Department of Energy
Washington, DC 20585

DEC 23 1992

Mr. Joseph J. Holonich, Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Holonich:

The enclosed Yucca Mountain Site Characterization Project participant monthly status reports are forwarded for your information. If you have any questions on the enclosed reports, please contact Priscilla Bunton at (202) 586-8365.

Linda J. Desell, Chief
Regulatory Integration Branch
Office of Civilian Radioactive
Waste Management

Enclosures:
(1) EG&G/Energy Measurements Progress Report, October 1992
(2) Lawrence Livermore National Laboratory Yucca Mountain Project Status Report, October 1992
(3) Los Alamos Monthly Activity Highlights, October 1992
(4) Sandia National Laboratories Monthly Highlights and Status Report, October 1992

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NH03.1/1
WM-11

cc:w/o encl.
C. Gertz, YMPO
cc: w/encl.
K. Hooks, NRC
R. Loux, State of Nevada
T. J. Hickey, Nevada Legislative Commission
M. Baughman, Lincoln County, NV
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P. Niedzielski-Eichner, Nye County, NV
G. Derby, Lander County, NV
P. Goicoechea, Eureka, NV
C. Schank, Churchill County, NV
F. Mariani, White Pine County, NV
V. Poe, Mineral County, NV
E. Wright, Lincoln County, NV
J. Pitts, Lincoln County, NV
R. Williams, Lander County, NV
J. Hayes, Esmeralda County, NV
B. Mettam, Inyo County, CA

EG&G ENERGY MEASUREMENTS
Santa Barbara Operations
EG&G ENERGY MEASUREMENTS, INC., 101 CONVENTION CENTER DRIVE, LAS VEGAS, NEVADA 89109 TEL: (702)794-7463

November 10, 1992
LV92-RAG-019
WBS 1.2.13.4
NQA

Wendy Dixon, Director
Project and Operations Control Division
Yucca Mountain Project Office
DOE Field Office, Nevada
P. O. Box 98518
Las Vegas, NV 89193-8518

PROGRESS REPORT - OCTOBER 1992

Attached is the October 1992 progress report on biological studies and support activities conducted by EG&G/EM for the Yucca Mountain Project. Please contact me (293-7762) or Kent Ostler (794-7474) if you have questions regarding this report.

EG&G Energy Measurements, Inc.

for Thomas P. O'Farrell, Manager
Environmental Studies Project
611 Avenue H
Boulder City, NV 89005

rag

Enclosure

cc: G. Ryder, DOE/YMP
D. Sorensen, SAIC
P. Niles, SAIC

DIVISION DIXON
cc: LORI/Dyer
cc: Schuck/Ryder
cc: McCann-SAIC
cc: Brodsky/B. Jones
cc: Gandi
cc: Hamilton-Ray
cc: Simmons
cc: GeoA-O/O

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11/13/92

ENCLOSURE 1

YUCCA MOUNTAIN PROJECT
BIOLOGICAL RESOURCES PROGRAM
MONTHLY PROGRESS REPORT
OCTOBER 1992

Summary of Work Accomplished During Report Period

EG&G Energy Measurements (EG&G/EM) conducted work for the Biological Resources task (WBS 1.2.13.4) for the Project Office. Activities included conducting preactivity surveys; continuing site characterization effects studies, support studies for the radiological monitoring program, desert tortoise studies, and habitat reclamation studies; development of work instructions and study designs for new studies; and responding to requests for biological support by Project Office.

Monitoring and Mitigation

- EG&G/EM conducted preactivity surveys during October for:

  1) Bare Mountain trenches (#92-024b).
  2) Booster pump station for 8" water line from J-13 well to the North Portal area (#92-015b).
  3) Access road to the explosives and cap storage pads (#92-015b).
  4) Infiltration tests at borehole UE-25 UZN-85 (#92-030b).
  5) Borehole N-62 (#92-018b).
  6) NRG-2 (#93-002b).
  7) Shelter at tracer well #3

- Reclamation inventories were completed for:

  1) Access road to the explosives and cap storage pads (#92-015b).
  2) Booster pump station for 8" water line from J-13 well to the North Portal area (#92-015b).
  3) Trench MWV-T7 (#93-001b).
  4) Bare Mountain trenches (#92-024b).

- Preactivity survey reports were submitted to Project Office for:

  1) Borrow pit No. 1 (#92-023b).
  2) Trench MWV-T7 (#93-001b).
  3) Access road to the explosives and cap storage pads (#92-015b).
  4) Radiological Environmental Monitoring Station NF104 (#92-006b).
  5) Bare Mountain trenches (#92-024b).

- Site-specific reclamation stipulations were submitted to Project Office for:

  1) Borrow pit No. 1 (#92-023b).
  2) Trench MWV-T7 (#93-001b).
  3) Explosives and cap storage pads and access road (#92-015b).
  4) Bare Mountain trenches (#92-024b).

- Two tortoises residing within the proposed boundaries for the drill pad for NRG-6 (#92-019b) were displaced to areas adjacent to the construction area.

- Resurveys were conducted for neutron borehole N-35 (#92-018b), NRG-6 (#92-000b), and trench MWV-T7 (#93-001b). Tortoises near NRG-6 and trench MWV-T7 were monitored during construction.

- A verbal request was received from Project Office (G. Ryder) to determine whether a preactivity survey was needed for capping wells 48 and 49 near the LM-300 drill rig. The wells are 15-25 meters from the road. Because access would be by foot with no surface disturbance, no survey was required and verbal approval was given for casual access.

- EG&G/EM (S. Blomquist, J. Angerer, and A. Hughes) met with Project Office (G. Ryder), SAIC (T. Pysto), and DRI (T. Hartwell) to discuss survey needed in the next several months and problems and solutions concerning the YMP preactivity survey process. Problems discussed included speeding time-sensitive survey requests, receiving illegible maps with survey requests, incomplete descriptions of proposed actions, inadequately marked activity sites, and changes in construction activity schedules without notifying EG&G/EM (this affects tortoise monitoring schedules). Solutions were proposed for each of these problems.

Habitat Reclamation

- Plant cover and density and seedling density were measured on 27 plots to monitor natural plant succession on previously disturbed sites. This task is completed for this calendar year.

- Topsoil stockpiles in Midway Valley were stabilized with a soil sealant.

- Seedling density was measured on the Forty-Mile Wash reclamation trial plots and the Trench 14 topsoil stockpile to monitor seedling survival.

- Soil samples were collected at Well JF-3; Trench A'; and reclamation sites 1, 2, 4, and 5. These samples will be sent to a laboratory for analysis.

Site Characterization Effects Program

- Perennial shrub density was measured on 16 ecological study plots (ESPs). This task has been completed for calendar year 1992.

- Traffic counts were recorded each week at 12 locations except for the last week when three counters were not working. These counters were sent for repairs. Eight of the counters were rotated to different locations each week. Four counters are left at permanent locations. Fugitive dust samples were collected from the 48 ESPs and weighed. The previous months dust samples were weighed.

- Soil moisture and temperature and weather data were collected once at the 48 ESPs.

Radiological Monitoring Program

- Small mammal specimens were collected from seven radiological monitoring locations. Specimens of both Merriam's kangaroo rat and long-tailed pocket mice were collected from all plots except FF58 where only kangaroo rats were collected. The seven locations included new sites near the proposed south portal site and the existing north portal facility. These locations replace the former NF5 and NF14 locations. EG&G/EM also was notified by the SAIC radiological monitoring group that NF2 was no longer needed. This location is above the original ESF site in Drill Hole Wash. These changes were made because of the selection of Alternative 30 for the ESF.

- Gambel's quail were trapped and collected for the Radiological Monitoring Program. Three were collected for the analysis of radionuclide body burdens. All quail were captured near the subdock in Drill Hole Wash. No quail were captured in Forty-Mile Wash. Fifty-three quail were marked only with legbands, and nineteen were fitted with radio transmitters and legbands to estimate movements, survival, and monitor reproductive success. Three quail fitted with transmitters were killed by predators within 24 hours of their capture and release. The transmitters were recovered and placed on new captures. When trapping was stopped, sixteen quail had working radio transmitters. These birds were located once each week.

- One road-killed jackrabbit was collected near Yucca Mountain for the Radiological Monitoring Program. One jackrabbit now has been collected in each of Crater Flats, near Yucca Mountain, and in Forty-Mile Wash. These opportunistic collections were made at the request of the SAIC radiological monitoring group.

Desert Tortoise Program

- Most of the radiomarked tortoises were located twice each week. The tortoises scheduled to be located weekly or biweekly were located. Six new tortoises were found and marked with radio transmitters. Eleven were marked only with numbers. Four tortoises that were found could not be marked because they were in burrows. Three tortoises previously radiomarked that could not be located were found. These tortoises had either lost their radio transmitters or had a dead transmitter. New transmitters were attached to all three.

- Raven surveys were conducted for five days on the control area northwest of Crater Flats and at Yucca Mountain.

- Tortoise # 423 (relocated from Midway Valley) was located 2-3 times each week. It has remained in an area approximately 2.4 km east of its original release site for the last eleven weeks. Because this tortoise has remained in the area for nearly three months, information on this tortoise will not be included in future reports unless something new occurs.

- At the end of October 62 of the 63 eggs in the tortoise nests being monitored had hatched. The other egg is presumed to be nonviable. One of the hatchlings was deformed and was found dead in the nest. Thirty-three live hatchlings were found and 30 of these were radiomarked. At the end of the month, five of these were still alive and eight were missing. The remaining 17 had died. Causes of death could not be confirmed in most cases.

- The annual effort to weigh, measure, and replace transmitters on radiomarked tortoises was completed.

- Additional searches for tortoises were conducted near the proposed borrow pit east of Fran Ridge to locate additional animals which may be affected by the activity. Three tortoises were found. One of these was previously marked and was fitted with a transmitter. The second was new and was marked and fitted with a transmitter. The third was unmarked but could not be removed from its burrow. Four more tortoises, all relatively small, were found in the area by other contractors and were fitted with radio transmitters.

Support Items

- The September monthly report of Yucca Mountain Site Characterization Project activities and accomplishments was sent to the Project Office. Weekly reports of activities also were submitted to Project Office and SAIC.

- An assessment was conducted of the EG&G/EM Quality Assurance Program related to YMP activities.

- Work continued on scopes of work and budgets for fiscal year 1993.

Lawrence Livermore National Laboratory

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LLYMP9211028
November 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 - October 1992
SCP: N/A

Attached is the October 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,

John Podobnik for W. L. Clarke

W. L. Clarke
LLNL Technical Project Officer
for YMP

WC/EC

cc:
Distribution

DIVISION: Gertz
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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.

ENCLOSURE 2

LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT
OCTOBER 1992 TECHNICAL HIGHLIGHTS AND STATUS REPORT
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LAWRENCE LIVERMORE NATIONAL LABORATORY
(LLNL)
YUCCA MOUNTAIN PROJECT (YMP) STATUS REPORT

OCTOBER 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).** The preliminary results of initial EQ3/6 runs to consider precipitation and dissolution effects on pore and fracture properties are being used to evaluate the effects of mineral recrystallization on pore properties in regions dominated by slow fluid movement.

2) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** Hydrothermal calculations have been extended to include heat and fluid flow in the saturated zone (SZ) rather than treating the water table as an isothermal boundary. For a wide range of areal power densities, SZ conduction dominates convection, causing heating and fluid flow (convection cells) in the SZ. The convection cells are large, they extend radially more than 10 km from the repository, they form in about 1000 years, they last for many tens of thousands of years, and they have flow rates that are much larger than the ambient flow of the SZ.

3) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** Hydrothermal calculations of the heat and fluid flow in the saturated zone (SZ) due to the radioactive waste heat have geochemical consequences in the SZ due to increased temperatures and flow rates. Scoping calculations of these impacts are underway, including the possibility of simulating them in LLNL's Large Block Tests.

4) **1.2.2.2.4 (Engineered Barrier System (EBS) Field Tests).** LLNL testing is being modified in response to the proposed Accelerated-ESF schedule. Two tests will be required in the north ramp and two additional tests will be required on the Main Test Level to provide the data needed for the Site Suitability determination and the License Application.

5) **1.2.2.3.1.1 (Waste Form Testing - Spent Fuel).** Flow-through testing with oxidized ($UO_{2.4}$) and unoxidized (UO_2) spent fuel particles ~1mm in size indicates that the oxidized specimen dissolution rates of both uranium and cesium are about twice as fast. The oxidized specimen dissolution rate of technetium was initially eight times as fast, decreasing to about twice as fast after 35 days. The higher ratios are attributed to increased access to the grain boundary surfaces of the outermost few layers of grains; the remaining layers apparently were not opened by the prior oxidation.

6) **1.2.5.4.2 (Waste Package Performance Assessment).** 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.

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

This WBS element has not been funded in FY93.

1.2.2 WASTE PACKAGE

1.2.2.1 Waste Package Coordination and Planning

H. Benton, R. Fish and D. Stahl (M&O) and D. Harrison (YMPO) visited LLNL on October 8 to discuss budgets and workscopes for FY93.

W. Clarke, D. Wilder, W. Halsey, T. Buscheck and J. Blink participated in the Thermal Workshop meeting held in Las Vegas on October 13. This meeting was hosted by the M&O to focus on FY93 activities to develop a technical basis for an early ACD decision on thermal load.

1.2.2.2 Waste Package Environment

1.2.2.2.1 Chemical and Mineralogical Properties of the Waste Package Environment

Initial runs with EQ3/6 to consider precipitation and dissolution effects on pore and fracture properties continued. The preliminary results are being used to evaluate the effects of mineral recrystallization on pore properties in regions dominated by slow fluid movement.

Efforts continued to refine the coupling of fluid-rock interaction with hydrological properties. Emphasis has been on identifying problems with the numerical interpolation techniques used to smooth data between different time slices. Also, the compilation of the reaction kinetics models that may be used to refine the knowledge of the distribution of equilibrium domains was initiated.

W. Glassley participated in the close-out workshop of the Alligator Rivers Natural Analogue Project and the CEC Natural Analogue Working Group meeting held in Toledo, Spain on October 5-9.

W. Glassley visited Dynamic Graphics, Inc. to discuss the use of their software package for three dimensional representation of geochemical processes in the waste package environment.

B. Viani participated in the Geochemistry Integration Team teleconference on October 13. Discussion and planning continued for the May 1993 Colloid Workshop.

A paper by K. Ragnarsdottir (Bristol University) entitled "Dissolution Kinetics of Heulandite at pH 2-12 and 25°C" was sent to YMPO on October 20. This paper will be submitted to Geochimica Cosmochimica Acta.

1.2.2.2.2 Hydrologic Properties of the Waste Package Environment

The first draft of a revised Study Plan for Near Field Environment Hydrology is about 80% completed.

Model Calculations

LLNL staff continued to analyze the preliminary scoping calculations of the hydrothermal performance of the repository, using the RIB Version 4 thermal conductivity data and using the new LLNL model which represents hydrothermal flow in the upper 1000 m of the saturated zone (SZ) as well as within the unsaturated zone (UZ). The focus has been on the impact of hydrothermal flow in the SZ on hydrothermal flow in the UZ. Whether one chooses to treat the water table as a constant temperature boundary or to model the SZ as part of a UZ-SZ hydrothermal system has a very pronounced impact on the long-term hydrothermal performance of the repository, affecting the duration of boiling at the repository by a factor of two. The rationale for treating the water table as a constant temperature heat sink is that natural convection in the SZ presumably transports heat away from the UZ-SZ boundary (i. e. the water table) as fast as it reaches this boundary. It was decided to investigate the impact of convection on heat flow in the SZ for a wide range of Areal Power Densities (APD) and it was found (as it had been for the UZ) that heat flow is dominated by heat conduction. Because convection does not carry away heat from the UZ-SZ boundary as fast as it reaches this boundary, it is necessary to include hydrothermal flow in the SZ in modeling the long-term hydrothermal performance of UZ and the repository.

Although heat convection does not dominate SZ heat flow, SZ heat flow appears to dominate SZ fluid flow after approximately 1000 years. This dominant influence of repository-heat-driven flow was found to occur for all APDs investigated, 20 to 114 kW/acre for 30 year old and 60 year old fuel. As the SZ temperatures below the repository rise, the accompanying decrease in mass density results in a significant upward component of flow (on the order of meters per year) from considerable depth, generating buoyancy-driven convection cells. Flow in the upper SZ region of the innermost convection cell underlying the repository is radially away from the repository center. At a radial distance of approximately 2 to 3 km from the repository center, the direction of flow in this innermost convection cell is downward to considerable depth. Because the matrix permeability of the SZ is presumably quite small, these large-scale buoyancy-driven convection cells require large-scale connectivity within the fracture system. The connectivity (and bulk hydraulic permeability) of the fracture system in the SZ will be determined through the analysis of multiple well, multiple level pump tests.

Repository-heat-driven convection cells in the SZ require tens of thousands of years to fully develop. As the thermal pulse from the repository propagates both vertically and radially into the SZ, the region over which repository-heat-driven convection occurs continues to expand during (at least) the first 20,000 years. As this region expands, additional parallel convection cells are added to this system. After 1000 years, two convection cells have developed (in cross-section), extending radially approximately 2 to 3 km from the repository center; after 5000 years, the radial extent of thermally-driven convection is about 5 km (with at least two additional parallel convection cells added to the original cells); after 10,000 years, the radial extent of the convection cells is about 8 to 10 km; after 20,000 years, the radial extent of the convection cells exceeds 10 km from the repository center. Even after 50,000 years, convection cells extend radially more than 10 km away from the repository center with liquid-phase fluxes on the order of 30 cm/yr at a radial distance of 14 km from the repository center. Using the same bulk permeability, k_b, applied in these calculations ($k_b = 2.8 \times 10^{-13} m^2$), and applying a relatively steep hydraulic gradient of $10^{-3} m/m$ results in a horizontal flux of only 8.7 cm/yr. Therefore, it appears that repository-heat-driven flow may dominate SZ flow for tens of thousands of years.

A somewhat surprising observation is that the magnitude and extent of the convection cells is relatively insensitive to APD as long as the same quantity of waste is emplaced. Because it requires on the order of 1000 years for heat to significantly perturb SZ flow, the thermal perturbation is attenuated in time and space before it affects SZ flow. Heat flow below the repository is effectively spherical with the hydrothermal impact in the SZ being relatively insensitive to the radial extent of the heat source (within the range of cases considered). A comparison of two cases with APDs of 57 and 114 kW/acre (30 year old fuel) having the same integral heat indicated negligible differences in the liquid-phase flux and temperature fields in the SZ after 5000 years (the most discernible differences were seen at 1000 years). At 20,000 years, the 114 and 57 kW/acre cases had temperature rises of 21.2 and 19.8°C at 250 m below the water table at the repository centerline, 13.2 ands 13.1°C at 500 m below the water table at the repository centerline, and 12.1 and 10.4°C at the water table about 4 km radially outward from the repository centerline. The final comparison was at slightly different radial distances to coincide with the convection cell geometry. These examples show that both the hydrological and thermal impacts of heat are relatively insensitive to the actual design of the repository and are primarily sensitive to the integral heat (i. e. total mass of spent fuel emplaced in the repository). Therefore, the hydrothermal 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 fuel.

The near field geochemistry group has already begun scoping calculations of geochemical changes brought about by both the temperature rise in the SZ and the movement of water through temperature gradients in the SZ. Because of the relatively steep vertical temperature gradients, the pronounced vertical component of flow in these repository-heat-driven convection cells may result in significant geochemical effects. It may be possible to replicate some of these hydrothermal-geochemical effects in the large block testing program at LLNL.

Laboratory Experiments

The determination of the characteristic curves of the eight disc-type Topopah Spring tuff samples from the U3hg-1 hole at a depth of 1312 feet and of the five Grouse Canyon tuff samples from G-Tunnel (NTS) has been completed. A room temperature constant humidity chamber was used. The measurement of suction potential as a function of water saturation for a complete imbibition and draining cycle at 20°C has been completed. These results will be used, along with the previously determined one-D imbibition rate, to calculate relative permeability of the U3hg-1 borehole rock, and to compare the imbibition in water vapor and in liquid water environments, which were previously observed on the same Grouse Canyon tuff samples.

Work has been started to measure electrical resistivity as a function of moisture content at room temperature. The purpose of the measurement is to generate calibration curves of electrical resistivity of Topopah Spring tuff samples with respect to moisture content so that the laboratory and field determined resistivities can be interpreted in terms of degree of water saturation. Gold electrode were deposited on the flat surfaces of cylindrical disc samples. Two electrical resistance measurements were done on each of the four samples which have different thicknesses. Measurements have been made from a dry state to about 8% pore volume water saturation. The measurements at higher degrees of water saturation will be continued next month. Four samples of the U3hg-1 tuff were also prepared for the electrical resistance measurement.

Model Development & Documentation

J. Nitao completed a prototype version of the NUFT (Nonisothermal Unsaturated Flow and Transport) code which can handle multiphase heat flow. Previous prototype versions of NUFT were isothermal. The new version of NUFT can also handle aqueous phase species transport.

T. Quinn is investigating a proposed modification to the V-TOUGH code. For some of the high APD UZ-SZ model calculations, the performance of V-TOUGH slows down considerably, causing it to use unacceptable amounts of computer time. One possible cause is that when the condensate zone above the boiling zone is at or very close to 100% liquid phase saturation, fluctuations in the gas phase relative permeability between zero and a finite value result in convergence problems. Because two phase flow in randomly oriented, variable-aperture fractures is likely to be highly channelized, it is extremely unlikely that gravity driven condensate drainage will be capable of saturating 100% of the fracture porosity within the two phase, boiling/condensate zone. Therefore, some portion of the fracture porosity in this zone will be gas filled at all times. An additional relative permeability curve option is being added to the subroutine "initpc" which allows the user to specify an irreducible gas phase saturation. The user will be able to specify this feature by choosing either option 9 or 13. These changes are being tested by using input deck, g130rrsi (114 kW/acre, 60 year old fuel) on the LLNL Open Computing Facility.

A directory has been set up on node s70 that contains the current suite of test problems for verifying V-TOUGH. A new test file has been added that tests most of the user options of the V-TOUGH time history option.

As required by the Individual Software Plan ISP-NF-1, a script was set up that will perform a backup of all pertinent V-TOUGH development directories that are currently located on s70:/us/vtough. Currently, the monthly backups are done by manually storing the files on floppy disks. This new feature will automatically perform the monthly backup so that all that will be needed is to load a floppy into the drive. Options are also being investigated to perform periodic backups on all of WBS 1.2.2.2.2 hard disk drives.

Meetings

D. Chesnut presented a talk "Flow and Transport in Geologic Media" to students and faculty of the Department of Applied Science, University of California, Davis, on October 20 at the LLNL branch campus.

1.2.2.2.3 Mechanical Attributes of the Waste Package Environment

Planning continued for the large block test.

1.2.2.2.4 Engineered Barrier System (EBS) Field Tests

The first draft of the Study Plan for Engineered Barrier System Field Tests has been reviewed by an LLNL Technical Information Department (TID) editor.

J. Blink met with N. Elkins and H. Kalia (LANL TCO) to discuss layout of EBS heater Tests in an accelerated ESF. LLNL testing is being modified in response to the proposed Accelerated-ESF schedule. Two tests will be required in the north ramp and two additional tests will be required on the Main Test Level to provide the data needed for the Site Suitability determination and the License Application.

Large Block Test (LBT)

W. Lin, J. Blink (LLNL) and N. Elkins (LANL TCO) evaluated the Fran Ridge test pits and the pavement area on the west flank of Busted Butte on October 6 as potential sites for quarrying blocks for the LBT. The Fran Ridge is much more accessible.

J. Blink met with J. McGoldrick, R. Sunday, and R. Kellner (REECO) in Las Vegas on October 28 to initiate a search for subcontractors who could quarry and finish blocks for the LBT.

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

Based on conversations with the LANL TCO, RSN, and the M&O, LLNL requested that YMPO reallocate LLNL's budget to place $100k in the WBS element.

Preliminary studies in support of TBM procurement and YMPO Assessment Team activities are expected to be requested.

1.2.2.3 Waste Form and Materials Testing

1.2.2.3.1 Waste Form

The responses to the review comments for the Preliminary Waste Form Characterization Report were completed and returned to YMPO on October 8.

1.2.2.3.1.1 Waste Form Testing - Spent Fuel

R. Stout visited PNL on October 24 to discuss FY93 workscope planning and budgeting issues concerning the spent fuel oxidation/drybath testing task with the PNL staff. Workscope planning for the spent fuel dissolution task will be performed in November.

The PNL QA plan for this program is currently being revised to reflect changes in program auditing requirements and software quality assurance requirements. QA training will be conducted in November to update program staff to the new requirements.

Spent Fuel Dissolution

A series of seven experiments has begun at LLNL. Five are at 20% oxygen and 75°C. Two of the five are in the test matrix. The other three from the seven remaining design candidates that were not in the test matrix, are being run because of the availability of the cells, samples and oven. This will provide valuable data with little additional cost. The final two experiments are two long-term UO_2 powder runs similar to those being performed at PNL at 20% oxygen and 25°C; one at pH=8, 0.02 m carbonate and the other includes 0.1M NaCl as well. These runs provide an useful comparison between results at the two laboratories.

A stainless steel system instrumented with oxygen probes has been tested at LLNL, and an experiment at low oxygen concentration has begun.

Flow-through testing with spent fuel specimens at reduced oxygen fugacities continues to progress normally at PNL according to the approved test matrix.

Flow-through testing at PNL with oxidized ($UO_{2.4}$) and unoxidized (UO_2) spent fuel particles ~1mm in size indicates that the dissolution rates of both uranium and cesium are about twice as fast in the oxidized specimens. The difference is attributed to increased access of water to the grain boundaries in the oxidized specimens which increased the effective surface area. The data indicates that the grain boundaries for only the outermost two or three layers of grains are involved. This is a relatively small effect considering the very large increase in effective surface area that would have resulted if oxidation had cracked open the grain boundaries sufficiently to make them all accessible to the water.

Recently, some of the leachate solutions generated in the above tests were analyzed for technetium. Initial technetium dissolution rates were about eight times higher in the oxidized specimens decreasing to about two times higher after 35 days. Longer-time data are not available. Thus, oxidation had a larger effect on technetium than on either cesium or uranium, perhaps because technetium in the grain boundaries was in a more soluble form following oxidation.

Flow-through testing will be initiated at PNL with additional types of air-oxidized spent fuel specimens. This work is described in the approved test plan for this dissolution activity.

A paper by W. Gray (PNL) entitled "Effects of Air Oxidation on the Dissolution Rate of LWR Spent Fuel" was sent to YMPO on October 13. This paper will be presented at the MRS meeting in Boston, MA on November 30-December 4.

Spent Fuel Oxidation

Samples at PNL were transferred from drybath 6 to drybath 5 due to excessive temperature fluctuations in drybath 5. Discussions with the manufacturer indicated the problem may be due to a bad heating element. This is not surprising as the system was originally intended to be used for only two years. The service life of these drybaths has been almost eight years to date. Because the drybaths are located in the hot cell, replacement and/or repair is difficult. The spent fuel in this drybath was transferred to the other drybath and all the drybaths were restarted.

A paper by L. Thomas (PNL) entitled "Effects of Fission Products on Air-Oxidation of LWR Spent Fuel" was sent to YMPO on October 22. This paper will be submitted to the Journal of Nuclear Materials.

Activity Plan D-20-44, Rev. 1, "Thermogravimetric Analysis for Spent Fuel Oxidation Testing" and Activity Plan D-20-45, Rev. 1, "Low-Temperature Oven Method for Spent Fuel Oxidation Testing" were completed and distributed.

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 344 weeks. The N3 tests (ATM-10, a West Valley actinide-doped glass) continue and have been in progress for 262 weeks.

The Scientific Investigation Plan, SIP-WF-02, Rev. 0, "YMP Glass Waste Form Testing" was transmitted to YMPO for approval.

1.2.2.3.2 Metal Barriers

No significant activities.

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 for the diffusion experiments using single crystals of clinoptilolite continued.

Development of the alpha track autoradiography technique continued.

Interactions of Actinide-bearing Solutions with Rock Core Samples

The core was removed from the core flow-through apparatus. Examination of the jacket and seals surrounding the core indicated that the synthetic oil used to apply the confining pressure to the core had reacted with the epoxy sealer.

Preparation of a new sample for the flow-through apparatus was initiated. To simulate a fractured sample, a cylindrical core of Topopah Spring tuff was taken and then sawed in half longitudinally. The core was oven dried to a constant weight and then immersed in filtered (0.2 μm) deionized water for hydration prior to the flow tests.

The saw-cut face of as-cut, rinsed in deionized water, and ultrasonically cleaned samples of tuff were examined under the Scanning Electron Microscope (SEM) to look for fine particles that could be mobilized in flow experiments. The as-cut and rinsed samples showed significantly more fine (~ 1 μm) particles than did the sample that had been ultrasonically cleaned. The cut face of the core will be ultrasonically cleaned to minimize colloid mobilization in subsequent flow tests.

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

A copy of D. Ruffner's files was provided to the M&O. The thermal calculations performed by G. Johnson and E. Platt have been archived in the LLNL computer

center. They will be p~ated and provided to the M&C~ These activities will complete the transition of WBS 1.2.2.4 to the M&O.

1.2.3 SITE INVESTIGATIONS

1.2.3.1 Site Investigations Coordination and Planning

This WBS element has not been funded in FY93. J. Blink attended part of the Surface Based Testing priorization meeting in Las Vegas on October 28.

1.2.3.2 Geology

1.2.3.2.1.2.1 Natural Analogue of Hydrothermal Systems in Tuff

The responsibility for Study Plan 8.3.1.3.3.1 was transferred from LANL to LLNL. The WBS Dictionary is being changed accordingly.

1.2.3.4 Geochemistry

1.2.3.4.2 Geochemical Modeling

This WBS element maintains and develops the EQ3/6 software package for use in near field environment characterization, site characterization and performance analysis. The most recently released version is Version 7 which is being maintained. Documentation for this version to satisfy the requirements of NUREG-0856 is in the final stages of review and publication. Version 7 is also the subject of a qualification activity independent of the code author. The development of Version 8 has begun.

The geochemical code user manuals entitled "EQPT, A Data File Preprocessor for the EQ3/6 Software Package, User's Guide and Related Documentation, Version 7.0, Part II" and "EQ6, A Computer Program for Reaction Path Modeling of Aqueous Geochemical Systems: Theoretical Manual, User's Guide and Related Documentation, Version 7.0, Part IV" by T. Wolery, and S. Daveler were submitted to YMPO for approval on October 22 and 29th respectively. All four manuals have now been submitted. Part I is now being published.

A draft ISP, "Individual Software Plan for EQ3/6, Version 8 and Subsequent Versions", was completed and is being reviewed for approval. Logs and file folders for Version 8 were prepared in anticipation of the start of actual development.

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, R. Stout, S. Steward, T. Wolery, W. Glassley, T. Buscheck, R. Van Konynenburg, W. Bourcier, C. Palmer, W. Halsey, W. O'Connell, J. Blink (LLNL), R. Einziger, L. Thomas, W. Gray (PNL) and J. Bates (ANL) participated in the NWTRB meeting held in Las Vegas on October 14-15. The main topic was the source term, in particular waste form reactions, geochemical reactions, and how the source term has been used in performance assessments. Presentations were made by R. Van Konynenburg, R. Stout, S. Steward, W. Bourcier, C. Palmer, T. Wolery and W. O'Connell (LLNL); R. Einziger, and W. Gray (PNL) and J. Bates (ANL). A dry run for these presentations was conducted in Las Vegas on September 30-October 1.

D. Wilder participated in the field trip to Yucca Mountain with the NWTRB panel on October 16.

1.2.5.3 Technical Data Management

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

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 SPARCstation 2 (node s60) continued. Completion of this transfer will result in an improved performance for each database and software module of the GEMBOCHS system. Program CNGBOCHS was ported to this new hardware platform this month.

A detailed testing of program D0OUT (on node s33) using the recently restructured GEMBOCHS database has begun. This critical testing activity, which is being carefully documented, requires painstaking comparison of extremely large output files.

A SUPCRT92-only thermodynamic data file (DATA0.sup) was generated for use with EQ3/6. It contains volume and enthalpy of reaction grids in addition to the usual equilibrium constant grids.

A paper by S. Daveler entitled "CNGBOCHS: An Integrated Ingres-Email-Interleaf System for Processing Change Request Associated with the GEMBOCHS Database and EQ3/6" is completing the internal review process and should be ready for submittal to YMPO in November.

Work was performed on PACS network charts and budget summaries for GEMBOCHS activities in FY93 and beyond.

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

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. Early work on geochemical reaction progress by Bruton and Shaw in 1987 was combined with recent determinations of spent fuel and UO_2 surface reaction rates in various water chemistries by Gray et al. at PNL and Steward et al. at LLNL, and with hydrologic estimates of water flux and spent fuel surface wetted. The water flux to surface area ratio is estimated to be of the order of 5 mm/year or perhaps much lower. Even at the lower end of the surface reaction rates, enough uranium is reacted to precipitate most of the silica in the groundwater. Then, the solubility of uranium increases by several orders of magnitude and the surface reaction rate increases at least in some low-silica chemical conditions studied to date. Conclusions at this early stage are:

1) a low water-to-fuel ratio is an important parameter range to be studied in spent fuel reaction measurements, and

2) a high reaction rate under repository conditions is at least plausible now.

The performance allocations assigned at the time of writing the Site Characterization Plan can be revisited based on recent data and performance assessments. The concept of spatial variability in the downward groundwater infiltration, combined with existing estimates of the range of infiltration values to be anticipated, makes it plausible that more than 10% of the waste packages can become "wet", i.e., have some trickling water flow. Mass transfer resistance, e.g., limited diffusion, was also assigned a role in the performance allocation, as a multiplicative factor to reduce any release rate. It is now known that the effect of diffusion combines with other processes as a time convolution rather than a multiplicative factor. Hence, diffusion is less effective in some geometric designs, although diffusion could become a controlling factor for other designs. The spent fuel alteration rate could be much higher than allocated, as discussed in the preceding paragraph. On the favorable side, hydrologic considerations indicate that only a small fraction of the spent fuel within a breached container could be wetted by the limited amount of water available. Cladding could also play a major role. The hot dry repository design concept could also make a major contribution.

1.2.9 PROJECT MANAGEMENT

1.2.9.1 Management and Coordination

W. Clarke, W. Halsey, and D. Wilder participated in the EEI/DOE meeting on multipurpose canisters (MPCs) held in Las Vegas on October 29. This meeting was

held to discuss issues regarding possible use of a MPC for storage/transport/disposal and possible impact on the EBS.

1.2.9.1.2 Technical Project Office Management

C. K. Chou, LLNL Deputy Associate Director for the Fission Energy Systems Safety Program (the parent organization of LLNL-YMP), visited YMPO on October 18-20. He met with C. Gertz and senior managers from YMPO.

W. Clarke and J. Blink attended the TPO meeting in Las Vegas on October 23 and the budget meeting in Las Vegas with C. Gertz on October 21.

W. Clarke and J. Blink attended the Technical Advisory Group meeting in Las Vegas on October 2.

J. Blink attended LESSON-NV committee meetings in Henderson, NV on October 5 and in Las Vegas October 23. He also attended the LLNL LESSON Instructors annual meeting in Livermore on October 22, at which he presented a summary of the first year of LESSON in Nevada.

J. Blink and E. Harle (SAIC) presented a program on energy to eleven 4th and 5th grade classes at Faye Herron School on October 8 and 9, and to three 6th grade classes at the Meadows School in Las Vegas on October 16. Over 400 students participated in the "hands on" activities.

J. Blink presented a program on Nuclear Energy to four 7th and 8th grade science classes at Burkholder School in Henderson, NV on October 20. Over 100 students participated in "hands on" activities.

1.2.9.2 Project Control

1.2.9.2.2 Participant Project Control

The September FTE report and the October Quarterly Worker Data report were sent to YMPO. The September actual schedule progress and costs were submitted to the PACS reporting system via PACS workstation.

The scrub of the Mission 2001 exercise was completed. System errors have been eliminated, costs have been verified and reductions made where possible. Further changes will require a change in project strategy and assumptions as well as budget and schedule.

The September cost plan was prepared.

Year-end close was completed. Total LLNL-YMP costs underran by approximately $139k. At the third level WBS, 1.2.1 experienced an underrun of $39k, 1.2.2 underran $66k, 1.2.5 underran $4k and 1.2.9 underran $30k.

An activity was initiated to establish the FY93 Baseline with a revised budget allocation. It is anticipated that this task will be completed in early November.

Excess equipment was disposed of as authorized by YMPO.

1.2.11 QUALITY ASSURANCE

1.2.11.1 Quality Assurance Coordination and Planning

LLNL-YMP-FY92 Quality Assurance Audit and Surveillance Schedules, Rev. 2, and LLNL-YMP FY93 Quality Assurance Audit and Surveillance Schedules, Rev. 0, were transmitted to YMPO.

D. Wolfe attended the QA Managers Meeting and QARD Comment Resolution meeting in Las Vegas on October 14-15.

1.2.11.2 Quality Assurance Program Development

Work began on the preparation of the transition plan required for implementation of the new QARD (currently undergoing final review and approval by OCRWM). The transition plan will outline changes to simplify and streamline the LLNL-YMP QA program in addition to meeting the QARD requirements. This is in agreement with the recommendation of the 1992 Management Assessment conducted in July. The intent of the changes to the LLNL QA Program will be to:

1) eliminate unnecessary requirements,
2) eliminate redundancy,
3) provide a performance-based approach to QA requirements,
4) implement a "just in time" approach to procedure preparation and review, training and technical activity planning,
5) provide for clean compliance with the QARD requirements for quality-affecting activities, and
6) provide for clear direction concerning non-quality affecting activities.

The following revisions and change notices to QPs and the QAPP were completed and issued:

1) Quality Procedure (QP) Change Notice 2.1-4-2, "Preparation, Approval, & Revision of Procedures, Requirements, Plans, and the Quality Assurance Program Description",
2) QP Change Notice 4.1-2-1, "Preparation of QA Requirements Specifications & Approval of Subcontractor QA Programs",
3) QP 6.0, Rev. 3 "Document Control ",
4) QP 18.0, Rev. 4 "Audits", and
5) Quality Assurance Program Plan 033-YMP-R 18.0, Rev. 1 which was forwarded to YMPO.

1.2.11.3 Quality Assurance Verification

1.2.11.3.1 Quality Assurance Verification - Audits

An amended response for CARs YM-92-064 and -065 from Audit YMP-92-21 was provided to YMPO. The response complied with the Project Office suggestion to extend the investigative action for both to include all instruments listed on the calibration master status list since March 1989. The corrective action completion date has been revised to December 15.

CARs-LLNL-010, -014, and -025 were completed, verified, and transmitted to YMPO.

1.2.11.3.2 Quality Assurance Verification - Surveillance

Support was provided for a YMP surveillance of the LLNL-YMP Grading program that began on September 29. Corrective actions to CARs YM-92-048 and YM-92-049 were verified during surveillance and closed by YMPO on October 9.

Surveillance Report S92-14 "Procurement" was issued on October 13.

Surveillance S93-01 was performed 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".

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

Eight technical documents were reviewed and approved by QA.

QA acts as Publications Manager for controlled documents. Assistance was provided for preparation of eleven Grading Reports. Two grading reports are currently undergoing review and approval. They are for Version 8 of EQ3/6 and initial qualification of V-Tough activities.

Assistance was provided for two Implementing Software Procedures (ISP):

1) ISP for development of EQ3/6, Version 8 and
2) ISP revision for the initial qualification of EQ3/6, Version 7.

1.2.12.2 Records Management

1.2.12.2.2 Local Records Center Operation (LRC) and 1.2.12.2.3 Participant Records Management

A total of 192 items were logged into the LLNL-YMP tracking system. This includes 31 records/records packages that were processed through to the CRF. Sixteen action items were closed.

All 1989 and 1990 microfilm numbers have been added to the records database. Work continues in this area on 1991 and 1992 records.

Work on backlog continues.

1.2.12.2.5 Document Control

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

1.2.13 ENVIRONMENT, SAFETY AND HEALTH

1.2.13.1 Environment, Safety and Health Coordination and Planning

This WBS element has not been funded in FY93.

1.2.15 SUPPORT SERVICES

1.2.15.2 Administrative Support

Input to the 7th Progress Report (PR) for work performed by LLNL for the reporting period of April 1-September 30, 1992 was sent to YMPO on October 8.

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

Eight self-study assignments were issued and fourteen people were trained to these assignments. Currently, there are sixty-six individuals on the project who are to be trained and/or tracked.

Technical Area Leaders reviewed the Technical Implementing Procedures (TIPs) and Quality Procedure training requirement lists and signed Management Recertification forms for all individuals.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545 NOV 20 AM 11 '00

WBS 1.2.9.1
QA N/A

I-334471 4

DIVISION: Gertz
CC: Dyer
CC: Arnold
CC: Lamb
CC: Brodsky
CC: Jones, S.
CC: Blanchard
CC: Dixon
CC: _____

REC'D IN YMP 11/23/92

November 17, 1992

TWS-EES-13-11-92-029

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

Dear Mr. Gertz:

SUBJECT: HIGHLIGHTS OF THE LOS ALAMOS MONTHLY ACTIVITY REPORT—OCTOBER 1992

Attached are the highlights of the Los Alamos Monthly Activity Report for October 1992. This internal document describes our technical work; however, the report has not received formal technical or policy review by Los Alamos or the Yucca Mountain Site Characterization Project. Data presented in this document represent work progress, are not referenceable, and are not intended for release from the US Department of Energy. If you have changes to our distribution list, please call me at (505) 667-0916.

Sincerely,

Susan H. Klein

Susan H. Klein

SHK/ajs

Attachment: a/s

Cy w/att:
M. B. Blanchard, YMPO, Las Vegas, NV
T. E. Blejwas, SNL, Albuquerque, NM
J. A. Canepa, EES-13, MS J521
W. L. Clarke, LLNL, Livermore, CA
W. R. Dixon, YMPO, Las Vegas, NV
J. R. Dyer, YMPO, Las Vegas, NV
N. Z. Elkins, EES-13/LV, MS J900/527
L. D. Foust, CRWMS, M&O/TRW, Las Vegas, NV
L. R. Hayes, USGS, Denver, CO
V. F. Iorii, YMPO, Las Vegas, NV
M. Martin, M&O/TRW, Las Vegas, NV
A. R. Pratt, EES-13, MS J521
E. P. Springer, EES-13, MS J521
M. Voegele, SAIC, Las Vegas, NV
RPC File (2), MS M321
TWS-EES-13-File, MS J521

Cy w/o att.:
CRM-4, MS A150

ENCLOSURE 3

Los Alamos Highlights
October 1992

WBS 1.2.3.1.2 Test Management and Integration. Staff began developing information for tests to be performed in north-ramp portal area and preparing planning packages for launch chamber tests.

WBS 1.2.3.2.1.1.1 Mineralogy, Petrology, and Rock Chemistry of Transport Pathways. Instrumental neutron activation analyses were obtained for fracture calcites from USW G-1 and G-4. These data will be used to broaden the study of fracture calcites beyond cores USW G-2 and GU3/G3. Data obtained from spring-deposited calcites of Death Valley (Travertine Point, Grapevine Spring, and Nevares Spring) will be used to compare these spring compositions with those from Yucca Mountain.

WBS 1.2.3.2.1.1.2 Mineralogical and Geochemical Alteration. D. Vaniman evaluated the INAA results for outcrop and plant ash samples. The sample set included a variety of rock and secondary-mineral samples from Trench 14, Busted Butte, and the Calico Hills, as well as from low-temperature ashen roots of plants from near Trench 14 and from piñon-juniper woodlands. Additional text and a glossary were prepared for a YMP position paper on calcite-silica deposits; staff reviewed a new draft of the paper.

WBS 1.2.3.2.5 Postclosure Tectonics. The Lathrop Wells volcanic center was renamed the Cind-R-Lite volcanic center. (The former name was derived from the proximity of the center to the town of Lathrop Wells, which has been renamed Amargosa Valley. Cind-R-Lite volcanic center is the name of the company that has had a patented and operational claim on the center since 1940.)

Documentation on statistical procedures used for estimating the probability of magmatic disruption of a repository were submitted to DOE for forwarding to the NRC. The procedures use modules of SYSTAT to evaluate the spatial variability of the location of basaltic volcanic centers in large high-cone density volcanic fields.

Four trenches at the Cind-R-Lite center were deepened. Following examination of the trenches, staff revised their stratigraphic descriptions of the Cind-R-Lite center, and these descriptions are now consistent with most previously obtained geochronology data. As a result of these revisions, questions about the anomalously young TL age for the Ql3 lava have been resolved.

WBS 1.2.3.3.1.2.2 Water-Movement Tracer Tests. The University of Rochester and Lawrence Livermore National Laboratory returned results of chlorine-36 analysis of 20 samples from the neutron-access boreholes USW UZ N-37, N-54, and N-55. Analysis of 10 additional samples are expected next month. Staff made the following observations concerning the latest set of analyses: (1) Rochester and Livermore analyses, performed on four identical samples, agreed within one standard deviation. (2) The unusually high chlorine-36 results obtained previously from the Paintbrush nonwelded unit in N-55 was shown to be reproducible. (3) A profile of chlorine-36 in the N-37 alluvium showed bomb-pulse levels down to 20 feet, with background levels below that depth. (The alluvium here extends to 36.5 feet.)

WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-water Flow System (Reactive Tracer Testing). Z. Dash and B. Robinson are continuing to serve as temporary software configuration manager and CCB chair, respectively. Two publications were prepared for the special issue on the Yucca Mountain Project of the journal, *Radioactive Waste Management and the Nuclear Fuel Cycle*. W. L. Polzer and E. H. Essington submitted a paper, "The Use of Selectivity Coefficients to Estimate Modified Langmuir Isotherm Parameters as a Function of Experimental

Conditions." B. A. Robinson will submit a paper, "A Strategy for Validating a Conceptual Model for Radionuclide Migration in the Saturated Zone Beneath Yucca Mountain."

WBS 1.2.3.4.1.2.1 Batch Sorption Studies. In response to a 1987 NRC position paper request for experiments to determine whether batch sorption coefficients (obtained using crushed tuff) could accurately model radionuclide sorption behavior along release pathways, staff conducted experiments and prepared a report ("Dependence of Radionuclide Sorption on Sample Grinding, Surface Area, and Water Composition" by P. S. Z. Rogers). The major conclusions were (1) Particle grinding does not influence the sorption behavior of the tuff samples studies until the particle size becomes smaller than about 40 μm. (2) Previous batch sorption experiments using particle size ranging from 63–500 μm or 75–500 μm are experimentally ideal as they provide an optimum compromise between sampling error caused by too large a grain size and creation of active surface area and mineral fractionations caused by excessive grinding. (3) There should be no experimental artifacts caused by sample grinding in previous work as long as the experimental samples were washed after preparation. (4) The BET surface areas of the tuff samples studied are independent of the particle grinding size. (5) Neptunium sorption onto tuff is very limited.

WBS 1.2.3.4.1.2.3 Sorption Models. Atomic force microscopy images of goethite were interpreted using known structural and crystallographic properties. Our long term goal is to perform a series of experiments to determine the sorption site density of hematite and goethite for radionuclides and observe how it is changed by the reaction of the mineral surface with ground-water. This information is a necessary input parameter for most sorption models.

WBS 1.2.3.4.1.3 Radionuclide Retardation by Precipitation Processes. The neptunium (Np) undersaturation experiment at pH 7 was analyzed for solution species by absorption spectrophotometry; staff found that approximately 36% of the total soluble Np was complexed by carbonate, and 64% existed as NpO_2^+.

After completing the spectral analysis, the pH 7 undersaturation experiment was stopped because the Np concentration had remained stable for approximately 80 days.

Four of the six solids obtained in the plutonium oversaturation experiments were examined by x–ray diffraction. The only sample that gave a diffraction pattern was the washed solid from pH 8.5, indicating that the solids formed at pH 6 and 7 are amorphous. This was also the case in the 25°C experiments in UE-25p #1 water.

In the Am/Nd oversaturation experiments, four of six solid samples were also examined by x-ray diffraction; a diffraction pattern was observed only on the pH 7 sample.

WBS 1.2.3.4.1.4 Radionuclide Retardation by Dispersive, Diffusive, and Advective Process. Neptunium (Np) is highly soluble in Yucca Mountain ground-water, and nuclear reactors produce ^{237}Np, which has a half-life of 2.14×10^6 years. Consequently, the transport of ^{237}Np through tuff is of major importance in assessing the performance of a potential high-level nuclear waste repository at Yucca Mountain. The objective of this work is to determine how Np retardation is influenced by minerals in Yucca Mountain tuff as a function of ground-water chemistry (elemental composition, pH, and Eh).

Batch sorption experiments on Np were completed. Staff observed that Np sorption is measurable in tuffs and pure minerals and increases rapidly with increasing pH for minerals that sorb actinides by surface complexation. The dependence of Np sorption on pH can be observed in the sorption behavior of Tuff G4-275 in the presence of minerals such as quartz and hematite, which sorb by surface complexation.

Staff concluded that oxides (such as hematite), which exist as trace minerals in Yucca Mountain tuffs, may provide a significant amount of Np retardation because of their high Np sorption coefficients. The large number of silicates in Yucca Mountain tuff may also provide significant Np retardation because of their sorption properties. Additional information may be found in the detailed Los Alamos November Monthly Report.

WBS 1.2.3.4.1.5.1 Retardation Sensitivity Analysis. Staff met with J. Fabryka-Martin to discuss Cl-36 transport in Yucca Mountain.

FEHMN. Work continued on mesh generation for an unstructured mesh of the repository region. Surface features are included as well. Work on the three degree-of-freedom double porosity/double permeability model continued. Verification runs with TRACRN and other codes continued using 3-d flow and transport examples and the Jornada trench problem.

WBS 1.2.5.4.6 Development and Validation of Flow and Transport Models. In preparation for installation of the lower-boundary device, the caisson was filled with sand and the sand was compacted.

WBS 1.2.6 Exploratory Studies Facility. Staff continued to gather information on the use of tracers, fluids, and materials (TFM) used at Yucca Mountain with emphasis on FY93 ESF-related activities. Staff developed new set of milestones to facilitate start of north ramp construction.

WBS 1.2.9.1.2 Technical Project Office Management. Los Alamos management staff toured YM with the Director of Los Alamos National Laboratory (LANL) and the LANL Associate Director for Energy and the Environment.

Management staff presented FY92 accomplishments, FY93 planned accomplishments, and budget impact to the YMP Program Manager and key staff.

Sandia National Laboratories
Albuquerque, New Mexico 87185

I-33462

NOV 30 3 20 PM '92

WBS: 1.2.9
QA: NA

NOV 25 1992

Carl P. Gertz, Project Manager
Yucca Mountain Site Characterization
Project Office
U. S. Department of Energy
Nevada Operations Office
101 Convention Center Drive
Phase 2, Suite 200
Las Vegas, Nevada 89193-8518

Attention: V. F. Iorii

Subject: October 1992 Monthly Highlights and Status Report

Dear Carl:

Enclosed is the Monthly Highlights and Status Report for the month of October, 1992. Please note that work was conducted and reported for the month of October in the Work Breakdown Structure (WBS) elements on the attached list, yet budget was not received in these elments for FY93.

Pending the results of the FY93 baseline, any subsequent work (previously performed under these elements) will be reported under the appropriate element for the scope and work defined in the SNL baseline. If you have any questions, please call Alice Hotchkiss at FTS 844-7515. Thank you.

Sincerely,

John T. Holmes for

L. E. Shephard, Manager
YMP Management Department 6302

AH:6318:pe
Attachment

DIVISION: Gertz
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CC: List (YMP)
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11/30/92

ENCLOSURE 4

WBS ELEMENT	DESCRIPTION
1.2.1.6	Configuration Management
1.2.3.2.8.3	Ground Motion from Regional Earthquakes and Underground Nuclear Explosions
1.2.3.6.2.1	Future Regional Climate and Environments
1.2.14.3	Communications and Liaison

Copy to:

YMPO	J. M. Boak
YMPO	U. Clanton
YMPO	J. R. Dyer
YMPO	D. Harrison
YMPO	V. F. Iorii
YMPO	E. H. Pietrie
YMPO	W. B. Simecka
NRC	P. T. Prestholt
M&O/TRW	M. Martin
SAIC	M. Brodeur
SAIC	P. L. Osborne
TRW	J. Bodnar (2)
TRW	E. M. Fortsch (2)
TRW	R. K. St. Clair (2)
USGS	L. R. Hayes
ORNL	R. B. Pope
CCS	S. O'Connor
6115	P. Davis
6300	D. E Miller
6302	T. E. Blejwas
6302	J. T. Holmes
6302	Library
6312	F. W. Bingham
6313	L. S. Costin
6318	S. E. Sharpton
6318	F. Cheek-Martin
6319	R. R. Richards
6351	D. Thompson
6318	YMP CRF
6318	31/12911/MGMT/1.3/NQ

Sandia National Laboratories

YUCCA MOUNTAIN

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

Monthly Status Report

October 1992

DISCLAIMER

Quality assurance checks on data contained in this report have been performed only to determine that the data have been obtained and documented properly. The SNL Project Department 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. Milestones have not been baselined and are included only to show status.

Sandia National Laboratories

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

Monthly Status Report

October 1992

Sections At-A-Glance

WBS Elements Without Reportable Activity This Period

1.2.1.1	Systems Engineering Coordination and Planning
1.2.2.4.3	Container/WP Interface Analysis
1.2.4.2.1.1.4	In Situ Design Verification
1.2.4.2.2	Equipment and Instrumentation Development
1.2.4.6.2	Sealing Testing
1.2.5.5	Special Projects
1.2.6.1.1	ESF Coordination, Planning and Technical Assessment

Highlights

SNL staff initiates a new geostatistical simulation effort to support performance assessment calculations. Several realizations covering the entire repository block are generated as part of the development process.

See ***1.2.3.2.2.2.2 Three-Dimensional Rock Characteristics Models*** page 4

SNL's primary thermomechanical finite-element code receives quality assurance certification.

See ***1.2.4.2.3.1 Certification of Design Methods*** on page 13

SNL staff performs structural calculations, using the compliant joint model option of the finite-element code, on thermal results of the repository thermal management systems study.

See ***1.2.4.2.3.2 Design Analysis*** on page 14

SNL staff constructs the first primary and secondary wetting and drainage curves for a fracture/matrix system from wetted structure data.

See ***1.2.5.4.6 Development and Validation of Flow and Transport Codes*** on page 21

SNL calculations estimating effects on repository performance of surficial water use in the controlled zone outside the repository complete technical review.

See ***1.2.5.4.7 Support Calculations for Postclosure Performance Analyses*** on page 23

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TABLE OF CONTENTS, Continued

EXECUTIVE SUMMARY
OCTOBER 1992

WBS 1.2.3.2.2.2.2 Three-Dimensional Rock Characteristics Models

- A new geostatistical simulation effort has been initiated to support various performance assessment calculations. These simulations use indicator techniques to code major lithologies in drill holes. Descriptions of spatial continuity are developed based on the lithologic indicators, and stochastic images of stratigraphy are then produced.

WBS 1.2.4.2.3.1 Certification of Design Methods

- JAC2D, SNL's primary thermomechanical finite-element code, received quality assurance certification.

WBS 1.2.4.2.3.2 Design Analysis

- Structural processing of the thermal results obtained as part of the SNL support to the M&O's systems study on repository thermal management continued with structural calculations carried out using the compliant joint model option of the finite-element code. A summary of results will be submitted to the 1993 International High-Level Radioactive Waste Management Conference.

WBS 1.2.5.4.6 Development and Validation of Flow and Transport Models

- SNL staff began analysis of experimental data on wetted area structure in horizontal fractures with water entry/exit through the surrounding matrix. For the first time, both primary and secondary wetting and drainage curves for a fracture/matrix system were built from wetted structure data.

WBS 1.2.5.4.7 Support Calculations for Postclosure Performance Analyses

- Calculations to estimate the effects on repository performance of surficial water use in the controlled zone outside the repository have completed technical review.

1.2.1 SYSTEMS ENGINEERING

The objective of the Systems Engineering element is to apply the systems engineering discipline to transform the regulatory requirements into functional needs of the MGDS design, system configuration, and site characterization activities. The Systems Engineering element is comprised of five tasks: Systems Engineering Coordination and Planning (1.2.1.1), Program-Level Requirements Document Development (1.2.1.2.1), Project-Level Requirements Documents Development and Maintenance (1.2.1.2.2), Special Studies (1.2.1.5), which includes development of items important to safety/waste isolation, and Configuration Management (1.2.1.6).

1.2.1.2.1 PROGRAM LEVEL REQUIREMENTS DOCUMENT DEVELOPMENT

Status Report on Ongoing Activities

Review comments on the Office of Civilian Radioactive Waste Management (OCRWM) Mined Geologic Disposal Requirements Document (MGDRD) were prepared and submitted.

Major Activities Upcoming Next Three Months

Comment resolution on the MGDRD will be completed.

1.2.1.2.2 PROJECT LEVEL REQUIREMENTS DOCUMENTS DEVELOPMENT AND MAINTENANCE

Status Report on Ongoing Activities

Review comments on the five lower-level requirements documents for the Surface-Based Testing Facilities, Repository Design, Site Design and Test, Exploratory Studies Facility (ESF), and Engineered Barrier Design were prepared and submitted to the Yucca Mountain Project (YMP).

Major Activities Upcoming Next Three Months

Comment resolution on the requirements documents will be completed.

1.2.1.5 SPECIAL STUDIES

Major Accomplishments

SLTR92-0004, "Disturbance Criteria for Items Important to Waste Isolation: A Methodology and an Application to Unconsolidated Surficial Deposits," by F. J. Schelling, Y. K. Behl, and R. C. Kalinski, was completed and provided to the YMP Assessment Team. Draft SAND92-2334, "Preclosure Radiological Safety Evaluation—Exploratory Studies Facility," by F. J. Schelling, J. D. Smith, and K. K. Wahi, is in review. Upon completion, the report will be provided to the Assessment Team.

Major Activities Upcoming Next Three Months

A report on the remaining natural barriers and a compilation of recommendations on the allowable disturbances that may impact natural barrier performance is in preparation for use by the YMP Assessment Team. This report is expected to be completed in December 1992.

1.2.1.6 CONFIGURATION MANAGEMENT

Status Report on Ongoing Activities

Several YMP Change Requests (CRs) were submitted to revise the Work Breakdown Structure (WBS) Dictionary to better reflect Sandia National Laboratories (SNL) activities. Several Affected Document Notices (ADNs) were completed and returned to YMP, as requested.

1.2.3 SITE INVESTIGATIONS

The objective of the Site Investigations element includes work scope related to site data collection and analysis to support site suitability evaluation, design, licensing, performance assessment requirements, and the natural barrier system component of the multiple barrier system described in the physical system. The Site Investigations element is comprised of nine tasks: Site Investigations Coordination and Planning (1.2.3.1), Systematic Acquisition of Site-Specific Subsurface Information (1.2.3.2.2.2.1), Three-Dimensional Rock Characteristics Models (1.2.3.2.2.2.2), Laboratory Thermal Properties (1.2.3.2.7.1.1), Laboratory Thermal Expansion Testing (1.2.3.2.7.1.2), Laboratory Determination of Mechanical Properties of Intact Rock (1.2.3.2.7.1.3), Laboratory Determination of the Mechanical Properties of Fractures (1.2.3.2.7.1.4), Ground Motion from Regional Earthquakes and Underground Nuclear Explosions (1.2.3.2.8.3.3), and Future Regional Climate and Environments (1.2.3.6.2.1.6).

1.2.3.1 SITE INVESTIGATIONS COORDINATION AND PLANNING

Major Accomplishments

Management and staff prepared material describing the effects of the FY95 budget splits proposed by the YMPO for work in WBS 1.2.3. This material was presented at the Yucca Mountain Project Office (YMPO) briefing on October 23, 1992 and used for recent construction of detailed budgets.

Issues/Potential Problems Needing Resolution and Potential Impacts

Reductions in the FY93 budget from the Mission 2001 baseline case may impact SNL's ability to support the important link between site investigations and performance assessment that is currently provided by geostatistically based models of rock properties in WBS 1.2.3.2.2.2.2. Also impacted by reduced budgets in WBS 1.2.3 are SNL support for analysis of ground motion from underground nuclear explosions (1.2.3.2.8.3.3) and climate modeling (1.2.3.6.2.1.6).

1.2.3.2.2.2.1 SYSTEMATIC ACQUISITION OF SITE-SPECIFIC SUBSURFACE INFORMATION

Major Accomplishments

The summary paper entitled "Influence of Deterministic Geologic Trends on Spatial Variability of Hydrologic Properties in Tuff," by C. A. Rautman (SNL), J. D. Istok (Oregon State University), A. L. Flint (the United States Geological Survey [USGS]), L. E. Flint (Raytheon Services of Nevada [RSN]), and M. P. Chornack (USGS), has been accepted for presentation at the 1993 International High-Level Radioactive Waste Management Conference. Text for the full-length paper, which will appear in the *Proceedings* volume, is in preparation. (SCP Activity 8.3.1.4.3.1.1)

Significant Meetings Attended

SNL staff participated in a workshop on Project Drilling Technical Requirements and Drilling Prioritization in Las Vegas, NV on October 28 and 29, 1992. The workshop focused on defining the essential requirements of each Project drilling program, as distinguished from added-on requirements from other studies requesting data or samples from a particular set of holes. Such secondary requirements often negatively affect the cost and schedule of the overall drilling program. Defining requirements as those which are essential, those which can be added on at a minimal cost or a large additional benefit, and those which are excessively costly in time or other resources per unit benefit may significantly alter the time and dollars required to complete the site drilling program. Consideration of resequencing drill holes was deferred to a later meeting, although it is likely that the changes proposed in drilling and sampling methods will lead to

significant changes in the schedule priority. As the first Project-wide reconsideration of the drilling program since 1988-1989, this workshop reflected experience gained from drilling the shallow neutron holes and UZ-16. (SCP Activity 8.3.1.4.3.1.1)

Status Report on Ongoing Activities

The draft Los Alamos National Laboratory (LANL) report entitled "Geologic Evaluation of Six Nonwelded Tuff Sites in the Vicinity of Yucca Mountain for a Surface-Based Test Facility for the Yucca Mountain Project," by D. E. Broxton, S. J. Chipera, and F. M. Byers, Jr. (LANL), and C. A. Rautman (SNL), received SNL management approval The report is in the LANL review process and will be sent to the Yucca Mountain Project Office (YMPO) during November. SNL and USGS staff contributed hydrologic properties sections based on continuing transect sampling work. (SCP Activity 8.3.1.4.3.1.1)

Measurement of hydrologic properties on samples from two horizontal transects of Bandelier Tuff (Quaternary, Jemez Mountains, NM) resumed following repair of a malfunctioning drying oven. Laboratory work for the initial work on this natural analog for some of the nonwelded tuffs at Yucca Mountain is now complete. Geostatistical analysis of the data will begin, subject to constraints related to preparation of the International High-Level Radioactive Waste Management Conference paper. (SCP Activity 8.3.1.4.3.1)

Major Activities Upcoming Next Three Months

Evaluation of data from surface transects will continue as directly related to preparation of the paper for the 1993 International High-Level Radioactive Waste Management Conference. Text and figures for this paper will be prepared. The paper is expected to enter the review process by late November/early December 1992. (SCP Activity 8.3.1.4.3.1)

1.2.3.2.2.2.2 THREE-DIMENSIONAL ROCK CHARACTERISTICS MODELS

Major Accomplishments

The summary paper entitled "Recent Developments in Stochastic Modeling and Upscaling of Hydrologic Properties in Tuff," by C. A. Rautman (SNL) and T. H. Robery (Spectra Research Institute), was accepted for presentation at the 1993 International High-Level Radioactive Waste Management Conference. Text for the full-length paper, which will appear in the *Proceedings* volume, is in preparation. (SCP Activity 8.3.1.4.3.2.1)

Status Report on Ongoing Activities

A new geostatistical simulation effort has begun in order to support the various performance assessment (PA) calculations. These simulations use indicator techniques to code major lithologies in drill holes into a few basic categories (welded versus nonwelded or welded, nonwelded, and zeolitic). A description of spatial continuity for these lithologic indicators is then developed (one is being assumed for development work on the technique) and used to produce stochastic images of stratigraphy. Several realizations covering the entire repository block have been generated as part of the development process. The technique appears to produce viable stochastic images of the stratigraphy at Yucca Mountain, complete with dipping beds and pinching and swelling of major lithologic units. As anticipated, uncertainty in the (vertical) location of stratigraphic contacts is well expressed between different simulations. In the vicinity of existing drill hole information, the stratigraphic contacts are "well behaved," and the simulated units of welded versus nonwelded tuff thus produced are quite realistic and believable. Away from control points (drill holes), the stratigraphic units produced by the simulations tend to split into numerous subunits that resemble conventional geologic cross sections less closely. Statistically, the poorly controlled portions of the model are indistinguishable from the better controlled portions. The proportions of welded and nonwelded material are essentially the same and the continuity patterns are approximately correct. In the absence of real information, such as a drill hole in what is now a large unsampled region, it is difficult to verify or disprove the simulations. There is considerable uncertainty regarding the geology in a region 5,000 to 8,000 ft removed from the closest sample location. (SCP Activity 8.3.1.4.3.2.1)

Geostatistical evaluation of the two-dimensional Tiva Canyon shardy-base grid continues following resolution late last month of some apparently anomalous results. There is more channelling and relict topography developed on the pre-Tiva Canyon eruption surface than had been anticipated, which produces rather abrupt thickness variation in the basal part of the Tiva Canyon Member. Although the existence of such features is not particularly surprising, they are not represented on published cross sections of the mountain, which typically portray contacts as straight lines between control points in drill holes or at outcrops. These observations suggest that the erratic contacts produced by the indicator simulations initiated this month may well be more realistic representations of geology than classical geologic techniques. An ancillary discovery from the geostatistical evaluation has been that stratigraphic position, expressed as a fraction of a sample's position within the total thickness of the unit, appears to be a better descriptor of location than the absolute position expressed in feet or meters. Our ability to predict (i.e., model) material property values is better based upon stratigraphic evaluation. (SCP Activities 8.3.1.4.3.2.1 and 8.3.1.4.3.1.1)

No significant activity occurred during October regarding the development of models using the Lynx modeling system. Current staff resources cannot support these activities.

Major Activities Upcoming Next Three Months

The complete text and figures for the 1993 International High-Level Radioactive Waste Management Conference paper on developments in stochastic modeling is in preparation and will be completed, presumably during November 1992. The paper will be submitted for review as soon as possible to meet a January 1993 publication deadline. (SCP Activity 8.3.1.4.3.2.1)

Work on the indicator simulations of Yucca Mountain will continue. The assumed model of spatial continuity used for code development and debugging will be replaced by one based on actual data, probably derived from the published geologic cross sections of Yucca Mountain. Data digitized from the geologic map of Yucca Mountain may eventually be incorporated into that model. Additional conditioning data will be incorporated from geophysical logs of holes such as the welded tuff holes for which no geologic description has ever been published. (SCP Activity 8.3.1.4.3.2.1)

Issues/Potential Problems Needing Resolution and Potential Impacts

Budgetary uncertainty is causing staff uncertainty regarding priorities for the three-dimensional modeling activity. Increased Project emphasis on increased sophistication in PA calculations suggest that the simulation approaches being investigated have significant value. It is difficult to reconcile this Project goal with the conflicting budgetary signals being received at present.

Other Items to Report

SNL staff met in Salt Lake City, UT to review papers submitted for the 1993 International High-Level Radioactive Waste Management Conference, sponsored by the American Nuclear Society (ANS). C. A. Rautman is a session organizer for this year's session on geostatistical methods. Most papers accepted for presentation at the conference apply geostatistical simulation techniques to radioactive-waste disposal sites. These concepts are gaining international acceptance within the radioactive-waste community.

1.2.3.2.7.1.1 LABORATORY THERMAL PROPERTIES

Status Report on Ongoing Activities

Revision 1 to Study Plan (SP) 8.3.1.15.1.1, "Laboratory Thermal Properties," has been forwarded to the YMPO. The revision incorporates changes that make the SP consistent with the current configuration of the ESF. (SCP Activities 8.3.1.15.1.1.1, 8.3.1.15.1.1.2, and 8.3.1.15.1.1.3)

Documentation is being prepared for the procedure to compare predicted heat capacity values with calorimetric data. (SCP Activity 8.3.1.15.1.1.2)

The failure to successfully calibrate the C-Matic Low Temperature (LT) system with the moisture containment cells has been traced to the shrinking of the cells. The cylindrical walls of the cell are machined from Delrin, a Dupont plastic, and it appears that heating the cell allows the polymer to relax and then contract upon cooling. The reference samples did not have enough clearance with the walls to sit flush with the lower plate of the cells. The cells have been machined to open up the diameter. Another calibration run is in process. The C-Matic LT will be used for measuring thermal conductivity at temperatures from 20 to 100°C. (SCP Activity 8.3.1.15.1.1.3)

A geologic sample was run in the Thermal Conductivity Analyzer (TCA) to determine the effect of heat sink compound (HSC) on the measured conductivity. The sample was run four times, without HSC, from 120 to 270°C. The sample was then run an additional four times with HSC. The following observations were made:

1. Without HSC, the conductivities (_) measured for the second, third, and fourth runs at 120°C were lower than that of the first run. This is probably due to moisture loss—the sample was not oven-dried prior to testing.

2. With HSC, the conductivities measured for the second, third, and fourth runs at 120°C were higher than that of the first run. This might be attributed to the absorption of HSC during the first run.

3. Without HSC, there was a significant difference (>20%) between the conductivities measured at 120°C and 270°C. With HSC, the difference was minimal (<2%).

4. The conductivities measured at 270°C without HSC approached the conductivities measured with HSC.

Revision 01 to Technical Procedure (TP)-207, "Calibration of Temperature Sensors Used for Thermal Properties Testing," is being reviewed. This revision restructures the procedure for easier use, incorporates three interim change notices (ICNs), and extends the calibration range of the transfer thermocouples to as low as 0°C. (SCP Activity 8.3.1.15.1.1.3)

Major Activities Upcoming Next Three Months

The scoping study on the effects of saturation on thermal conductivity will begin after the C-Matic LT instrument is calibrated, the data acquisition software is verified and approved, and the relevant procedure are revised. (SCP Activity 8.3.1.15.1.1.3)

The TCA will be used to measure thermal conductivities at or above 110°C. (SCP Activity 8.3.1.15.1.1.3)

Other Items to Report

On October 13, 1992, J. Connolly and M. Spilde from the University of New Mexico's Department of Earth and Planetary Sciences gave a presentation at SNL on the analytical capabilities of the JEOL 733 Electron Microprobe with a new Oxford/Link Integrated Data Analysis System. The new system combines digital imaging with X-ray analysis to provide chemical and physical data on micron-sized areas to entire thin sections. The system has the capability to provide true quantitative data about the spatial distribution of chemical elements and to determine a number of physical parameters, such as size/shape, area percent, aspect ratios, and basic phase distribution.

1.2.3.2.7.1.2 LABORATORY THERMAL EXPANSION TESTING

Status Report on Ongoing Activities

Revision 1 to SP 8.3.1.15.1.2, "Laboratory Thermal Expansion Testing," has been forwarded to YMPO. The revision incorporates changes that make the SP consistent with the current configuration of the ESF. (SCP Activity 8.3.15.1.2.1)

The dilatometer control program has been revised and compiled. Except for a few minor aesthetic bugs, the program has been completed.

A calibration for testing small samples (1-in. long) has been completed and a verification is in progress. To facilitate the testing of 1-in. samples, a fused silica extension block is placed in the same holder and run in series with the sample. The expansion of this block is accounted for in the calibration.

Major Activities Upcoming Next Three Months

TP-203, "Measurement of Thermal Expansion of Geologic Samples Using a Push Rod Dilatometer," will be submitted for approval pending a successful verification with the apparatus described for small samples.

Samples containing tridymite and crystobalite, which undergo polymorphic transformations at temperatures below 275°C, will be tested to determine when these transformations begin and end and their effect on the thermal-expansion behavior. The heating rates used on samples containing these silica polymorphs may need to be significantly less than rates used for testing on other samples.

A scoping study on the effects of sample size on thermal expansion will be initiated after the accuracy and reproducibility of the test data is established, instrument calibration is completed, data acquisition software is verified and approved, and relevant procedures are issued. (SCP Activity 8.3.1.15.1.2.1)

1.2.3.2.7.1.3 LABORATORY DETERMINATION OF MECHANICAL PROPERTIES OF INTACT ROCK

Status Report on Ongoing Activities

New England Research, Inc. (NER) is conducting a study of time-dependent deformation involving high-temperature experiments at creep and low strain rate conditions. The problems with the first constant stress (creep) experiment were resolved and the experiment has been re-initiated. Six samples of TSw2 will be tested at a pore pressure of 4.5 MPa, a confining pressure of 5 MPa, and constant differential stress of 80 MPa. The experiments will be performed first at room temperature and then at 250°C. Each test will take four months to complete. The sample is undergoing the week-long room temperature testing and the evaluated temperature part of the experiment will be started in early November. (SCP Activity 8.3.1.15.1.3.2)

SAND92-0119, "Experimental Comparison of Laboratory Techniques in Determining Bulk Properties of Tuffaceous Rocks," and SAND92-0847, "The Effect of Frequency on Young's Modulus and Seismic Wave Attenuation in Tuff," have been technically and editorially reviewed. The documents are being revised in response to comments. (SCP Activity 8.3.1.15.1.3.2)

The logbook covering a series of six experiments run at a nominal axial strain rate of 10^{-6} s^{-1} was submitted to the Data Records Management System (DRMS). (SCP Activity 8.3.1.15.1.3.2)

Major Activities Upcoming Next Three Months

Staff members from NER will be in Albuquerque, NM on November 9 through 12, 1992 to present results from the testing of samples of Topopah Spring Member tuff in the investigation of time-dependent mechanical properties. In addition, a number of reports that are in process will be discussed. These technical documents are being coauthored by NER and SNL personnel.

1.2.3.2.7.1.4 *LABORATORY DETERMINATION OF THE MECHANICAL PROPERTIES OF FRACTURES*

Status Report on Ongoing Activities

The time-dependent mechanical properties of fractures are being investigated to address long-term stability issues within the potential repository. A triaxial creep (constant shear stress) experiment is being conducted on a sample (right-circular cylinder, diameter of ~2.125 inches and length-to-diameter ratio of 3:1) with a fracture oriented ~35° to the sample axis. The confining pressure and the initial axial stress difference were both 10 MPa, which gave a ratio of shear-to-normal stress on the surface of about 0.36. The triaxial creep test continues at incrementally increasing stress levels. Little to no creep has been observed, even though the shear-to-normal stress ratio now stands at 0.73. The coefficient of friction for smooth surfaces is usually ~0.6. (SCP Activity 8.3.1.15.1.4.2)

The technique for making gypsum cement replicas of rough fractures in the welded Topopah Spring Member tuff is being refined. Maximum surface hardness and strength is desired. The problem of entrainment of bubbles is being addressed. When these issues are resolved, a set of replicas will be cast to study the effect of topographic correlation. (SCP Activity 8.3.1.15.1.4.2)

SP 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," has been reviewed by other Project participants, YMPO, and U.S. Department of Energy/Headquarters personnel (DOE/HQ). Review comments were received in May. The study plan is in the process of being revised. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

Work is continuing on the development of a computer program to model the dilation, normal stiffness, and shear stiffness of single fractures in rock. (SCP Activity 8.3.1.15.1.4.2)

Major Activities Upcoming Next Three Months

A revised version of SP 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," will be submitted to the Project Office in the next two months. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

SAND92-2216J, a journal article entitled "Simple Mathematical Model of a Rough Fracture," is being drafted and will be submitted for review in the next two months. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

SAND92-2333, "The Effect of Sliding Velocity on the Mechanical Response of Artificial Joints in Topopah Spring Member Tuff," is being drafted and will begin technical and editorial review in the next two months. (SCP Activity 8.3.1.15.1.3.2)

1.2.3.2.8.3.3 GROUND MOTION FROM REGIONAL EARTHQUAKES AND UNDERGROUND NUCLEAR EXPLOSIONS

Status Report on Ongoing Activities

B. Rutherford has completed responses to technical comments on SAND92-0956, "A Statistical Analysis of Ground Motion Resulting from Underground Nuclear Explosions in the Yucca Mountain Region."

M. Walck had planning discussions with T. Blejwas, the SNL Technical Project Officer (TPO), and T. Sullivan of YMPO.

1.2.3.6.2.1.6 FUTURE REGIONAL CLIMATE AND ENVIRONMENTS

Significant Meetings Attended

F. Giorgi and G. Bates attended the Meso-Scale Model Version 4 (MM4) workshop held in Boulder, CO, on October 20 through 23, 1992. The workshop centered on science intended to increase the quality of modeling forecasts generated from the MM4. Because MM4BAT is derived from the MM4 model, lessons learned by the modelers may later be incorporated in the MM4BAT.

The SNL Quality Assurance (QA) Audit of the National Center for Atmospheric Research (NCAR) occurred on October 27 and 28, 1992 at Boulder, CO. It was attended by R. Sandoval, R. Richards, D. Hawkinson, J. Friend, S. Askew, Y. Behl, S. Thompson, F. Giorgi, G. Bates, and F. Tower.

Status Report on Ongoing Activities

A database containing twenty years of observational data for twenty stations around Yucca Mountain has been extracted from the "Surface Land Daily Cooperative Summary of the Day" data set to streamline the Phase II validation analyses. This data set contains daily meteorological data taken at approximately 10,000 stations nationwide.

The forecast data for a test run of the MM4BAT model, completed last month, has been compared to archived forecast data from the model produced at SNL in Livermore, CA. Except for differences in the last digit, attributable to compiler variations, the databases are essentially identical.

The software evaluation report for the regional climate model, MM4BAT, was completed and submitted to the Records Center.

Major Activities Upcoming Next Three Months

The SNL YMP Department Operating Procedure (DOP) 2-4 requirements for the Phase I Analysis will be addressed.

The test run of MM4BAT and its pre- and post-processing software will be documented.

The Phase II validation analysis will continue.

1.2.4 REPOSITORY

The objective of the Repository element includes work scope related to the repository component of the physical system including the repository operations system, the underground facility component of the engineered barrier system, the access/borehole seals, and the monitoring system component of the performance evaluation system. The Repository element is comprised of 11 tasks: Repository Coordination and Planning (1.2.4.1.1), Excavation Investigations (1.2.4.2.1.1.1), In Situ Thermomechanical Properties (1.2.4.2.1.1.2), In Situ Mechanical Properties (1.2.4.2.1.1.3), In Situ Design Verification (1.2.4.2.1.1.4), Rock Mass Analysis (1.2.4.2.1.2), Equipment and Instrumentation Development (1.2.4.2.2), Certification of Design Methods (1.2.4.2.3.1), Design Analysis (1.2.4.2.3.2), Sealing and Design Requirements (1.2.4.6.1), and Sealing Testing (1.2.4.6.2).

1.2.4.1.1 REPOSITORY COORDINATION AND PLANNING

Status Report on Ongoing Activities

Work continues with the thermal design working group that has been formed with key staff from SNL, Lawrence Livermore National Laboratory (LLNL), and the Management and Operations (M&O). The initial focus of this group is to revise the current Site Characterization Plan (SCP) thermal design goals for the repository. Once this is completed, issues such as the range of thermal loading to be studied during Advanced Conceptual Design (ACD) can be addressed. In the past month, SNL staff provided input to working groups. These groups developed a plan that identified the major issues related to thermal loading and proposed actions to move toward a decision on thermal loading for repository design.

Initial design analyses to address a range of thermal loading for both in-drift and in-borehole emplacement schemes have been completed and will be consolidated with M&O waste-stream studies. Thermal structural calculations of near-drift response for a range of thermal loadings are ongoing and final results are expected to be transmitted to M&O by the end of November 1992. Significant effort was expended this month in replanning work for FY93. Work scopes in some areas were revised based on expected budget reductions. The most severe impacts are in the areas of ESF test development, codes/models development, and QA certification.

Major Activities Upcoming Next Three Months

SNL will participate in the development of a plan for addressing the thermal loading of the repository. Specific actions for FY93 will be identified and thermal goal working groups will begin review of the thermal goals.

Issues/Potential Problems Needing Resolution and Potential Impacts

Reductions in the FY93 budget from the Mission 2001 baseline case will impact SNL's ability to support ESF design and the resolution of repository thermal loading issues. Delays are anticipated in completing model and code software QA requirements for documented QA analyses that support ESF design and the evaluations of items important to safety and waste isolation. Also impacted by reduced budgets and possibly accelerated schedules are the SNL preparations for the ESF in situ tests. Two tests must be ready to run at the start of ESF ramp construction by the tunnel boring machine (TBM). Current budgets in FY93 will not support the level of effort required to meet an accelerated start of construction (i.e., start of TBM tunneling before November 1994).

1.2.4.2.1.1.1 EXCAVATION INVESTIGATIONS

Status Report on Ongoing Activities

Revision of SP 8.3.1.15.1.5, "Excavation Investigations," to reflect the current ESF configuration and mining method was begun.

1.2.4.2.1.1.2 IN SITU THERMOMECHANICAL PROPERTIES

Status Report on Ongoing Activities

A rough draft of SP 8.3.1.15.1.6, "In Situ Thermomechanical Properties," was begun.

1.2.4.2.1.1.3 IN SITU MECHANICAL PROPERTIES

Status Report on Ongoing Activities

A rough draft of SP 8.3.1.15.1.7, "In Situ Mechanical Properties," was begun.

1.2.4.2.1.2 ROCK MASS ANALYSIS

Status Report on Ongoing Activities

Laboratory work continued on the experiments involving small polycarbonate models. An experiment using Moiré techniques was performed. During analysis of the data, two major problems were encountered with the data analysis algorithms. First, it was found that the fringe data contains a noise-like feature not accounted for by the simple model being applied to derive the two-dimensional displacements from the fringe motion. Basically, the actual grid pattern on the sample and the master is being seen in addition to the Moiré interference pattern. This problem was successfully remediated by design of an anisotropic two-dimensional filter applied to the fringe data before processing. The second problem stems from the discontinuous fringe pattern at each physical discontinuity (joint) on the specimen. In the data analysis, it is necessary to find an envelope automatically by computer. Significant progress was made in resolving this problem by taking advantage of the different frequency content of the fringes near the discontinuities. After remedying both problems, displacements of ~5 μ (1/5 of a fringe spacing) can be resolved presently. Further work on improving this resolution continues. These new analysis techniques will be applied to the plates tests next month.

A detailed experiment on the frictional properties of the Lexan polycarbonate sheets, used for the above experiment, was performed. Two phenomena were studied: (1) slip-velocity dependence on the coefficient of friction and (2) nonlinearity in the torque-slip curve due to partial slip of asperities before the entire sample surface is fully sliding. Preliminary analysis of this data was started this month, yielding the following qualitative results:

- Velocity dependence is truly a second-order effect with a decade change in sliding velocity resulting in <5% change in the coefficient of friction.
- There does seem to be a significant component of partial slip before full sliding is established.
- The exact displacement needed to fully develop sliding will be determined from a more detailed analysis of the data.

A series of experiments designed to study the effects of a nonstandard loading condition of frictional properties has been conducted by the University of Colorado

(CU). Replicas of fractures in rock samples have been tested for normal stiffness and shear deformation properties. SAND92-1853, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Data Report," detailing the experiment techniques and the resulting data, has been technically and editorially reviewed. A graphic model has been used to predict the shear behavior and the results have been compared to the data. This analysis is being reported in SAND92-2247, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Comparison Between Predicted and Observed Behavior," which has been drafted and is now beginning the review process. Additional analyses of the data will be reported in a third SAND document that is being drafted at the present time and should begin SNL review in November 1992.

A new study has been initiated to observe the surface characteristics of natural fractures and compare these to the frictional data gathered on replicas of the surfaces. This study will place special emphasis on determining whether the fitting parameters on the Barton model for frictional behavior have physical significance or not. The majority of the experimental work will be carried out by a CU graduate student at SNL.

R. Price (SNL) visited CU on October 5 and 6, 1992 to discuss the progress on the data and analysis reports and the plans for the new study.

1.2.4.2.3.1 CERTIFICATION OF DESIGN METHODS

Status Report on Ongoing Activities

JAC2D, SNL's primary thermomechanical finite-element code, received QA certification in early October 1992. During this month, modifications to the base version of JAC2D were made to incorporate one of SNL's jointed rock models. This work was nearing completion at the end of October. This modified version of JAC2D will be submitted for QA certification in early November. The test problems will include those used to qualify the original JAC2D and a series that will verify the implementation of the jointed rock model.

SNL has been able to perform a multicavity problem with its combined finite-element/boundary-element technology. Good results have been obtained when all the boundary-element boundaries are treated as interface nodes. Conventional infinite elements could not perform this problem because it has multiple closed contours. The accuracy of SNL's capability was verified using separate finite-element, boundary-element, and combined finite-element/boundary-element analyses. Excellent agreement between the analyses was obtained. This work was documented in a paper presented at the CUBE 92 Symposium, October 27 through 30, 1992: "A Combined Finite Element - Boundary Element Formulation for Iterative Solution Methods," by J. R. Koteras.

The first version of a new one-dimensional block code was written in October. Although this code cannot solve many practical problems, it will serve as a tool to check the basic theory that will be applied to the two- and three-dimensional versions. SNL verified that the basic block element is computationally simple and works well. Individual blocks were coupled using a penalty formulation.

Major Activities Upcoming Next Three Months

SNL will explore the applicability of using an augmented Lagrangian formulation to enforce the block constraints of the one-dimensional code. An augmented Lagrangian formulation should allow these codes to take advantage of the simplicity of the penalty formulation while at the same time give the user the ability to iteratively refine how well the constraints are satisfied.

Issues/Potential Problems Needing Resolution and Potential Impacts

Potential FY93 budget reductions for this work will severely impact SNL's ability to complete model development and QA certify codes for use in ESF-related analyses. These analyses are needed to support ESF PA, design, and the determination of items important to safety and waste isolation. Reduction or delays in this effort will result in delays in conducting the items important to safety and waste isolation evaluations for FY93 design packages.

1.2.4.2.3.2 DESIGN ANALYSIS

Status Report on Ongoing Activities

Internal SNL comments on SAND92-0589, "Yucca Mountain Site Characterization Project: New Three-Dimensional Far-Field Repository Field Thermomechanical Calculations," by R. Hardy et al., have been received and are being addressed. This report documents the work completed for Problem Definition Memo (PDM) 75-25. The analyses defined in the PDM provide information on the temperatures, stresses, and strains expected in the vicinity of ESF openings that may become part of the repository. The new repository design was used in the analysis, with thermal loadings of 57 and 80 kW/acre. (SCP Section 8.3.2.4.1.1)

Structural processing of the thermal results obtained as part of the SNL support to the M&O's systems study on repository thermal management continued. Structural calculations are being carried out using the compliant joint model option of the finite-element code JAC (Biffle, 1984). Initial efforts will focus on a design-basis areal power density (APD) of 100 kW/acre assuming rock quality categories of 1, 3, and 5 (Hardy and Bauer, 1991), with additional calculations completed as appropriate. A summary of the thermal and structural results obtained from this study will be submitted to the 1993 International High-Level Radioactive Waste Management Conference.

Documentation of a study comparing the predictions of near-field thermal response using approximations of smeared two-dimensional heat sources and discrete three-dimensional representations continued. It was the purpose of this study to provide a preliminary evaluation of the adequacy of smeared source approximations in two-dimensional thermal modeling. Local APDs of 20, 25, 34, 57, 80, and 114 kW/acre were examined.

1.2.4.6.1 SEALING AND DESIGN REQUIREMENTS

Status Report on Ongoing Activities

Work associated with the development of a strategy to seal exploratory boreholes resumed. The first task was to reevaluate the existing borehole database for consistency with the database compiled at the end of FY91. This was accomplished and new maps showing the locations of boreholes were generated. Draft text for some portions of the report are under preparation.

1.2.5 REGULATORY

The objective of the Regulatory element is to assure site-related compliance with Nuclear Regulatory Commission agreements, requirements, and policies; evaluate the performance of the natural barriers, engineered barriers, and total systems for meeting regulatory standards; and manage, maintain, and accumulate technical data and information produced by site characterization, design development, and performance assessment activities for the project. The Regulatory element is comprised of 11 tasks: Regulatory Coordination and Planning (1.2.5.1), Site Characterization Program (1.2.5.2.2), Technical Database Input (1.2.5.3.5), Total System Performance Assessment (1.2.5.4.1), Repository Performance Assessment (1.2.5.4.3), Site Performance Assessment (1.2.5.4.4), Interactive Graphics Information System (1.2.5.4.5), Development and Validation of Flow and Transport Models (1.2.5.4.6), Support Calculations for Postclosure Performance Analyses (1.2.5.4.7), Development and Verification of Flow and Transport Codes (1.2.5.4.9), and Special Projects (1.2.5.5).

1.2.5.1 REGULATORY COORDINATION AND PLANNING

Major Accomplishments

Management staff prepared material describing the effects of the FY93 budget splits proposed by the YMPO for work in WBS 1.2.5. This material was presented at the YMPO briefing on October 23, 1992, and used for recent construction of detailed budgets.

Issues/Potential Problems Needing Resolution and Potential Impacts

The proposed FY93 budget splits contain no funds for WBS 1.2.5.1. If they are adopted, the coordination and planning work will have to be changed to other elements in WBS 1.2.5. The WBS dictionary will have to be changed because it currently calls for such work only in WBS 1.2.5.1.

1.2.5.2.2 SITE CHARACTERIZATION PROGRAM

Major Accomplishments

The SNL input to the Semi-Annual Report was transmitted electronically to the YMP.

Status Report on Ongoing Activities

Verification of comment resolution for SP 8.3.1.17.3.5, "Ground Motion at the Site From Controlling Seismic Events," was received from the YMPO, verified by SNL staff, and resubmitted to the Project Office on October 29, 1992.

Verification of comment resolution for SP 8.3.1.17.4.3, "Quaternary Faulting Within 100 km of Yucca Mountain, Including the Walker Line," was received from the YMPO on October 5, 1992.

An SNL staff review of SP 8.3.1.17.4.4, "Quaternary Strike-Slip Faulting Proximal to the Site Within Northeast-Trending Fault Zones," was submitted to the YMPO on October 5, 1992.

Verification of comment resolution for SP 8.3.1.2.3.3, "Site Saturated Zone System Synthesis and Modeling," was submitted to the YMPO on October 29, 1992.

The following study plans were received from the Project Office on October 29, 1992:

- SP 8.3.1.8.1.2, "Physical Processes of Magmatism and Effects on the Potential Effects," for review.
- SP 8.3.1.8.5.2, "Characterization of Igneous Intrusive Features," for review.

- SP 8.3.1.15.2.2, "Characterization of the Site Ambient Thermal Conditions," for review.

- SP 8.3.1.3.5.1.2, "Dissolved Species Concentration Limits and Colloid Behavior," for verification of comment resolution.

1.2.5.3.5 TECHNICAL DATABASE INPUT

Status Report on Ongoing Activities

Technical Data Information Forms (TDIFs) are being developed for the following reports:

- SAND85-0762, "Bulk, Thermal, and Mechanical Properties of the Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nevada"

- SAND84-1101, "Uniaxial and Triaxial Compression Test Series on Topopah Spring Tuff From USW G-4, Yucca Mountain, Nevada"

1.2.5.4.1 TOTAL SYSTEM PERFORMANCE ASSESSMENT

Major Accomplishments

SLTR90-2002, "Progress Report on the Construction of Event Trees in Support of Scenario Development: Tectonism," by G. E. Barr, E. Dunn, R. W. Barnard, and H. A. Dockery, was released on October 12, 1992. This letter report will form the basis for scenario selection and will be followed by the SAND report documenting the scenario selection.

Significant Meetings Attended

SNL staff attended the meeting of the Nuclear Waste Technical Review Board (NWTRB) on the subject of development of a source term for radionuclide releases from the engineered barrier system (EBS). The meeting was held on October 14 and 15, 1992 in Las Vegas, NV. SNL presentations before the Board were "Source Term for the Sandia National Laboratories Total System Performance Assessment" and "Source Term Sensitivity Studies Done in TSPA-91." The former talk focused on the incorporation of source-term information in the recently released Total System Performance Assessment done in 1991 (TSPA-91). The latter presentation was on the use of a modified source term that recognized the spent fuel was not of uniform age or burnup. Therefore, the releases could vary depending on the age and burnup of the radionuclides modeled.

SNL staff also supported the field trip to Yucca Mountain, NV, held in conjunction with the NWTRB meeting, and discussed SNL's role in the project at the Yucca Mountain Field Operations Center (FOC) display.

Several SNL staff participated in the paper review for the ANS International High-Level Radioactive Waste Management Conference to be held in Las Vegas, NV in April 1993. Over 380 papers were reviewed in Salt Lake City, UT on October 19 through 21, 1992.

Status Report on Ongoing Activities

SNL staff is continuing to add material to the first draft of the scenario report for the nominal flow case, particularly on the effects of mine ventilation. Approximately 15 sketches illustrating the events and processes making up the scenarios have been drafted, although the authors have not yet approved the figures. Drafting of the tree segments that will appear in the text has also begun. Drafting constitutes the bulk of the work remaining to be done; approximately 100 sketches and 20 tree segments will be in the final report.

Work also continues on the SAND report covering the TSPA source-term sensitivity studies presented at the NWTRB meeting discussed above.

Staff have supported the planning of the Expert Judgment Workshop to be held in Albuquerque, NM in November 1992. A presentation of the use of expert judgment for the TSPA is being prepared for that meeting.

1.2.5.4.3 REPOSITORY PERFORMANCE ASSESSMENT

Status Report on Ongoing Activities

Work continued on the documentation of a far-field thermal study that will be presented at the 1993 International High-Level Radioactive Waste Management Conference. The study focuses on an evaluation of a range of design-basis areal power densities given a consistent set of modeling assumptions. Captured in the three-dimensional model are an accounting for variations in yearly average waste characteristics and the use of a detailed repository geometry. Specific activities pursued this month centered on attempts to obtain a fully three-dimensional visualization of the results. (Design Activity 1.11.6)

1.2.5.4.4 SITE PERFORMANCE ASSESSMENT

Status Report on Ongoing Activities

The search for and review of the Yucca Mountain hydrologic data in over 20 USGS and SNL documents has been completed. In addition, analog data have also been extracted from reports on tuffs from Apache Leap, AZ and Mortendad Canyon, NM. These tabular data, with particular emphasis on porosity and saturated hydraulic conductivity, were identified and provided for addition to the Performance Assessment Data Base (PADB). Because of the large amounts of data expected to be included in the PADB, a tracking system is being developed to provide detailed information on the discrete types of hydrogeologic parameters, rather than having information available only under broad categories.

Three-dimensional geostatistical simulations using the sequential Gaussian simulator (SGSIM) have been attempted for the region containing the repository, but did not produce good results because of the sparsity of data and short correlation length. Indicator simulations should perform better because more data are available and the correlation length should be substantially greater. The sequential indicator simulation program (SISIMPDF) has been implemented and three-dimensional simulations produced for the welded and nonwelded tuff classes. The results are much better for the indicator simulations, although they deteriorate somewhat if nearby data are lacking. Currently, twenty drill holes have been identified for providing data and these data are being reviewed. Three-dimensional visualizations for an early simulation have been produced by SNL staff using Applications Visualization System (AVS) graphics. Simulations of the east-west INTRAVAL cross section have also been produced for welded, vitric nonwelded, and zeolitic nonwelded classes. Efforts are ongoing to assist SNL staff in determine the appropriate parameters for the simulations. A meeting of staff from Departments 6100 and 6300 was held on October 7, 1992 to coordinate the link between generators of simulations using geostatistics (6100) and users (TSPA and INTRAVAL) of the simulations (6300).

Improvements in the north-south INTRAVAL cross-section study have been continuing. The simulations produce infiltration rates at the top of the Topopah Spring member. Although there continue to be changes, the simulations and infiltration rates appear to be reasonable and may provide additional information to infiltration rates calculated from one-dimensional studies by an SNL staff member.

Major YMPO review comments on SAND92-0461, "Pre-Waste-Emplacement Ground-Water Travel Time Sensitivity and Uncertainty Analysis for Yucca Mountain, Nevada," by P. Kaplan, were addressed. The document has been returned to YMPO for additional review.

1.2.5.4.5 INTERACTIVE GRAPHICS INFORMATION SYSTEM

Major Accomplishments

The new Sparc 10 computational server was installed on the network and is ready for use. ARCVIEW licenses for network access to the ACR/INFO database were installed. Several workstations and personal computers (PCs) to access the ARCVIEW software were configured and users have begun to view map data from their own computers.

Status Report on Ongoing Activities

Work continues to progress in the development of conversion techniques to translate the existing CALMA gridded terrain models of the thermal/mechanical units into contour maps to be used in ARC/INFO. ARCVIEW techniques are being explored and view files developed for various subjects of interest. A data dictionary has been started to provide users with a guide to the data now available to them.

The following CALMA job has been completed:

- Job 391 for M. J. Esp - Section Through Ramps/ Drift

Major Activities Upcoming Next Three Months

The computer systems will be relocated to a new building and the local area network (LAN) will be tested and debugged in the new location. A plan to minimize downtime and disrupted services will be developed and implemented.

Training for support personnel in ARC/INFO and ARCVIEW will continue. The additional license for ARC/INFO will be installed and a training program will be developed to instruct users on the basics of building an ARCVIEW map at their workstation or PC.

Working with the Geographic Nodal Information Study and Evaluation System (GENISES), techniques will be developed to transfer data via the network and to replace existing data with data qualified under a QA procedure when it becomes available.

The following CALMA jobs are in process:

- Job 386 for H. A. Dockery - Dril Holes/Section
- Job 396 for P. Gottlieb - Repository Expansion Areas

- Job 397 for D. L. Eley - Convert GTMs to ARC/INFO
- Job 398 for D. Guerin - Hydrogeologic Drill Holes
- Job 399 for J. A. Fernandez - New Proposed/Exist Drill Holes
- Job 400 for J. Houseworth - Profiles for INTERA/M&O

1.2.5.4.6 DEVELOPMENT AND VALIDATION OF FLOW AND TRANSPORT MODELS

All activities addressed in this monthly status report support SCP Section 8.3.5.12.2.1.1. Activities supporting SCP Section 8.3.5.12.2.2.2 are not scheduled for FY93 and hence are not addressed.

Major Accomplishments

All accomplishments have been included in the Status Report on Ongoing Activities section for the sake of brevity and completeness.

Significant Meetings Attended

R. J. Glass met with W. Springer and other LANL staff on October 15, 1992 to discuss implementation of the bottom suction boundary condition designed for the LANL large-scale caisson test.

R. J. Glass attended a meeting of session organizers for the 1993 International High-Level Radioactive Waste Management Conference in Salt Lake City, UT on October 20, 1992.

Status Report on Ongoing Activities

Unsaturated flow through single fractures:

A first draft of a journal article reporting the results of the full-field instability experiments is nearing completion; an additional experiment using a natural fracture in welded tuff collected from the Bandelier tuff is scheduled for November 1992. Detailed analysis of experimental data from single-finger experiments in an initially dry analog fracture was begun. Staff continued to prepare that data for submission to the DRMS. In anticipation of acceptance by the 1993 International High-Level Radioactive Waste Management Conference, work was begun on an article presenting the results of the single-finger experiments. Data collected from both full-field and single-finger experiments in the analog fracture under partially saturated conditions was collated in preparation for a second presentation at the 1993 International High-Level Radioactive Waste Management Conference; an outline of that presentation was prepared.

Modifications to improve light level stability in the Rotating Test Stand (RTS) were completed. Work is continuing on improved routing of fluid and air pressure lines. All modifications are expected to be completed in early November 1992.

Numerical experimentation continued in the effort to use modified percolation theory to model gravity-driven fingering in fractures. Aperture distributions and spatial structures are being systematically varied as is the angle of the fracture with respect to gravity.

Fracture/matrix interaction:

Staff began analysis of data from experiments conducted this summer on wetted area structure in horizontal fractures with water entry/exit through the surrounding matrix. The data substantiate earlier preliminary experiments. In addition, both primary and secondary wetting and drainage curves were built from wetted structure data from one of the experimental fracture/matrix systems. This constitutes the first time such curves have been built for a fracture/matrix system. Analysis will continue and be compared with hysteresis models in the next few months.

Studies to understand the influence of matrix imbibition on fracture percolation in thin, two-dimensional systems cut normal to the plane of the fracture are still underway. Efforts this month include continued familiarization of SNL staff with the Siemens' Polytron real-time X-ray equipment (available through cooperative agreement with the University of New Mexico [UNM]). Image conversion between Polytron, Sun4, and 486 PC formats/platforms is still underway, as well as initial efforts for data processing and displaying output. Initial efforts have been undertaken to acquaint SNL staff with the capabilities and material property inputs needed by the numerical model LLUVIA-II to adapt the program to simulate these studies of fracture matrix interaction. Efforts have been initiated to measure the requisite material properties characterizing the porous media of concern.

Field, laboratory and numerical experimentation to determine scaling laws for effective-media properties in heterogeneous media:

To support studies aimed at understanding processes governing the rock-property scaling and variability, an automated gas permeameter test system is being built. Construction of the test system was delayed because several key components had not been received from the vendors until late in October 1992.

Development of experimental capabilities:

Efforts have continued to purchase a Phillips MG161 X-ray generator and tube head to be used in high-resolution imaging of moisture content and solute concentration fields in opaque materials (i.e., tuff samples). Acquisition of the unit has been slowed by end-of-the-fiscal-year backups in the SNL Purchasing Department.

Caisson test:

Acid and neutral extraction studies to determine the degree of heterogeneity of soluble components of the Wedron sand that will be used in the caisson experiment continued. Procedures using the inductively coupled plasma mass spectrometer (ICP-MS) are being developed for analysis of leachate compositions containing relatively high concentrations of sodium chloride (NaCl), the background electrolyte for the tracer solutions. Flow-through tests with ceramic cup samplers that will be used in the caisson indicated that sorption of lithium (Li) by the cups is negligible. Similar studies using nickel (Ni) tracers are currently underway. LANL staff finalized the design of the pH monitoring system that will be used in the caisson. Studies examining the adsorptive behavior of Ni in various types of samples containers indicate that losses to the containers at alkaline pH appear to be fully reversible upon acidification, for samples originally at a pH of 8 or less. To mimic long-term storage of acidified samples, a set of test samples containing either 0, 5, or 50 ppb added Ni are being periodically sampled and monitored for evaporative losses. Initial results covering two weeks show negligible evaporation and no change in concentration.

Reactive transport model development:

Review of the first draft of a User's Manual for the Lagrangian-Eulerian Model of Hydrogeochemical Transport (LEHGC) code was initiated. Efforts to implement the LEHGC coupled reaction-transport computer code on a massively parallel architecture continued. Several benchmark test problems to evaluate the geochemical equilibrium calculation subroutines were designed and used to identify potential errors in the code.

Reactive transport experimental studies:

The draft technical procedure for Ni analysis using the graphite-furnace atomic absorption spectrophotometer has been revised to reflect improvements in operating procedures and data reduction. Operating procedures have been improved by eliminating spurious readings caused by sublimation of the sample matrix (e.g., NaCl and HNO_3) and poor reproducibility of the configuration of the tip of the capillary tube of the auto-sampler. Data reduction has been improved by refining the calculation of the calibration curve and correcting for

evaporation from the auto-sampler vial. Data quality has improved as a result of these optimizations. The useful dynamic range is 0 - 200 ppb Ni using standard operating parameters and a quadratic calibration curve. Precision appears to be approximately ±0.5% or 0.2 ppb (1s), whichever is greater; the limit of detection appears to be ±0.2 ppb.

Initial results of unsaturated K_d measurements are encouraging. A uniform distribution of water within an unsaturated sand was achieved with the Turbula mixer using ~1 ml in a 1-L chamber.

Major Activities Upcoming Next Three Months

The automated gas permeameter test system will be built and tested.

A suite of tests aimed at studying the influences of matrix imbibition on fracture percolation, conducted in thin, two-dimensional systems cut normal to the plane of the fracture, will be conducted.

Detailed studies of sorption of boron (B), bromine (Br), Li, and Ni by sand to be used in caisson or in supporting laboratory studies will continue. The caisson will be instrumented and filled. Isotherm experiments to determine the linear range of sorption of the tracers will continue. Surface potentiometric titration of sand will continue. The LEHGC code will be implemented on massively parallel architecture.

Issues/Potential Problems Needing Resolution and Potential Impacts

Reductions in the FY93 budget from the Mission 2000, baseline case may prevent initiation of experimental work on nonisothermal flow and on concentrated flux (weeps/seeps). Reduction may also delay development and documentation of the reactive transport code LEHGC and reduce SNL participation in the caisson transport experiment.

1.2.5.4.7 SUPPORT CALCULATIONS FOR POSTCLOSURE PERFORMANCE ANALYSES

Status Report on Ongoing Activities

Calculations to estimate the effects on repository performance of surficial water use in the controlled zone outside the repository, which are presented in ESF PA Analysis No. 12 and PDM 72-32, have completed technical review. Two efforts are underway using these calculations. The first involves writing recommendations for controls on surficial water usage and locations of surficial ponds; these recommendations are intended for inclusion in Appendix I of the ESF Design Requirements document (ESFDR) and the Surface-Based Testing Field Requirements Document (SBTFRD). The second activity is a SAND report, SAND92-2248, describing the analysis; this report is currently being drafted.

PDMs 72-28, 72-29, 72-30, and 72-31 have been closed.

Preliminary efforts for a model validation exercise have been initiated in collaboration with WBS 1.2.5.4.6. Preliminary calculations are being performed in conjunction with a series of experiments investigating matrix/fracture interaction by modelling flow through a discrete fracture. These experiments are being performed by SNL Department 6115. The code LLUVIA-II has been installed on the Sun workstation and tested against the test cases in the LLUVIA-II manual (SAND91-2416). Investigation has begun to obtain and implement other hydrology codes that may be used for tracer tracking (FEM, TOUGH, LEHGC, etc.)

A PA of impacts on waste isolation of relocating neutron drill hole N-62 was completed.

A PA of impacts on waste isolation of the staked locations of the Proposed Surface Geophysical Surveys was completed.

SNL staff is participating in a working group to improve the surface-based testing job and test planning process. The group reached a consensus of the information needs for PA of impacts on testing and on waste isolation surface-based activities.

Major Activities Upcoming Next Three Months

The documents describing the PA plan for the ESF Title II design support will be completed. The plan

described in the document will be developed and implemented.

The two activities regarding ESF Analysis No. 12—the recommendations for the ESFDR and SBTFRD, and the report SAND92-2248—will be completed.

A new ESF PA analysis investigating the sensitivity of previous analyses to uncertainty in the hydrologic properties of the nonwelded Paintbrush Tuff will be initiated with the writing of a Work Agreement.

New investigations to support ESF design and testing will also be planned. These include the use of hydrocarbons (hydraulic oil, grease, etc.) in the ESF and the use of water for construction and testing.

Other Items to Report

S. Sobolik will become Task Leader of WBS 1.2.5.4.7 in November 1992 replacing M. Fewell.

1.2.5.4.9 DEVELOPMENT AND VERIFICATION OF FLOW AND TRANSPORT CODES

Major Accomplishments

Three abstracts by SNL authors have been accepted for presentation at the winter American Geophysical Union (AGU) meeting in December 1992:

- "Comparison of Numerical and Analytical Estimates for Effective Unsaturated Conductivities for Stratified, Heterogeneous Media," by R. R. Eaton and J. T. McCord (Department 6422);
- "An Experimental Investigation of Matrix Interaction of Fracture Flow," by S. D. Flotz (UNM), V. C. Tidwell (Department 6115), C. A. Kelsey (UNM), and R. R. Eaton (Department 1512);
- "Efforts to Verify and Validate the Lagrangian-Eulerian Model of Hydrogeochemical Transport (LEHGC)," by P. L. Hopkins (Department 1511), M. D. Siegel (Department 6115), and G. T. Yeh (Penn State University).

Significant Meetings Attended

R. R. Eaton attended a one-week course on "Multiphase Flow and Heat Transfer" during the week of September 28, 1992.

P. L. Hopkins attended a tutorial on massively parallel programming for the nCUBE.

Status Report on Ongoing Activities

Code Development (Subactivity 1.6.2.1.2):

A report entitled "Review and Selection of Unsaturated Flow Models," by M. Reeves, J. Duguid and N. Jasek (M&O), is currently being reviewed by SNL Department 1513 staff. The AVS was successfully used to visualize the three-dimensional data sets being used as the basis for the INTRAVAL and the TSPA simulations.

The two-dimensional porosity simulations using SGSIM for the INTRAVAL north-south cross section are continuing. A member of the SNL staff has added a PV-WAVE program, POROS, that allows quick and easy display of the results of the simulations. The programs for these simulations have been placed in an area accessible to SNL staff.

A geostatistical unit adaptive method (GUAM) has been written to take the cross sections from the three-dimensional simulations and superimpose distinct units. The program is being tested and evaluated as to usefulness.

The geostatistical adaptive grid (GAG) program is being tested and debugged. SNL staff has provided additional data from J-13 and Mortendad Canyon (Jemez Mountains of NM), and the data have been added to the data files for generating the correlations between the hydrologic parameters. SNL staff is currently reviewing the rest of the data in the data files.

Software Quality Assurance (QA) (No SCP activity)

A member of the SNL staff prepared for and participated in the NCAR audit.

The work to qualify JAC2D and MERLINII codes has been completed.

The effort to process software QA records continues.

1.2.9 PROJECT MANAGEMENT

The objective of the Project Management element includes work scope related to project-level planning and control, and management of contract activities. The Project Management element includes two tasks: Technical Project Office Management (1.2.9.1.2) and Project Control (1.2.9.2.2).

1.2.9.1.2 TECHNICAL PROJECT OFFICE MANAGEMENT

Significant Meetings Attended

T. E. Blejwas and J. T. Holmes attended the Technical Advisory Group Meeting on October 2, 1992 in Las Vegas, NV.

T. E. Blejwas and J. T. Holmes also attended the Project Manager/Technical Project Officer (TPO) Meeting from 9 to 11:30 a.m. and the Planning and Budget Meeting from 12:30 to 1:30 p.m. on October 23, 1992 in Las Vegas, NV.

T. E. Blejwas made a presentation to C. P. Gertz regarding impacts on SNL of recent budget estimates from 1:30 to 3:00 p.m. on October 23, 1992 in Las Vegas, NV.

Other Items to Report

Effective November 1, 1992, T. E. Blejwas has taken another position at SNL and will no longer be the TPO for the YMP from SNL. Effective November 9, 1992, the new TPO will be L. E. Shephard.

1.2.9.2.2 PROJECT CONTROL

Major Accomplishments

The final SNL cost totals for FY92 were reported to the YMPO on October 13, 1992, on time according to the Project schedule. The SNL budget and actual cost data for the YMP has been installed online for reference by the SNL task leaders and managers. The SNL monthly report for September was transmitted electronically to the YMPO. Parade version 2.1 was installed to support future analysis of Planning and Control System (PACS) milestones and costs. Upper tier Work Agreements between the TPO and each Task Leader were developed for FY93 WBS elements.

Significant Meetings Attended

Staff attended a half-day seminar sponsored by the Albuquerque Project Management Institute.

Status Report on Ongoing Activities

The YMPO crosswalk was verified against the SNL crosswalk using the FY92 WBS Dictionary and the Interim WBS Dictionary.

Work scopes for newly identified summary accounts for the FY93 PACS exercise are being developed and Mission 2001 work scopes are being revised.

The SNL PACS software has been modified to support the WBS structure and the reporting requirements in the new fiscal year. Work continues on the installation of the new NOVELL server computer to support the PACS processing requirements. Work has begun on modifications to the SNL on-line copy of the WBS Dictionary. Development of the SNL Contractor WBS Dictionary and appendices (History File and Interface Identification) continued. Development of change requests (CRs) for the revision of the YMP Project Interim WBS Dictionary based on SNL work were initiated. As a part of the implementation of a configuration management system, work continued on the Personnel Database table on the on-line system.

The SNL YMP Project and Control System staff provided additional support to management in developing ad hoc budgets and schedules for an October 23, 1992 presentation to the Project Manager, C. Gertz.

Major Activities Upcoming Next Three Months

SNL is awaiting the arrival of the new PACS Participant Workstation software and database configuration required to support the 1993 fiscal year. The FY93 PACS or work scope schedule exercise will be completed in mid-November. The Contractor WBS Dictionary and appendices will be completed. Development of an SNL "Configuration Management Plan" will be continued.

1.2.11 QUALITY ASSURANCE

The objective of the Quality Assurance element includes work scope related to the development and maintenance of project participants' assurance programs consisting of all those planned and systematic actions necessary to provide adequate confidence that the information to obtain a license for siting, constructing, and operating a geologic repository and monitored retrievable storage facility will be met and complies with Federal regulations.

1.2.11 Quality Assurance

Major Accomplishments

One scheduled subcontractor audit was completed this month. The SNL QA audit of the National Center for Atmospheric Research (NCAR) identified ten problem areas requiring corrective action.

The annual QA evaluation of all active SNL Procurement Contracts for the YMP was completed. Based upon review criteria and QA Grading of WBS activities, SNL contractors were selected for audit. The SNL QA Audited Schedule for FY93 was issued to SNL YMP and YMP Quality Assurance Department (QAD).

Significant Meetings Attended

R. Richards attended the YMP QA Manager's meeting and the Quality Assurance Requirements and Description (QARD) comment resolution meeting on October 14 and 15, 1992 in Las Vegas, NV.

Status Report on Ongoing Activities

The procedure-steamlining process continues. The improvement and simplification of SNL Quality Assurance Implementing Procedures (QAIPs) will continue, as will activity on the development of a new computer-network-based QA matrix. QAIPs 4-1, "Procurement," 7-1, "Procurement Verification Activities," and 17-2, "Data Records Management System," were completed and have been or will be issued.

Routine QA review of procurement documents continues. The QA review of active SNL contracts was completed and a procurement database was developed to identify/cross index contractor WBS activities with the applicable Graded QA Program requirements.

Work on providing input to the Training program continues. A draft Orientation Manual for SNL YMP activities is receiving critical review and an effort was undertaken to compare and assess procedure usage versus training assignments.

Work Agreements have been issued for SNL YMP work activities. Current efforts are centered on developing lower-tier Work Agreements to define specific ongoing work activities. A QA Advisory was issued to clarify this activity. Work plans are being recalled and replaced by Work Agreements.

Major Activities Upcoming Next Three Months

Two surveillances are scheduled for the next quarter. Areas to be reviewed include QA programmatic elements 1, 2, 5, 6, 12, 13, 16, 17, and 18.

A Project Office audit will be conducted in November 1992. Preliminary arrangements to support the YMP QAD audit have been completed. Plans for core team meetings to establish SNL contact personnel, readiness actions, etc., are in progress.

Issuance of the new OCRWM QARD in December or January will require a plan to implement the new requirements, change procedures, and provide input to the YMP requirements matrix.

1.2.12 INFORMATION MANAGEMENT

The objective of the Information Management element includes work scope related to the project-level establishment of systems to facilitate organization, storage, and retrieval of information/documents. The Information Management element is comprised of four tasks: Information Management Coordination and Planning (1.2.12.1), Local Records Center Operation (1.2.12.2.2), Participant Records Management (1.2.12.2.3), and Document Control (1.2.12.2.5)

1.2.12.1 INFORMATION MANAGEMENT COORDINATION AND PLANNING

Major Accomplishments

The input to the PACS for 1.2.12 was developed.

Major Activities Upcoming Next Three Months

Upcoming Information Resource Management Council meetings will be supported. The response to the ITRLRP will be prepared and submitted.

1.2.12.2.2 LOCAL RECORDS CENTER OPERATION

Major Accomplishments

Four members of the Records Management Staff were fully involved for two weeks with the complete inventory of the YMP Local Records Center (LRC), dual-storage area, Participant Data Archive (PDA), and selected personnel. The inventory was essentially completed. Copies of inventory forms were completed and submitted to the YMP Information Resources Manager.

QAIP 17-2, "Data Records Management System" was revised.

D. Loftus has joined the Records Management staff as a replacement for resigning staff.

Five boxes of proprietary "Procurement" records were prepared for SNL approval signatures and SNL microfilming.

Status Report on Ongoing Activities

An inventory of technical data and records residing in the PDA was completed.

Major Activities Upcoming Next Three Months

All Desk Guidances will be completed and submitted for SNL approval.

Records staff will support the DOE/YMP QA audit in November.

The Records Management Total Quality Team will be formed to review the Records Series and the Master List of File Codes, and to revise records packaging processes to simplify work and enhance the organization of Project or topic files.

Technical data submitted to the PDA will be reviewed to ensure that records were appropriately identified and then forwarded to the YMP CRF.

The Records Management Total Quality Team will review the technical data record packaging process to determine if improved processing to reduce redundancy and duplication of efforts and improve protection of data is possible.

1.2.12.2.3 PARTICIPANT RECORDS MANAGEMENT

Major Accomplishments

Detailed planning for the FY93 PACS was completed.

Major Activities Upcoming Next Three Months

Planning for the move into a new facility will get underway.

1.2.12.2.5 DOCUMENT CONTROL

Major Accomplishments

The Document Control System is now fully operational on the Administrative Information Management System (AIMS) and is available to all staff through the LAN. The parallel system on a PC has been backed up and shut down. This represents a major step toward making this information readily available to individuals who have a need to access it and to reduce the amount of paper distributed.

Status Report on Ongoing Activities

The Document Control staff is in the process of recalling a number of controlled documents and preparing and submitting record packages for same to the LRC. This effort will continue over the next three months. Fine-tuning of work continues on the on-line Controlled Document System Software on the AIMS System.

Major Activities Upcoming Next Three Months

SNL will continue to prepare and submit record packages to the LRC for superseded and recalled controlled documents.

The Controlled Document Staff will support the November 30-December 4 DOE/YMP QA audit as well as being audited as part of Criteria 6.

1.2.14 INSTITUTIONAL

The objective of the Institutional element includes work scope related to institutional and external interactions. The Institutional element includes the Communications and Liaison (1.2.14.3) task.

1.2.14.3 COMMUNICATIONS AND LIAISON

Status Report on Ongoing Activities

R. Orzel (Department 6351) represented SNL on the public tour conducted at Yucca Mountain, NV on October 17, 1992. These tours are conducted monthly as part of the DOE public outreach program. A representative from each of the Yucca Mountain Project (YMP) participants is requested to staff the exhibits at the FOC and answer questions that the public might have about the displays.

Issues/Potential Problems Needing Resolution and Potential Impacts

No funding is currently available for this activity. Although SNL has been directed to continue to support the tours.

1.2.15 SUPPORT SERVICES

The objective of the Support Services element includes work scope related to project-level general administrative and project support activities. The Support Services element is comprised of three tasks: Support Services Coordination and Planning (1.2.15.1), Administrative Support (1.2.15.2), and YMP Support for the Training Mission (1.2.15.3).

1.2.15.1 SUPPORT SERVICES COORDINATION AND PLANNING

Major Accomplishments

Planning for the FY93 PACS input was completed.

Major Activities Upcoming Next Three Months

Planning for the move to a new facility will begin.

1.2.15.2 ADMINISTRATIVE SUPPORT

Major Accomplishments

The SNL YMP printed and distributed the following reports:

- SAND91-7038, "Performance Prediction of Mechanical Excavators in Yucca Mountain Welded Tuff," by L. S. Costin (SNL), and R. Gertsch and L. Ozdemir (SM). (WBS 1.2.4.2.1.3)

- SLTR90-2002, "Progress Report on the Construction of Event Trees in Support of Scenario Development: Tectonics," by E. Dunn, G. E. Barr, R. W. Barnard, and H. A. Dockery (SNL). (WBS 1.2.1.4.1)

SNL recently conducted its own Nuclear Waste Fund (NWF) property inventory and participated in the SNL-wide, wall-to-wall property inventory during the week of October 19, 1992. SNL resolved questions raised by SNL property auditors.

Status Report on Ongoing Activities

SNL has begun its preparation of conference papers for the International High-Level Waste Management Conference to be held in Las Vegas, NV in April 1993.

Major Activities Upcoming Next Three Months

SNL will prepare and submit conference papers to the International High-Level Waste Management Conference to be held in Las Vegas, NV in April 1993.

SNL will submit to the YMPO a list of property to be returned to the YMPO or disposed of in accordance with NWF requirements.

SNL will continue to refine its property database and to work with SNL's Property Management organization in an effort to eliminate conflicting data in the SNL property database.

1.2.15.3 YMP SUPPORT FOR THE TRAINING MISSION

Status Report on Ongoing Activities

Work on lesson plans for training on procedures continues. Three "Geology for Non-Geologists" classes were conducted this month with good results. The classroom sessions are being videotaped and will be edited using techniques that will facilitate viewer interaction during viewing.

The orientation manuals are still in management review. It is expected that the review process will be completed no later than November 15, 1992.

Training records were verified for accuracy with respect to dates in the database vis a vis hardcopy records. The completion of this task closes Corrective Action Report (CAR) 92.01.

An interface training session was conducted on October 28, 1992. The purpose of the session was to instruct staff on proper interface processes and to allow for some practice using role-playing techniques. The session was attended by approximately 45 persons.

Major Activities Upcoming Next Three Months

The "Geology for Non-Geologists" course will be completed and editing of the "Geology for Non-Geologists" course tapes will begin.

The orientation manuals will be finalized and work will begin on the development of additional lesson plans.

A new records manager will be hired to replace the resigning manager.