: 762263.80'  
                   E: 562310.03'  
 TOTAL DEPTH: 175.8'  
 ANGLE FROM VERT: 0 BEARING: NA

-  ALLUVIUM
-  NON-WELDED
-  PARTIALLY WELDED
-  DENSELY WELDED
-  VITROPHYRE
-  BEDDED TUFF

LOG FINAL VERSION  
 11/05/92  
 REVISION 1: 11/11/92

Logging by Drilling Support Division, Drilling Support and Sample Management Dept, T&MSS

| RUNS<br>DATES<br>BITS | CORE LOSS | DRILLING RATE<br>(ft/hr) |    |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/ REMARKS  |
|-----------------------|-----------|--------------------------|----|-----|-----------------------|-----|-------------------------|---|
|                       |           | 0                        | 10 | 20  | 0                     | 50  |                         |   |
|                       |           | 20                       | 70 | 120 | 50                    | 100 |                         |   |
| DC-1<br>10/13/92      |           |                          |    |     |                       |     | NO DATA                 | <p>0.0-14.7 Alluvium; grayish orange, unconsolidated overburden of silt, sand, pebbles and cobbles; very few organics.</p> <p>14.7-47.3 Alluvium; cobbles and pebbles of Tiva Canyon.</p> |
| DC-2                  |           |                          |    |     |                       |     | 5                       |   |
| DC-3                  |           |                          |    |     |                       |     | 10                      |   |
| 1<br>14.7/11.4<br>78% |           | 7.3                      |    |     |                       |     | 15                      |   |
| 2                     |           | 10.8                     |    |     |                       |     | 20                      |   |
| 3 10/14/92            |           | 9.7                      |    |     |                       |     | 25                      |   |
| 4                     |           | 6.5                      |    |     |                       |     | 30                      |   |
| 5                     |           | 7.6                      |    |     |                       |     | 35                      |   |
| 6                     |           | 12.7                     |    |     |                       |     | 40                      |   |

| RUNS<br>DATES<br>BITS | CORE LOSS        | DRILLING RATE<br>(ft/hr) |      |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/ REMARKS |
|-----------------------|------------------|--------------------------|------|-----|-----------------------|-----|-------------------------|--------------------|
|                       |                  | 0                        | 10   | 20  | 0                     | 50  |                         |                    |
|                       |                  | 20                       | 70   | 120 | 50                    | 100 |                         |                    |
| 6                     |                  |                          | 12.7 |     |                       |     |                         |                    |
| 7                     |                  |                          | 6.8  |     |                       |     | 30                      |                    |
| 8                     |                  |                          | 9.6  |     |                       |     |                         |                    |
| 9                     | 21.6/11.6<br>54% |                          | 9.4  |     |                       |     | 35                      |                    |
| 10                    | 10/15/92         |                          | 10.4 |     |                       |     |                         |                    |
| 11                    |                  |                          | 10.9 |     |                       |     |                         |                    |
| 12                    |                  |                          | 12.6 |     |                       |     | 40                      |                    |
| 13                    |                  |                          | 10.9 |     |                       |     |                         |                    |
| 14                    |                  |                          | 11.6 |     |                       |     |                         |                    |
| 15                    |                  |                          | 7.3  |     |                       |     | 45                      |                    |
| 16                    |                  |                          | 7.9  |     |                       |     |                         |                    |
| 17                    |                  |                          | 5.4  |     |                       |     |                         |                    |
| 18                    | 16.4/12.1        |                          | 7.9  |     |                       |     | 50                      |                    |
| 19                    | 74%              |                          | 8.1  |     |                       |     |                         |                    |
| 20                    | 10/16/92         |                          | 9.7  |     |                       |     | 55                      |                    |
| 21                    |                  |                          | 11.4 |     |                       |     |                         |                    |
| 22                    |                  |                          | 12.5 |     |                       |     | 56                      |                    |
| 23                    |                  |                          | 18.8 |     |                       |     | 60                      |                    |
| 24                    |                  |                          | 14.0 |     |                       |     | 65                      |                    |
| 25                    |                  |                          | 21.5 |     |                       |     | 70                      |                    |

47.3-54.5 Alluvium; boulders, cobbles, and pebbles of Tiva Canyon.

@ 54.5 Alluvium/Tiva Canyon contact.

54.5-80.1 Tuff, ashflow; pale red, densely welded, devitrified; < 5% light gray pumice fragments, devitrified; 5% phenocrysts of sanidine; occasional small (<1cm thick) breccia zones recemented by calcite/silica?; some small void spaces associated with breccia zones.

| RUNS<br>DATES<br>BITS  | CORE LOSS | DRILLING RATE<br>(ft/hr) |      |      | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/ REMARKS  |
|------------------------|-----------|--------------------------|------|------|-----------------------|-----|-------------------------|---|
|                        |           | 0                        | 10   | 20   | 0                     | 50  |                         |   |
|                        |           | 20                       | 70   | 120  | 50                    | 100 |                         |   |
| 25<br>20.6/14.9<br>72% |           | 21.5                     |      |      |                       | 52  |                         |   |
| 26                     |           |                          | 12.9 |      |                       |     | 75                      |   |
| 27<br>10/19/92         |           |                          |      | 15.8 |                       | 22  |                         |   |
| 28                     |           | 8.1                      |      |      |                       |     | 80                      |   |
| 29                     |           | 7.8                      |      |      |                       | 43  |                         | 80.1-114.0 Tuff, ashflow; pale red, densely welded, devitrified; 10 to 12% oblate lithophysae with vapor phase silica and medium gray alternation rinds; <5% Phenocrysts of sanidine. |
| 30                     |           |                          |      | 13.8 |                       |     | 85                      | @ 85.9 Calcite filled fracture about 2 cm across.   |
| 31                     |           |                          | 10.6 |      |                       |     | 90                      |   |
| 32                     |           | 7.2                      |      |      |                       | 47  |                         |   |
| 33<br>25.9/15.5<br>60% |           | 6.4                      |      |      |                       | 78  | 95                      | @ 94.8-97.1 Breccia Zone: calcite matrix with tuff fragments 0.5 cm to 4.0 cm long, solution removal of matrix?, <5% vugs   |
| 34<br>10/20/92         |           | 6.4                      |      |      |                       |     | 100                     | @ 97.1-114.0 Fault Breccia: varies from micro-breccia to coarse breccia; uniform, anhedral calcite matrix, no visible mineralization, <5% vugs.                                       |
| 35                     |           | 6.3                      |      |      |                       | 18  |                         |   |
| 36                     |           | 4.8                      |      |      |                       |     |                         |   |
| 37                     |           |                          |      | 9.5  |                       |     | 105                     |   |
| 38                     |           | 7.4                      |      |      |                       | 38  |                         |   |
| 39                     |           |                          |      | 8.0  |                       |     | 110                     |   |
| 40                     |           |                          |      | 8.6  |                       |     | 115                     |   |

LITHOLOGY/ REMARKS

| RUNS<br>DATES<br>BITS  | CORE LOSS | DRILLING RATE<br>(ft/hr) |    |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/ REMARKS   |
|------------------------|-----------|--------------------------|----|-----|-----------------------|-----|-------------------------|--|
|                        |           | 0                        | 10 | 20  | 0                     | 50  |                         |  |
|                        |           | 20                       | 70 | 120 | 50                    | 100 |                         |  |
| 40<br>18.9/15.0<br>79% |           | 8.6                      |    |     |                       | 11  |                         | 114.0-175.8 Tuff, ashflow: pale red, densely welded, devitrified; very rare lithics or pumice; <3% biotite phenocrysts; abundant snowy calcite on fractures. |
| 41<br>10/21/92         |           | 5.7                      |    |     |                       | 18  | 120                     |  |
| 42                     |           | 10.1                     |    |     |                       | 67  | 125                     |  |
| 43                     |           | 6.6                      |    |     |                       | 33  | 130                     |  |
| 44                     |           | 11.6                     |    |     |                       | 11  | 135                     |  |
| 45<br>25.0/16.3<br>65% |           | 12.2                     |    |     |                       | 22  | 140                     |  |
| 46<br>10/22/92         |           | 6.9                      |    |     |                       |     | 145                     |  |
| 47                     |           | 6.0                      |    |     |                       |     |                         |  |
| 48                     |           | 4.0                      |    |     |                       | 15  |                         |  |
| 49                     |           | 2.9                      |    |     |                       | 53  | 150                     |  |
| 50                     |           | 22.8                     |    |     |                       |     | 155                     |  |
| 1                      |           | 5.4                      |    |     |                       | 14  | 160                     |  |

| RUNS<br>DATES<br>BITS | CORE LOSS | DRILLING RATE<br>(ft/hr) |                       |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | USW UZN#35<br>Page 5 of 5<br><br>LITHOLOGY/ REMARKS                            |
|-----------------------|-----------|--------------------------|-----------------------|-----|-----------------------|-----|-------------------------|--|
|                       |           | 0                        | 10                    | 20  | 0                     | 50  |                         |  |
|                       |           | 20                       | 70                    | 120 | 50                    | 100 |                         |  |
| 51<br>20/11.9<br>60%  |           | 5.4                      |                       |     |                       |     |                         |  |
| 52<br>10/23/92        |           | 34.2                     |                       |     |                       |     |                         |  |
| 53                    |           | 4.4                      |                       |     | 19                    |     | 165                     |  |
| 54                    |           | 7.2                      |                       |     |                       |     | 170                     |  |
| 55                    |           | 24.2                     |                       |     | 28                    |     |                         |  |
| 56 57                 |           | 1.61                     |                       |     |                       |     | 175                     |  |
| 12.7/4.6<br>36%       |           | 0.8                      | TOTAL DEPTH: 175.8 FT |     |                       |     |                         | TOTAL CORED: 175.8 FT<br>TOTAL RECOVERY: 113.3 FT<br>PERCENTAGE RECOVERED: 64% |

RSN bit #30: Serial # 2S27751, Christensen, surface set, 15 stones/ct., 10 air courses 1/4" X 3/16" wide by deep.

RSN bit #39: Serial # 2S8762, Christensen, diamond impregnated, flat bottomed, 7 airways 13/32" X 3/16" wide by deep.

RSN bit #40: Serial # L98153, Longyear, step carbonado with 6 airways 6/32" X 3/32" wide by deep.

RSN bit #41: Serial # 2S29254, Christensen, diamond impregnated, 5-row jagged face, 10 airways 1/8" X 1/4" wide by deep.

Bit information supplied by RSN.

INFORMAL MEMORANDUM

TO: Phil Justus  
FROM: Susan Jones *SJ*  
DATE: December 24, 1992

SUBJECT: PRELIMINARY FIELD COMPOSITE BOREHOLE LOGS

For your information, enclosed is a copy of the Preliminary Field Composite Borehole Log for borehole USW UZN-58 which was developed by the Drilling Support and Sample Management Department of Technical and Management Support Services. Drilling of the borehole was completed on November 18, 1992.

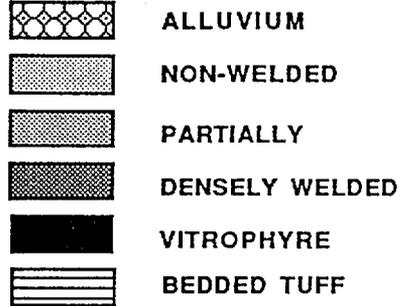
If you need additional information regarding the log, please contact Dennis R. Williams at (702) 794-7968.

Enclosure:  
Preliminary Field Composite  
Borehole Log

cc w/encl:  
S. E. LeRoy, M&O/Duke, Las Vegas, NV

## YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT PRELIMINARY FIELD COMPOSITE BOREHOLE LOG

BOREHOLE ID: USW UZN-58  
 STUDY PLAN NO: 8.3.1.2.2.1  
 CORE SIZE: HQ 2.4"  
 DRILL DATES: 11/5/92-11/18/92  
 GROUND ELEV: 4200' (EST.)  
 COORDINATES: N: 755,200' (EST.)  
                   E: 561,250' (EST.)  
 TOTAL DEPTH: 118.9'  
 ANGLE FROM VERT: NA BEARING: NA



FINAL LOG DATE  
12/16/92

Logging by Drilling Support Division, Drilling Support and Sample Management Dept., T&MSS

| RUNS<br>DATES<br>BITS     | CORE LOSS | DRILLING RATE<br>(ft/hr) |             |       | FRAC FREQ<br>(/ 5 ft) |    | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/REMARKS  |
|---------------------------|-----------|--------------------------|-------------|-------|-----------------------|----|-------------------------|--|
|                           |           | 0                        | 10          | 20    | 0                     | 50 |                         |  |
| DC-1<br>11/5/92           |           |                          |             | 161.4 |                       |    | 0                       | <p style="text-align: right;">Page <u>1</u> of <u>4</u></p> <p style="text-align: center;">LITHOLOGY/REMARKS</p> <p>0-20.8 Alluvium: gravel, sand and silt; occasional organics decreasing with depth</p> <p style="text-align: center;"><b>ALLUVIUM/TOPOPAH SPRING CONTACT @20.8</b></p> <p>20.8 - 95.1 Quartz latite: grayish pink to pale red; partially welded, devitrified; 10% phenocrysts of sanidine and plagioclase; 3-7% pumice fragments altering to clay. Fault breccia noted at contact</p> |
| DC-2                      |           |                          | 8.8'        |       |                       |    | 5                       |  |
| DC-3<br>5.5/6.2<br>89%    |           |                          | 83.7        |       |                       |    | 5                       |  |
| DC-4<br>11/6/92           |           | 48.3                     |             |       |                       |    | 5                       |  |
| DC-5                      |           | 25.5                     | 7.5         |       |                       |    | 5                       |  |
| DC-6<br>1                 |           | 6.7                      | RSN Bit #33 |       |                       |    | 10                      |  |
| DC-7                      |           |                          | 126.0       |       |                       |    | 10                      |  |
| DC-8                      |           | 41.1                     |             |       |                       |    | 10                      |  |
| DC-9<br>11.1/11.1<br>100% |           |                          | 60.0        |       |                       |    | 15                      |  |
| DC-10                     |           | 24.8                     |             |       |                       |    | 15                      |  |
| DC-11<br>11/9/92          |           | 4.5                      | RSN BIT #33 |       |                       |    | 20                      |  |
| 3                         |           | 3.5                      |             |       | 32                    |    | 20                      |  |
| 4<br>7.3/9.1<br>80%       |           |                          | 5.8         |       |                       |    | 25                      |  |
| 5<br>11/10/92             |           | 5.4                      |             |       | 11                    |    | 25                      |  |

ENCLOSURE

| DATE<br>WELLS<br>BIT | CORE LOSS         | DRILLING RATE<br>(ft/hr) |       |        |         | FRAC FREQ<br>(/ 5 ft) |        |         |         | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/REMARKS |
|----------------------|-------------------|--------------------------|-------|--------|---------|-----------------------|--------|---------|---------|-------------------------|-------------------|
|                      |                   | 0-20                     | 20-70 | 70-120 | 120-200 | 0-50                  | 50-100 | 100-150 | 150-200 |                         |                   |
| 4<br>11/10/92        |                   | 5.8                      |       |        |         | 11                    |        |         |         | 30                      |                   |
| 6                    |                   | 5.4                      |       |        |         |                       |        |         |         |                         |                   |
| 7                    |                   | 8.7                      |       |        |         | 20                    |        |         |         | 35                      |                   |
| 8                    |                   | 2.67                     |       |        |         |                       |        |         |         | 40                      |                   |
| 9                    |                   | 6.4                      |       |        |         | 14                    |        |         |         | 45                      |                   |
| 10                   |                   | 6.2                      |       |        |         | 10                    |        |         |         | 50                      |                   |
| 11<br>11/12/92       | 23.6/23.6<br>100% | 2.5                      |       |        |         | 13                    |        |         |         | 55                      |                   |
| 12                   |                   | 9.2                      |       |        |         | 22                    |        |         |         | 60                      |                   |
| 13                   |                   |                          |       |        |         |                       |        |         |         | 65                      |                   |
| 14                   |                   |                          |       |        |         |                       |        |         |         | 70                      |                   |
| 15<br>11/13/92       | 0.1/20.1<br>100%  | 10.0                     |       |        |         | 19                    |        |         |         | 70                      |                   |

RSN Bit #31

| S<br>RES<br>/TS  | CORE LOSS | DRILLING RATE<br>(ft/hr) |      |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | LITHOLOGY/REMARKS  |
|------------------|-----------|--------------------------|------|-----|-----------------------|-----|-------------------------|--|
|                  |           | 0                        | 10   | 20  | 0                     | 50  |                         |  |
|                  |           | 20                       | 70   | 120 | 50                    | 100 |                         |  |
| 15<br>11/13/92   |           | 10.0                     |      |     | 19                    |     |                         |  |
| 16               |           |                          | 20.0 |     | 9                     |     | 75                      |  |
| 17               |           |                          | 18.8 |     | 11                    |     | 80                      |  |
| 18               |           | 23.1                     |      |     | 31                    |     | 85                      |  |
| 19               |           | 25.2                     |      |     | 43                    |     | 90                      |  |
| 20               |           | RSN Bit #42              |      |     |                       |     | 95                      |  |
|                  |           |                          | 16.7 |     | 21                    |     |                         |  |
| 27.3/30.0<br>91% |           |                          |      |     |                       |     | 100                     |  |
| 21<br>11/18/92   |           |                          | 15.8 |     |                       | 100 |                         | 95.1 - 118.9 Tuff, ashflow: pale red to grayish pink, partially to moderately welded, devitrified; 10-15% pumice; up to 30% phenocrysts of sanidine, plagioclase and biotite; 10% lithophysae with abundant vapor phase mineralization |
| 22               |           |                          | 14.3 |     |                       | 92  |                         |  |
| 23               |           |                          | 10.0 |     |                       | 100 |                         |  |
| 24               |           | 6.3                      |      |     | 33                    |     | 115                     |  |

|                     |                  |                          |    |     |                       |     |                         |                        |
|---------------------|------------------|--------------------------|----|-----|-----------------------|-----|-------------------------|------------------------|
| US<br>DATES<br>BITS | CORE LOSS        | DRILLING RATE<br>(ft/hr) |    |     | FRAC FREQ<br>(/ 5 ft) |     | DEPTH<br>GRAPHIC<br>LOG | USW UZN-58 Page 4 of 4 |
|                     |                  | 0                        | 10 | 20  | 0                     | 50  |                         | LITHOLOGY/REMARKS      |
|                     |                  | 20                       | 70 | 120 | 50                    | 100 |                         |                        |
| 24                  | 11.4/18.8<br>61% | 6.3                      |    |     |                       | 33  | TOTAL DEPTH: 118.9'     |                        |

-120-

TOTAL DRIVE CORE: 16.3'  
TOTAL CORED: 102.6'  
TOTAL RECOVERED: 91.6'  
PERCENT CORE RECOVERED: 94%

**BIT INFORMATION:**

- RSN Bit #31 SN 2S25773: Stratapac, Christensen, 15 PDC cutters, 1/4" diameter, 10 airways 1/4" wide by 5/16" deep.
- RSN Bit #33 SN 2S27751: Carbonado, Christensen, surface set, 15 stones/st., 10 airways 1/4" wide by 3/16" deep.
- RSN Bit #42 SN 2S29256: Diamond Impregnated, Christensen, 5 rows, 10 airways, 1/8" wide by 1/4" deep.



# Lawrence Livermore National Laboratory

LLYMP9212051  
December 16, 1992

WBS 1.2.9  
"QA: N/A"

Carl Gertz, Project Manager  
Department of Energy  
Yucca Mountain Project Office  
P.O. Box 98518  
Las Vegas, Nevada 89193-8518

SUBJECT: Yucca Mountain Project Status Report - November 1992  
SCP: N/A

Attached is the November Project Status Report for LLNL's participation in the Yucca Mountain Project.

If further information is required, please contact Elizabeth Campbell of my staff at FTS 510-422-7854 or Jim Blink in Las Vegas at 702-794-7157.

Sincerely,

  
\_\_\_\_\_  
W. L. Clarke  
LLNL Technical Project Officer  
for YMP

WC/EC

cc:  
Distribution

## DISCLAIMER

The LLNL Yucca Mountain Project cautions that any information is preliminary and subject to change as further analyses are performed or as an enlarged and perhaps more representative data base is accumulated. These data and interpretations should be used accordingly.

LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT  
NOVEMBER 1992 TECHNICAL HIGHLIGHTS AND STATUS REPORT

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LAWRENCE LIVERMORE NATIONAL LABORATORY  
(LLNL)  
YUCCA MOUNTAIN PROJECT (YMP) STATUS REPORT

NOVEMBER 1992

EXECUTIVE SUMMARY

(Items Proposed for Reporting in YMPO or OGD Reports)

1) 1.2.2.2.1 (Chemical and Mineralogical Properties of the Waste Package Environment). LLNL staff worked with YMPO and LANL representatives to establish the collaborative activities necessary to address issues regarding flow, transport, rock-fluid interaction, and mineral stability. A better understanding of roles and efforts was developed from these consultations.

2) 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment). J. Nitao is currently testing a prototype version of the NUFT code (Nonisothermal Unsaturated Flow and Transport) for nonisothermal radionuclide transport problems. NUFT, which can handle multi-phase heat flow and aqueous-phase multiple species transport, was primarily developed outside of YMP. J. Nitao sent a description of NUFT to J. Duguid, M&O/INTERA, so that it could be included in the M&O report "Review and Selection of Unsaturated Flow Models".

3) 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment). At the request of the M&O, repository scale (including the saturated zone) hydrothermal calculations were conducted at Areal Power Densities of 20 and 114 kW/acre and for burnups of 21, 26, and 30 yrs (corresponding to Youngest Fuel First-YFF, Oldest Fuel First-OFF, and reference cases). For the 20 kW/acre cases, peak temperatures are similar (55-60°C), but the time of peak temperature varies from 150 to 729 yr. Most of the temperature buildup occurs during the first 100 yr in each case; this time is too short to smooth package-to-package and drift-to-drift temperature profiles, and hence the actual peak temperatures would be higher. For the 114 kW/acre cases, the peak temperature ranges from 178 to 203°C at times between 122 and 602 yr; again, most of the temperature buildup occurs in the first 100 yrs. For these 114 kW/acre cases, the duration of boiling ranges from 7331 to 11,450 yr; these times are long enough to smooth local temperature variations.

4) 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment). Hydrothermal calculations which include the saturated zone (SZ) have been conducted for the SCP-CDR reference case of 57 kW/acre, 10 yr old spent fuel with burnup of 33,000 MWd/MTIHM. The repository horizon peak temperature is 100.3°C at 95 yr and the time above boiling is 666 yr. These results are similar to those which consider the SZ surface to be isothermal (peak temperature of 100.0°C at 94 yr, and boiling for 553 yr). The peak water table temperature rise of 30°C occurs at 4140 yr, with no temperature rise in the first 500 yr and most of the increase occurring between 1000 and 2000 yr. At 20,000 yr, the water table heating is still 20°C, and the temperature rise one third of the way into the nonwelded zeolitized Calico Hills unit is 21°C (its maximum of 45°C occurs at 1635 yr). These calculations also show that, for vertically connected fractures, condensate drainage can persist all the way to the water table.

5) 1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment). Hydrothermal calculations which include the saturated zone (SZ) show that the SZ heating is a function of the quantity of spent fuel emplaced rather than the geometric design details of its emplacement. Consequently, the hydrothermal and potential geochemical consequences of heat in the SZ should not be considered a design issue, but rather the inherent response of the SZ to the emplacement of a given quantity of spent nuclear fuel.

6) 1.2.2.3.2 (Metal Barriers). At the American Society of Testing and Materials (ASTM) meeting in Miami, FL on November 16-18, container materials researchers from the NRC and the international community presented their results. The DOE community had no presentation due to lack of funding in this area last year. On the positive side, ANL presented data from 19,000 hrs of accelerated testing in J-13 water of Inconel 825, stainless steel 304 and stainless steel 316; these tests began under LLNL-YMP sponsorship and have continued using ANL internal funds. During the test, which is equivalent to 300 to 1000 years of service environment exposure, no environmentally-assisted cracks formed in the specimens. Another 35 months of testing would extend the equivalent service life exposure to 10,000 years. LLNL-YMP will probably resume funding these experiments this year.

## 1.2.1 SYSTEMS ENGINEERING

### 1.2.1.1 Systems Engineering Coordination and Planning

No significant activities.

### 1.2.1.5 Special Studies

No significant activities.

### 1.2.1.6 Configuration Management

LLNL-YMP reviewed its controlled documents to determine the impact of CR 92/140, CR 93/044, CR93/048 and CR93/053 and found that no LLNL-controlled documents were affected.

## 1.2.2 WASTE PACKAGE

### 1.2.2.1 Waste Package Coordination and Planning

R. Dyer, A. Simmons and J. Boak (YMPO) visited LLNL on November 13 to discuss coupling of geochemistry and hydrology.

D. Wilder attended the cost reduction meeting held in Las Vegas on November 6. This team is examining all aspects of the Testing Programs to find ways to reduce costs.

B. Viani participated in the November Geochemical Integration Team (GIT) meeting held by teleconference.

### 1.2.2.2 Waste Package Environment

Work was done to resolve comments on the Preliminary Near Field Environment Report.

#### 1.2.2.2.1 Chemical and Mineralogical Properties of the Waste Package Environment

Activities related to definition of equilibrium vs. non-equilibrium domains continued. The possibility of using standard computational packages to undertake simple models of rock-fluid interaction, and how these interactions may influence hydrological properties is being explored. The possibility that cellular automata may be useful is being evaluated.

Final justifications for sole source of the New Zealand contract were nearly completed. Minor delays in getting appropriate documents from the New Zealand participants are being addressed.

LLNL staff worked with YMPO and LANL representatives to establish the collaborative activities necessary to address issues regarding flow, transport, rock-fluid interaction, and mineral stability. A better understanding of roles and efforts was developed from these consultations.

A paper by K. Ragnarsdottir (Bristol University) entitled "Dissolution Kinetics of Heulandite at pH 2-12 and 25°C" was approved by YMPO. This paper was submitted to *Geochimica Cosmochimica Acta*.

A paper by W. Glassley entitled "Validation of Hydrogeochemical Codes Using the New Zealand Geothermal System" has been submitted for internal review.

#### 1.2.2.2.2 Hydrologic Properties of the Waste Package Environment

The first draft of a Study Plan for the laboratory experiment portion of the Near Field Environment Hydrology is almost complete. It will be available for editing next month.

#### Model Calculations

Work continued conducting and analyzing the preliminary scoping calculations of the hydrothermal performance of the repository, using the RIB Version 4 thermal conductivity data, and using the new model which represents hydrothermal flow in the upper 1000 m of the saturated zone (SZ) as well as within the unsaturated zone (UZ). All of the prior repository-scale and drift-scale hydrothermal calculations have considered 10, 30, and 60-yr-old spent nuclear fuel (SNF) having the reference SCP-CDR burnup of 33,000 megaWatt-days per metric ton of heavy initial metal (MWd). At the request of the M&O, repository-UZ-SZ scale hydrothermal calculations for SNF have been conducted with other average ages and burnups. This request was made in order to investigate the hydrothermal performance of the repository-UZ-SZ system under thermal loads which are more specifically tied to potential SNF selection options for the MGDS. As previously reported, the repository-UZ-SZ scale model does not represent the details of the emplacement

geometry or schedule; instead it averages the thermal loading over a 4.6-m-thick disk having a diameter which corresponds to the repository area being modeled. Two extreme SNF selection scenarios were considered with the "oldest fuel first" (OFF) scenario yielding an average fuel age and burnup of 26 years and 39,585 MWd and the "youngest fuel first" (YFF) scenario yielding an average fuel age of 21 years and burnup of 43,573 MWd. The 21-yr-old OFF and 26-yr-old YFF scenarios were considered for Areal Power Densities (APDs) of 20 and 114 kW/acre.

For the 20 kW/acre cases, a 3162 acre repository was considered. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case, an APD of 20 kW/acre results in Areal Mass Loadings (AMLs) of 16.61, 20.43, and 27.14 MTU/acre, respectively. The 21-yr-old YFF scenario attains a peak average temperature at the repository center,  $T_{peak}$ , of 55.45°C at a time to peak temperature,  $t_{peak}$ , of 149.8 yr, while for the 26-yr-old OFF scenario,  $T_{peak} = 57.85^\circ\text{C}$  at  $t_{peak} = 235.6$  yr. For the 30-yr-old SNF reference case,  $T_{peak} = 59.94^\circ\text{C}$  at  $t_{peak} = 729.4$  yr. As has been previously observed, the time to peak temperature  $t_{peak}$  increases with average SNF age. Although  $t_{peak}$  varies considerably among these three cases, there is very little substantive difference among the respective temperature profiles because most of the temperature buildup occurs during the first 100 years. For example, the 30-yr-old SNF case attains 94% of its ultimate temperature buildup during the first 100 years, with the temperature only increasing another 2.2°C between  $t = 100$  and 729.4 yr. The 21-yr-old YFF and 26-yr-old OFF scenarios attain over 99% of their ultimate temperature buildup during the first 100 years. Therefore, although  $t_{peak}$  may appear to vary considerably, actual differences in repository temperature at any given time are relatively minor among the three 20 kW/acre cases.

It should be emphasized that  $T_{peak}$  is the peak averaged temperature at the repository center. Consequently,  $T_{peak}$  does not reflect temperature gradients between the emplacement drift wall (or emplacement borehole wall) and the pillar centers, nor does it reflect spatial temperature variations arising from the variability in the heat output among waste packages (WPs). Because peak temperatures are nearly attained in 100 years, thermal homogenization will not have had sufficient time to impact local peak temperatures within the repository. Therefore, actual distributions of peak temperature will deviate significantly from the values of  $T_{peak}$  given above. Depending on the number of fuel assemblies per WP and variations in the WP heat output, local boiling conditions can persist for hundreds of years even if average repository temperatures might appear to be indicative of sub-boiling conditions. If WPs contain more than 2 PWR fuel assemblies, local boiling conditions appear to be likely.

For the 114 kW/acre cases, a 559 acre repository was considered. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case, an APD of 114 kW/acre results in AMLs of 94.65, 116.45, and 154.7 MTU/acre, respectively. For the 21-yr-old YFF scenario,  $T_{peak} = 177.52^\circ\text{C}$  at  $t_{peak} = 121.6$  yr. For the 26-yr-old OFF scenario,  $T_{peak} = 188.2^\circ\text{C}$  at  $t_{peak} = 453.6$  yr. For the 30-yr-old SNF case,  $T_{peak} = 202.8^\circ\text{C}$  at  $t_{peak} = 601.5$  yr. Although  $t_{peak}$  varies considerably among these three cases, all three cases are effectively at their peak temperature within the first 100 years. For the 21-yr-old YFF and 26-yr-old OFF cases, over 99% of the temperature buildup occurs during the first 100 years, while 93.5% of the ultimate

temperature buildup occurs for the 30-yr-old SNF case during the first 100 years, with temperature only rising another 11.6°C between  $t = 100$  and 601.5 yr.

For the three 114 kW/acre cases, the duration of the boiling period at the center of the repository,  $t_{bp}$ , is roughly linearly proportional to the AML. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case,  $t_{bp}$  is 7331, 9125, and 11,450 yr, respectively. Had these scenarios been run with the same AML (rather than the same APD), it is likely that  $t_{bp}$  would be similar for the three fuel ages with the 21-yr-old YFF case having the highest  $T_{peak}$ . Because of the relatively large  $t_{bp}$ , thermal homogenization with the repository will have occurred prior to the end of the boiling period. Therefore, spatial variability in heat output due to variations between WPs will not cause local values of  $t_{bp}$  to significantly deviate from average conditions.

The 10-yr-old SNF, 57 kW/acre, 33,000 MWd reference burnup case (resulting in an AML of 49.21 kW/acre) was also considered; this is essentially the reference of SCP-CDR case. For the model which includes hydrothermal flow in the upper 1000 m of the SZ,  $T_{peak} = 100.3^\circ\text{C}$  at  $t_{peak} = 94.6$  yr, and  $t_{bp} = 666$  yr. For comparison, the model which treats the water table as being at a fixed depth at a constant temperature calculates  $T_{peak} = 100.0^\circ\text{C}$  at  $t_{peak} = 94.0$  yr, and  $t_{bp} = 553$  yr. The maximum temperature rise,  $\Delta T_{max}$ , at the top of the SZ (225 m below the center of the repository) is  $29.8^\circ\text{C}$  occurring at  $t = 4140$  yr. The temperature at the water table does not respond to repository heating for the first 500 yr, with most of the temperature rise occurring between  $t = 1000$  and 2000 yr. At  $t = 20,000$  yr, the temperature at the water table is still  $19.7^\circ\text{C}$  above ambient. Approximately one-third of the way into the nonwelded zeolitized Calico Hills (CHnz) unit (106.5 m below the center of the repository),  $\Delta T_{max} = 45.4^\circ\text{C}$ , occurring at  $t = 1635$  yr. At  $t = 20,000$  yr, the temperature at this location in the CHnz is still  $21.1^\circ\text{C}$  above ambient. Such a substantial, persistent increase in temperature has the potential for modifying the geochemical properties, thereby modifying the transport properties of potential pathways for radionuclide transport.

The calculations also show considerable condensate drainage below the repository. For vertically connected preferential fracture pathways, the calculations indicate that condensate drainage can persist all the way to the water table. Condensate drainage along fractures may also contribute to the alteration of transport properties below the repository.

Work continued on examining repository-heat-generated hydrothermal flow in the SZ for APDs ranging from 20 to 114 kW/acre. Last month it was reported that heatflow in the SZ appeared to be dominated by heat conduction. This observation appears to hold for high APDs (i.e. sufficient to drive persistent boiling conditions at the repository) for  $t < 10,000$  yr and for low APDs for  $t < 2000$  yr. Convection begins to significantly affect SZ heatflow for  $t > 10,000$  yr for high APDs and for  $t > 2000$  yr for low APDs. The magnitude of repository-heat-driven buoyancy flow in the SZ was compared for three cases of 30-yr-old SNF having the same total mass of SNF: 1) 20 kW/acre over a repository area of 3162 acres, 2) 57 kW/acre over 1118 acres, and 3) 114 kW/acre over 559 acres. Although the geometric details of the convection cells differ, it was found that the overall magnitude of repository-heat-driven buoyancy flow is relatively insensitive to APD. For example, at  $t = 5000$  yr, the

maximum horizontal fracture velocity,  $(v_h)_{max}$  is 1182 m/yr for 20 kW/acre, 1513 m/yr for 57 kW/acre, and 1575 m/yr for 114 kW/acre. Although the APD varies by a factor of 5.7, the difference in  $(v_h)_{max}$  is only 33% between these cases. Note that the SZ fluxes quoted last month are equivalent continuum flux,  $Q_{ECM}$ , which is different from the fracture velocities that are quoted this month. When there is a large contrast between fracture and matrix permeabilities, the fracture velocity can be obtained by multiplying  $Q_{ECM}$  by the ratio of the total (matrix + fracture) porosity divided by the fracture porosity (i.e. the ratio of total flow area to fracture flow area). Overall, the SZ fracture velocities driven by repository heat are at least two orders of magnitude greater than those currently being attributed to the ambient system.

Thermally-driven buoyancy flow in the SZ is a result of changes in fluid volume,  $\Delta V$ , which occur as the region below the repository is heated. Because  $\Delta V$  increases with  $\Delta T$ , the magnitude of buoyancy flow generally increases with  $\Delta T$ . Although  $\Delta V$  per unit volume of heated SZ is less for lower APD, the larger "footprint" associated with the low APD repository results in a larger overall region where this heat-driven change in volume takes place. Consequently, for a given amount of time-integrated heat, the cumulative effect of repository heating on driving convection cells in the SZ is similar over a wide range of APD. In general, the magnitude of repository-heat-driven buoyancy in the SZ is insensitive to the actual design of the repository and is primarily sensitive to the time-integrated heat (i.e. total mass of SNF emplaced in the repository). Consequently, the hydrothermal and potential geochemical consequences of heat in the SZ should not be considered a design issue, but rather the inherent response of the SZ to the emplacement of a given quantity of SNF.

### Laboratory Experiments

Work continued on the measurement of electrical resistivity as a function of moisture content of Topopah Spring tuff samples from U3hg-1 and GU-3 hole at room temperature. The purpose of the measurement is to generate calibration curves of electrical resistivity of these samples with respect to moisture content so that laboratory and field determined resistivity can be interpreted in terms of degree of water saturation. A gold electrode was deposited on the flat surfaces of cylindrical disc samples. Two-electrode electrical resistance measurements were done on each one of the four samples with different thicknesses. Measurements have been made from dry to 100% pore volume saturation with water. The measurements in the drying phase will continue next month.

The investigation of the different imbibition rates of water into a rock sample when the sample is either in a vapor environment or in liquid water continued. To understand the mechanism of imbibition, capillary tubes of various inside diameters are put in a constant humidity chamber and are set at various levels of humidity. The imbibition rate of water into each capillary tubing will be determined.

## Model Development & Documentation

J. Nitao is currently testing a prototype version of the NUFT code (Nonisothermal Unsaturated Flow and Transport) for nonisothermal radionuclide transport problems. NUFT, which can handle multi-phase heat flow and aqueous-phase multiple species transport, was primarily developed outside of YMP. J. Nitao sent a description of NUFT to J. Duguid, M&O/INTERA, so that it could be included in the M&O report "Review and Selection of Unsaturated Flow Models".

### 1.2.2.2.3 Mechanical Attributes of the Waste Package Environment

The Study Plan 8.3.4.2.4.3 will resolve part of one of the NRC's open SCP comments; the details were provided to the M&O.

### 1.2.2.2.4 Engineered Barrier System (EBS) Field Tests

The first draft of the Study Plan for the Engineered Barrier System Field Tests is in internal review.

W. Lin and J. Roberts visited R. Glass' laboratory at Sandia National Laboratories in Albuquerque, NM, on November 18. W. Lin gave a talk on laboratory investigation of fracture healing during that visit.

W. Lin attended the SOC meeting on November 10 and the Cost Reduction meeting on November 24, both in Las Vegas.

W. Lin, D. Wilder and J. Blink worked with the M&O and the Test Coordination Office to adapt the ESF heater tests to the ESF construction schedule. J. Blink assisted in the production of the ESF movie.

### Large Block Test (LBT)

W. Clarke, D. Wilder, W. Lin, S. Blair, T. Buscheck, W. Glassley and J. Blink (LLNL), and L. Costin, J. Pott and C. Brechtel (SNL) visited NTS to inspect rock outcroppings for possible samples for the large block test. Contacts with Sandia National Laboratories and REECo have been made to evaluate various ways of obtaining blocks of Topopah Spring tuff from either Fran Ridge or Busted Butte. One facility has been identified that can finish the blocks according to LLNL's requirements for size and accuracy. Work has also started on designing the loading frame for the large block test.

An alternative to assembling the large block from 1 m<sup>3</sup> cubes is being considered. In this case, a 27 m<sup>3</sup> block would be carved into Fran Ridge and the loading frame would be constructed on site.

### 1.2.2.2.5 Characterization of the Effects of Man-Made Materials on Chemical & Mineralogical Changes in the Post-Emplacement Environment

Staff supplied a draft of a white paper entitled "Chemical and Mineralogical Concerns for the Use of Man-Made Materials in the Post-Emplacement

Environment" by A. Meike to R. Fish and D. Stahl (M&O). This paper discusses concerns for materials introduced into the ESF. It is now in internal review.

### 1.2.2.3 Waste Form and Materials Testing

#### 1.2.2.3.1 Waste Form

R. Stout participated in the MRS meeting in Boston, MA on November 30-December 3.

R. Stout and J. Blink worked to resolve reviewer comments on the Preliminary Waste Form Characterization Report.

#### 1.2.2.3.1.1 Waste Form Testing - Spent Fuel

##### Spent Fuel Dissolution

The five shorter duration uranium dissolution experiments begun last month at LLNL have been successfully completed. Their dissolution rates are being integrated with existing results. Those five cells are being rerun at the original room temperature conditions to check the reproducibility of the data.

The stainless steel system has demonstrated the ability to maintain the desired low dissolved oxygen concentration in the leaching solution. Additional systems are being designed and built to begin the low oxygen runs of the test matrix. They will be instrumented as necessary to monitor the dissolved oxygen level.

Multi-linear regression analysis was performed on PNL's spent fuel dissolution measurements. The results and additional variations on those fits are still being evaluated. They are also being compared with LLNL's UO<sub>2</sub> results.

A paper by W. Gray (PNL) entitled "Effects of Air Oxidation on the Dissolution Rate of LWR Spent Fuel" was approved by YMPO. This paper was presented at the MRS meeting in Boston, MA on November 30-December 4.

##### Spent Fuel Oxidation

Weight measurements taken from oxidation dry bath tests continued at PNL.

A paper by L. Thomas (PNL) entitled "Effects of Fission Products on Air-Oxidation of LWR Spent Fuel" was approved by YMPO. This paper was submitted to the Journal of Nuclear Materials.

##### Materials Characterization Center (MCC) Hot Cell Activities

The paper entitled "Methodology for Determining MCC Spent Fuel Acquisitions" by S. Marschman, R. Einziger (PNL) and R. Stout has been submitted for LLNL-YMP internal review.

### 1.2.2.3.1.2 Waste Form Testing - Glass

#### D-20-27 Unsaturated Testing of WVDP and DWPF Glass

The N2 tests (SRL actinide-doped glass) continue with no sampling period occurring this month. These tests have been in progress for 348 weeks. The N3 tests (ATM-10, a West Valley actinide-doped glass) continue and have been in progress for 266 weeks.

### 1.2.2.3.2 Metal Barriers

W. Clarke attended the American Society of Testing and Materials meeting in Miami, FL on November 16-18. Container materials researchers from the NRC and the international community presented their results. The DOE community had no presentation due to lack of funding in this area last year. On the positive side, ANL presented data from 19,000 hrs of accelerated testing in J-13 water of Inconel 825, stainless steel 304 and stainless steel 316; these tests began under LLNL-YMP sponsorship and have continued using ANL internal funds. During the test, which is equivalent to 300 to 1000 years of service environment exposure, no environmentally-assisted cracks formed in the specimens. Another 35 months of testing would extend the equivalent service life exposure to 10,000 years. LLNL-YMP will probably resume funding these experiments this year.

### 1.2.2.3.3 Other Materials

This WBS element has not been funded in FY93.

### 1.2.2.3.4 Integrated Testing

#### 1.2.2.3.4.1 Integrated Radionuclide Release: Tests and Models

#### Determination of Elemental Profiles in Rocks, Minerals, and Glasses using the Ion Microscope

Planning continued for diffusion experiments using single crystals of clinoptilolite. Single crystals of clinoptilolite were saturated with Na, Ca, and K using 1 N salts. These samples will be used to test the experimental protocol.

#### Interactions of Actinide-bearing Solutions with Rock Core Samples

The saw-cut core to be used in the flow experiment was rehydrated using filtered deionized water. The surface of the saw-cut was cleansed of adhering particles using an ultrasonic probe. The core was assembled and jacketed in preparation for emplacement in the flow-through apparatus.

An isoparaffinic solvent (ISOPAR-H) is being tested as a potential fluid to apply confining pressure to the core. A sample of jacket material with epoxy sealer was immersed in the vent and heated at 150°C and 50 bar pressure to test compatibility of the materials under the maximum temperature expected in the flow-through apparatus.

#### **1.2.2.3.4.2 Thermodynamic Data Determination**

No significant activities.

#### **1.2.2.3.5 Nonmetallic Barrier Concepts**

This WBS element has not been funded in FY93.

### **1.2.2.4 Design, Fabrication, and Prototype Testing**

#### **1.2.2.4.3 Container/Waste Package Interface Analysis**

This WBS element has not been funded in FY93.

## **1.2.3 SITE INVESTIGATIONS**

### **1.2.3.1 Site Investigations Coordination and Planning**

This WBS element has not been funded in FY93.

#### **1.2.3.2 Geology**

##### **1.2.3.2.1.2.1 Natural Analogue of Hydrothermal Systems in Tuff**

This WBS element has not been funded in FY93.

#### **1.2.3.4 Geochemistry**

##### **1.2.3.4.2 Geochemical Modeling**

The second geochemical code document entitled "EQ3NR, A Computer Program for Geochemical Aqueous Speciation-Solubility Calculations: Theoretical Manual, User's Guide and Related Documentation, Version 7" by T. Wolery was approved by YMPO and will be published in December. The third and fourth manuals of the set are awaiting approval at YMPO.

ISP-NF-08, "Individual Software Plan for EQ3/6 Version 8 and Subsequent Versions" was revised in response to review comments and approved. The Software Requirements Specification (SRS) and Software Design Documentation (SDD) for Version 8 were written and are being reviewed.

A few minor bugs in the Version 7.1 release were reported by users at ANL and the Center for Nuclear Waste Regulatory Analyses. These bugs are being analyzed.

##### **1.2.3.10 Altered Zone Characterization**

This WBS element has not been funded in FY93. Funding is expected after FY92 underrun funds are redistributed.

## 1.2.5 REGULATORY

### 1.2.5.1 Regulatory Coordination and Planning

This WBS element has not been funded in FY93.

### 1.2.5.2 Licensing

#### 1.2.5.2.2 Site Characterization Program

W. Clarke, D. Wilder, T. Buscheck, W. Lin, W. Halsey and J. Blink participated in the NWTRB Structural Geology & Geoengineering Panel workshop on the ESF design and construction strategy in Las Vegas on November 4-5.

### 1.2.5.3 Technical Data Management

#### 1.2.5.3.4 Geologic and Engineering Materials Bibliography of Chemical Species (GEMBOCHS)

The transfer of the GEMBOCHS database and software library from the local Sun 3/260 server (node s33 of the local Sun network) to a new, dedicated Sun SPARCstation2 (node s60) continued. Completion of this transfer will result in dramatically improved performance for each database and software module of the GEMBOCHS system. Several problems were encountered running the CNGBOCHS system on the s60. These centered on interfacing the package with an updated version of the electronic mail utility em. The problems were eventually resolved. EQPT was successfully ported to s60.

The detailed testing of program D0OUT (on node s33) using the recently restructured (August 1992) GEMBOCHS database was completed. This critical testing activity was carefully documented in the report entitled "Test Report for D0OUT-8612-SRC-V25, Rev. 0" by S. Lundeen.

D0OUT was used to generate a revised suite of thermodynamic datafiles (DATA0.[sup,nea,com,pit,hmw].R17) that supports the EQ3/6 geochemical software package (Version 7.1). These new datafiles were then piped through EQPT to generate the corresponding DATA1 suite, which was then transferred to the new dedicated directory for EQ3/6 DATA0 files, s60:/dberror/data0, where they can be accessed by local users of EQ3/6.

#### 1.2.5.3.5 Technical Data Base Input

No significant activities.

## 1.2.5.4 Performance Assessment

### 1.2.5.4.2 Waste Package Performance Assessment

The manual entitled "PANDORA 1.1 User's Manual" by L. Lewis and C. Hardenbrook has completed internal technical review and has been returned to the author for comment resolution.

The paper by R. Bradford entitled "The Role of Multiple Barriers in Assuring Waste Package Reliability" began internal review.

## 1.2.9 PROJECT MANAGEMENT

### 1.2.9.1 Management and Coordination

#### 1.2.9.1.2 Technical Project Office Management

J. Blink attended the Technical Advisory Group (TAG) meeting in Los Alamos, NM on November 17.

W. Halsey, R. Stout and D. Wolfe attended the Expert Judgment Panel meeting held in Albuquerque, NM on November 18-20.

W. Clarke and/or J. Blink represented LLNL at several meetings of the Infrastructure and Early Decision cost cutting groups.

J. Blink led a Boy Scout Atomic Energy Merit Badge session at the Yucca Mountain Information Office on November 7. Staff members from the M&O and SAIC assisted.

J. Blink (LLNL) and E. Harle (SAIC) made educational presentations to several 6th grade classes at K. Booker School in Las Vegas on November 3. Their hands-on energy lessons were attended by about 140 students. J. Blink also presented hands-on lessons on atoms and electricity to three 5th grade classes at R. Taylor School in Henderson. Finally, J. Blink and E. Harle presented hands-on energy lessons to four 9th grade classes at K. Guinn Jr. High School in Las Vegas on November 16.

J. Blink briefed the LLNL Educational Council on YMP Education Programs on November 6. A summary of his briefing was published in a local Livermore newspaper.

### 1.2.9.2 Project Control

#### 1.2.9.2.2 Participant Project Control

The October FTE report was submitted to YMPO. The October actual schedule progress and costs to PACS reporting system was submitted via PACS workstation.

Changes were completed to the FY93 baseline as required by budget modifications. The baseline data are complete with the exception of FY92 carryover allocations.

The LLNL database has been uploaded to PACS via workstation. Several difficulties were encountered with the software, and after two executables were mailed to LLNL, the upload was finally successful. As carryover decisions are announced by YMPO, changes to workscope, cost plans and schedules will be made.

The cost plan was prepared for FY93 and cost data were entered for October. Planned vs. actual relationships are difficult for this period since several accounting adjustments are contaminating the "earned value" position of LLNL.

LLNL is in the process of revising its account structure to match and support the FY93 PACS database. This effort will be completed in December.

The property management inventory update continues. PRISM has several errors and several pieces of equipment are still without custodians or are not being used by NWF participants.

J. Podobnik attended the Project Control Steering committee meeting in San Diego, CA on November 9.

## **1.2.11 QUALITY ASSURANCE**

### **1.2.11.1 Quality Assurance Coordination and Planning**

A draft QA Program transition plan, required for implementation of the new QARD, was distributed internally to administrative and technical area leaders for their review and comments. The transition plan outlines changes required to simplify and streamline the LLNL-YMP QA Program in addition to meeting the QARD requirements.

D. Wolfe attended a meeting on the Implementation of the OCRWM QARD in Las Vegas on November 30.

### **1.2.11.2 Quality Assurance Program Development**

A Change Notice was prepared for QP 2.8 to clarify requirements in response to YMP Surveillance SR-92-28 and CAR-YM-93-017.

### **1.2.11.3 Quality Assurance Verification**

#### **1.2.11.3.1 Quality Assurance Verification - Audits**

CAR-LLNL-023 was completed, verified, and transmitted to YMPO.

#### **1.2.11.3.2 Quality Assurance Verification - Surveillance**

YMPO performed Surveillance SR-92-28 and issued CAR-YMP-93-017.

Surveillance S93-02 was performed on the Instrument Calibration Program.

Surveillance S93-01 was issued on the following activities:

- 1) G-20-2, "Determination of Elemental Profiles in Rocks, Minerals, and Glasses Using the Ion Microscope",
- 2) G-20-3, "Interaction of Actinide Bearing Solutions with Rock Core Samples",
- 3) G-20-5, "Interaction of Materials under Repository Conditions" and
- 4) G-20-6, "Source Term Model Development".

CAR-LLNL-026 was issued as a result of Surveillance S93-01.

#### 1.2.11.4 Field Quality Assurance/Quality Control

This WBS element has not been funded in FY93.

#### 1.2.11.5 Quality Assurance - Quality Engineering

Individual Software Plan ISP-NF-07, Rev. 1 "Initial Qualification of EQ3/6" was reviewed, completed, and distributed.

### 1.2.12 INFORMATION MANAGEMENT

#### 1.2.12.2 Records Management

##### 1.2.12.2.2 Local Records Center Operation (LRC)

Document Control issued six new revisions and two Change Notices under controlled distribution. Routine follow-up for receipt acknowledgments continues.

##### 1.2.12.2.3 Participant Records Management

A total of 167 items were logged into the LLNL-YMP tracking system. This includes 38 records/records packages that were processed through to the CRF. Four action items were closed.

##### 1.2.12.2.5 Document Control

LLNL received no funding under this WBS. Work performed to complete LLNL's obligation in this WBS is funded under WBS 1.2.12.2.2.

### 1.2.13 ENVIRONMENT, SAFETY AND HEALTH

#### 1.2.13.1 Environment, Safety and Health Coordination and Planning

J. Blink wrote a memo to the Site Manager on November 24 suggesting the use of a logbook as a way to improve the efficiency and record keeping for project vehicles based at the FOC. This logbook would be maintained similarly to those used for aircraft and military vehicles.

J. Blink was appointed as the LLNL-YMP contact for RADCON and was also appointed to the ALARA Committee.

## 1.2.15 SUPPORT SERVICES

### 1.2.15.2 Administrative Support

Comments on the draft 7th Progress Report (PR) for work performed by LLNL during the reporting period of April 1-September 30, 1992 were sent to YMPO on November 23.

### 1.2.15.3 Yucca Mountain Site Characterization Project (YMP) Support for the Training Mission

A total of 22 different self-study assignments were issued and 59 people were trained to these assignments. Currently, there are 62 participants on the project who are to be trained and/or tracked.