

MONTHLY HIGHLIGHTS AND STATUS REPORT

Yucca Mountain Site Characterization Project

U.S. DEPARTMENT OF ENERGY

**YUCCA
MOUNTAIN
PROJECT**



**Sandia
National
Laboratories**

September 1993

9312020029 931118
PDR WASTE
WM-11 PDR



Sandia
National
Laboratories

YUCCA
MOUNTAIN

YUCCA
MOUNTAIN
SITE
CHARACTERIZATION
PROJECT

Monthly Status Report

September 1993

Major Sections

	Executive Summary	vii
1.2.1	Systems Engineering	1
1.2.2	Waste Package	2
1.2.3	Site Investigations	3
1.2.4	Repository	13
1.2.5	Regulatory	19
1.2.6	Exploratory Studies Facility	30
1.2.9	Project Management	31
1.2.11	Quality Assurance	33
1.2.12	Information Management	34
1.2.15	Support Services	37

September Highlights

SNL and USGS staff take the first step toward integrating rock properties models with stratigraphic models.

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

One north ramp borehole was drilled, providing stratigraphic data, and criteria were developed for drilling three shallow north ramp boreholes.

See **1.2.3.2.6.2.1 Surface Facilities Exploration Program** on page 5.

Mechanical properties tests were completed on NRG-3 core.

See **1.2.3.2.6.2.2 Surface Facilities Laboratory Tests and Material Property Measurements** on page 6.

The laboratory thermal properties study plan was approved, and testing for saturation effects on thermal conductivity was completed for air-dry and fully saturated samples.

See **1.2.3.2.7.1.1 Laboratory Thermal Properties** on page 7.

September Highlights, Continued

The laboratory thermal expansion testing study plan was approved.

See **1.2.3.2.7.1.2 Laboratory Thermal Expansion Testing** on page 8.

In support of code validation, data were analyzed from four laboratory tests of small, layered polycarbonate models.

See **1.2.4..2.1.2 Rock Mass Analyses** on page 16.

SAND93-1184, "Strategy for Sealing Exploratory Boreholes for the Yucca Mountain Project," was submitted to the Project Office for approval.

See **1.2.4.6.1 Sealing and Design Requirements** on page 18.

The SNL letter report entitled "Experimental and Numerical Investigations of Non-Isothermal Flow in Saturated and Partially Saturated Porous Media" was submitted to the Project Office for approval.

See **1.2.5.4.3 Repository Performance Assessment** on page 22.

The SAND report entitled "Stratigraphy and Hydrogeologic Properties for Total System Performance Assessment 1993" was submitted for internal SNL review.

See **1.2.5.4.4 Site Performance Assessment** on page 23.

Work continued on the manufacture of fracture casts and other analog fractures, and a natural tuff fracture (collected from the Bandelier Formation) was prepared for replication.

See **1.2.5.4.6 Development and Validation of Flow and Transport Models** on page 25.

SEPTEMBER 1993



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.

TABLE OF CONTENTS

WBS 1.2.1	Systems Engineering	1
WBS 1.2.2	Waste Package	2
WBS 1.2.2.4.3	Container/Waste Package Interface Analysis (Ryder)	2
WBS 1.2.3	Site Investigations	3
WBS 1.2.3.1	Site Investigations Coordination and Planning (Davies)	3
WBS 1.2.3.2.2.2.1	Systematic Acquisition of Site-Specific Subsurface Information (Rautman)	3
WBS 1.2.3.2.2.2.2	Three-Dimensional Rock Characteristics Models (Rautman)	4
WBS 1.2.3.2.6.2.1	Surface Facilities Exploration Program (Kessel)	5
WBS 1.2.3.2.6.2.2	Surface Facilities Laboratory Tests and Material Property Measurements (Kessel)	6
WBS 1.2.3.2.6.2.3	Surface Facilities Field Tests and Characterization Measurements (Kessel)	7
WBS 1.2.3.2.7.1.1	Laboratory Thermal Properties (Chocas)	7
WBS 1.2.3.2.7.1.2	Laboratory Thermal Expansion Testing (Chocas)	8
WBS 1.2.3.2.7.1.3	Laboratory Determination of Mechanical Properties of Intact Rock (Price)	9
WBS 1.2.3.2.7.1.4	Laboratory Determination of the Mechanical Properties of Fractures (Price)	10
WBS 1.2.3.2.8.3.3	Ground Motion From Regional Earthquakes and Underground Nuclear Explosions (Shephard)	11
WBS 1.2.3.6.2.1.6	Future Regional Climate and Environments (Schelling)	12
WBS 1.2.4	Repository	13
WBS 1.2.4.1.1	Repository Coordination and Planning (Costin)	13
WBS 1.2.4.2.1.1.1	Excavation Investigations (Pott)	14
WBS 1.2.4.2.1.1.2	In Situ Thermomechanical Properties (Pott)	14
WBS 1.2.4.2.1.1.3	In Situ Mechanical Properties (Pott)	15
WBS 1.2.4.2.1.1.4	In Situ Design Verification (Pott)	15
WBS 1.2.4.2.1.2	Rock Mass Analyses (Jung)	16
WBS 1.2.4.2.3.1	Certification of Design Methods (Jung)	17
WBS 1.2.4.2.3.2	Design Analysis (Ryder)	18
WBS 1.2.4.6.1	Sealing and Design Requirements (Finley)	18
WBS 1.2.5	Regulatory	19
WBS 1.2.5.1	Regulatory Coordination and Planning (Dockery)	19
WBS 1.2.5.2.2	Site Characterization Program (Schelling)	19
WBS 1.2.5.3.5	Technical Database Input (Eley)	20
WBS 1.2.5.4.1	Total System Performance Assessment (Dockery)	20
WBS 1.2.5.4.3	Repository Performance Assessment (Ryder)	22
WBS 1.2.5.4.4	Site Performance Assessment (Dockery)	23
WBS 1.2.5.4.5	Interactive Graphics Information System (Jones)	24
WBS 1.2.5.4.6	Development and Validation of Flow and Transport Models (Tidwell)	25
WBS 1.2.5.4.7	Supporting Calculations for Postclosure Performance Analyses (Sobolik)	28

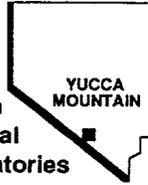
SEPTEMBER 1993

 TABLE OF CONTENTS
(continued)

WBS 1.2.5.4.9	Development and Verification of Flow and Transport Codes (Dockery)	29
WBS 1.2.5.5.2	Energy Policy Act Support (Dockery)	29
WBS 1.2.6	Exploratory Studies Facility	30
WBS 1.2.6.1.1	Exploratory Studies Facility Coordination, Planning, and Technical Assessment (Pott)	30
WBS 1.2.9	Project Management	31
WBS 1.2.9.1.2	Technical Project Office Management (Schelling)	31
WBS 1.2.9.2.2	Project Control (Sharpton)	31
WBS 1.2.11	Quality Assurance (Richards)	33
WBS 1.2.12	Information Management	34
WBS 1.2.12.1	Information Management Coordination and Planning (Sharpton)	34
WBS 1.2.12.2.2	Local Records Center Operation (Sharpton)	34
WBS 1.2.12.2.3	Participant Records Management (Sharpton)	35
WBS 1.2.12.2.5	Document Control (Sharpton)	36
WBS 1.2.15	Support Services	37
WBS 1.2.15.1	Support Services Coordination and Planning (Sharpton)	37
WBS 1.2.15.2	Administrative Support (Sharpton)	37
WBS 1.2.15.3	YMP Support for the Training Mission (Sharpton)	38



Sandia
National
Laboratories



SEPTEMBER 1993

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT EXECUTIVE SUMMARY

WBS 1.2.3.2.2.2.2 Three-Dimensional Rock Characteristics Models

- A tape of the prototype geometric model of Yucca Mountain was received from the USGS and installed on the SNL LYNX system. This interchange of models is the first step toward the integration of SNL's rock properties modeling with the "framework" geometric model being developed by the USGS. SNL and USGS staff are exploring mechanisms for facilitating the joint development of integrated models and ensuring compatibility among quasi-independent models for other applications.

WBS 1.2.3.2.6.2.1 Surface Facilities Exploration Program

- Criteria for the north ramp boreholes designated as NRG-8a, NRG-8b, and NRG-8c were developed for the Job Package for drilling. These shallow boreholes will investigate the depth of alluvium to the west of Exile Hill above the north ramp.
- Drilling of NRG-2b was completed, and an updated cross section of the north ramp that includes the stratigraphic data from NRG-2b was prepared to support programmatic decisions.

WBS 1.2.3.2.6.2.2 Surface Facilities Laboratory Tests and Material Property Measurements

- Mechanical properties tests (ultrasonic velocities, static elastic properties, and unconfined strength) for core from NRG-3 were completed.

WBS 1.2.3.2.7.1.1 Laboratory Thermal Properties

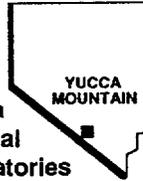
- Study Plan 8.3.1.15.1.1, Revision 1, "Laboratory Thermal Properties," was approved by the Project Office and copies transmitted to the NRC (Level 3 Milestone 0S43).
- Testing for the air-dry and fully saturated samples for the study of the effects of saturation on thermal conductivity was completed. The results of these experiments will help to determine whether thermal conductivity has a predictable dependence on the saturation state of the sample. Results from these tests will be used to determine the optimal baseline test conditions for thermal conductivity characterization.

WBS 1.2.3.2.7.1.2 Laboratory Thermal Expansion Testing

- Study Plan 8.3.1.15.1.2, Revision 1, "Laboratory Thermal Expansion Testing," was approved by the Project Office and copies transmitted to the NRC (Level 3 Milestone 0S44).



Sandia
National
Laboratories



YUCCA
MOUNTAIN

SEPTEMBER 1993

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
EXECUTIVE SUMMARY Continued

WBS 1.2.4.2.1.2 Rock Mass Analyses

- Work related to laboratory testing of small, layered polycarbonate models continued in support of code validation efforts. The data from four tests were analyzed. The four tests included a far-field view of loading normal to the plate, a close-up view of loading normal to the plate, a far-field view of loading at 10° to the plate, and a close-up view of loading at 10° to the plate. The results of the first two experiments showed the displacements around the hole to be nearly symmetrical. The experiments also detected joints that exhibited 2 microns to 3 microns of uniform slip.

WBS 1.2.4.6.1 Sealing and Design Requirements

- SAND93-1184, "Strategy for Sealing Exploratory Boreholes for the Yucca Mountain Project," was submitted to the Project Office for approval (Level 3 Milestone 0S24). This report develops a strategy for sealing boreholes based on evaluations of the current and planned borehole system, the potential impacts on performance that the borehole system could have, and the available technologies to seal boreholes.

WBS 1.2.5.4.3 Repository Performance Assessment

- The SNL letter report entitled "Experimental and Numerical Investigations of Non-Isothermal Flow in Saturated and Partially-Saturated Porous Media" was submitted to the Project Office (Level 3 Milestone 0S06).

WBS 1.2.5.4.4 Site Performance Assessment

- The SAND report entitled "Stratigraphy and Hydrogeologic Properties for Total Systems Performance Assessment 1993" was completed and submitted for internal SNL review. The report presents the TSPA-2 stratigraphy development of the three-dimensional representation of the proposed repository area and the hydrologic parameters developed for each of the model stratigraphy units.
- Work continued on the manufacture of fracture casts and other analog fractures. Once these manufacturing technologies are refined, they will be used to produce experimentally controlled fractures for characterization of relative permeability and other flow properties of Yucca Mountain fractures.

WBS 1.2.5.4.6 Development and Validation of Flow and Transport Models

- A natural tuff fracture collected from the Bandelier formation was prepared for replication. Fractures within the sample, other than the one of interest, were cemented with epoxy to prevent damage during processing. The fracture was then trimmed to a rectangular shape and cast into a fixture. After surface preparation, the fixture will be used to cast negative replicas of the fracture surfaces, which will subsequently be used to produce clear epoxy casts. In addition to replicating natural fractures, direct manufacture of controlled aperture fields is also under development.

SEPTEMBER 1993



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 to the MGDS design, system configuration, and site characterization activities. The Systems Engineering element is comprised of four 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), and Special Studies (1.2.1.5), which includes development of items important to safety/waste isolation.

All commitments scheduled within the Systems Engineering element have been fulfilled.

SEPTEMBER 1993

1.2.2 WASTE PACKAGE

The objective of the Waste Package element includes support to the Container/Waste Package Interface Analysis element (1.2.2.4.3) in the conduct of thermal and structural analysis of the near-field environment that will support evaluations of emplacement orientation, the effects of backfill properties and timing, as well as other thermal loading issues related to waste package design.

1.2.2.4.3 CONTAINER/WASTE PACKAGE INTERFACE ANALYSIS

Major Accomplishments

The formulation of a bench-scale experiment to develop an empirical relationship for the thermal conductivity of backfill continued. Additional pre-test analyses have been completed and are being used to establish instrumentation requirements, instrumentation locations, and approximate test durations.

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 twelve tasks: Site Investigations Coordination and Planning (1.2.3.1), Systematic Acquisition of Site-Specific Subsurface Information (1.2.3.2.2.1), Three-Dimensional Rock Characteristics Models (1.2.3.2.2.2), Surface Facilities Exploration Program (1.2.3.2.6.2.1), Surface Facilities Laboratory Tests and Material Property Measurements (1.2.3.2.6.2.2), Surface Facilities Field Tests and Characterization Measurements (1.2.3.2.6.2.3), 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 the Future Regional Climate and Environments (1.2.3.6.2.1.6).

1.2.3.1 SITE INVESTIGATIONS COORDINATION AND PLANNING

Significant Meetings Attended

On September 1, SNL staff attended the Sample Overview Committee (SOC) meeting in Area 25 at the Nevada Test Site (NTS). Numerous sample requests by various Project participants were addressed. The planned processes for development of the test planning package for the first SD borehole, SD-12, were discussed. Specimen Removal Requests for SD-12 were rejected. A letter from the Chair of the SOC concurring with the packaging requirements will be sent to the project engineer for the test planning package. Actual Specimen Removal Requests will be required after the hole is drilled.

Status Report on Ongoing Activities

Oversight activities of Site Investigations elements were conducted. In addition, considerable effort was invested in participation in the Project Office Quality Assurance (QA) audit from September 13 to 17 and in a number of additional interactions on planning the FY94 budget, workscope, and deliverables.

1.2.3.2.2.1 SYSTEMATIC ACQUISITION OF SITE-SPECIFIC SUBSURFACE INFORMATION

Status Report on Ongoing Activities

The first draft of the test planning package for drill hole SD-12, located along the main test level drift of the Exploratory Studies Facility (ESF), was received and reviewed during September. Comments were provided to the project engineer, and it is hoped that a final version will be available soon for approval by the concerned Technical Project Officers (TPOs). Drilling of SD-12 is scheduled to commence during October. (SCP Activity 8.3.1.4.3.1.1)

The paper entitled "Spatial Variability of Hydrologic Properties in Volcanic Tuff," intended for publication in the journal *Groundwater*, continues in SNL review. Comment responses were prepared, but are not yet signed off. The paper is an expansion of work originally presented at the International High-Level Radioactive Waste Management Conference in April and includes a test of the hypotheses developed by the original work. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

SNL staff normally assigned to this activity continued to be heavily involved in providing geologic support for work breakdown structure (WBS) element 1.2.3.2.6.2, Soil and Rock Properties of Potential Locations of Surface

SEPTEMBER 1993

Facilities. (SCP Activity 8.3.1.14.2.1) Geologic logging of core, virtually identical to that scheduled for the Systematic Drilling Program, is the principal focus of this support. SNL staff met on several occasions with U.S. Geological Survey (USGS) staff to discuss criteria for logging and for distinguishing stratigraphic units. (SCP Activity 8.3.1.4.3.1.1)

The draft data reports, tentatively entitled "Physical and Hydrologic Properties of Outcrop Samples From a Nonwelded to Welded Tuff Transition, Yucca Mountain, Nevada" and "Physical and Hydrologic Properties of Surface Outcrop Samples at Yucca Mountain, Nevada," remained in deferred status because of other staff commitments. (SCP Activities 8.3.1.4.3.1.1 and 8.3.1.2.2.3.1)

Major Activities Upcoming Next Three Months

Staff will continue to support the ESF Soil and Rock Properties Study (SCP Activity 8.3.1.14.2.1) as requested. Additional staff will be added. (SCP Activity 8.3.1.4.3.1.1)

Drafts of reports in preparation will be finalized and reviewed. Principal emphasis will be placed on completing all prerequisites for initiating the Systematic Drilling Program, probably in early FY94. Drill hole SD-12 is anticipated to be the first hole; initiation is dependent upon completion of drill hole UZ-14 and release of the LM300 drill rig. (SCP Activity 8.3.1.4.3.1.1)

1.2.3.2.2.2.2 *THREE-DIMENSIONAL ROCK CHARACTERISTICS MODELS*

Major Accomplishments

The updated version of the Lynx GMS software package (ver. 2.8) received late in August from the vendor, Lynx Geosystems, Inc., of Vancouver, B.C., was successfully installed and tested. A staff member has been added to work with the Lynx system. (SCP Activity 8.3.1.4.3.2.1)

A tape of the prototype geometric model of Yucca Mountain has been received from the USGS (SCP Activity 8.3.14.2.3.1) and installed on the SNL Lynx system. This interchange of models is the first step toward the integration of rock properties modeling with the "framework" geometric model being developed by the USGS. SNL and USGS staff are exploring mechanisms for facilitating the joint development of integrated models as appropriate and ensuring compatibility among quasi-independent models for other applications. (SCP Activity 8.3.1.4.3.2.1)

Status Report on Ongoing Activities

Little additional modeling activity has been performed on the models of rock quality designation (RQD) described last month because RQD data were not yet available for all north ramp drill holes. Work will resume during October to incorporate the missing data from holes NRG-4 and NRG-5. (SCP Activity 8.3.1.4.3.2.1)

Preparation of the study plan for the three-dimensional rock characteristics models study continued, using the revised U.S. Department of Energy/Nuclear Regulatory Commission (DOE/NRC) level-of-detail agreement for study plans. Other priorities severely limit the amount of time available for this work. An additional staff person joined staff who are supporting the three-dimensional rock characteristics study and will accelerate preparation of this study plan following completion of required training. Staff anticipates meeting the currently scheduled milestone date of December 31. (SCP Activity 8.3.1.4.3.2.1)

SEPTEMBER 1993

Draft text sections for the 1993 Total System Performance Assessment (TSPA) summary document describing the construction of the repository-scale three-dimensional indicator simulations of lithology were completed during the month. This material was also written as an extended summary entitled "Stochastic Indicator Models of Lithology, Yucca Mountain, Nevada," by C. A. Rautman and T. H. Robey (Spectra Research Institute), and submitted for consideration for presentation at the 1994 International High-Level Waste Management Conference. (SCP Activity 8.3.1.4.3.2.1)

Major Activities Upcoming Next Three Months

Rock quality along the trace of the north ramp will be modeled. Software development efforts to integrate the Lynx and geostatistical modeling packages will commence. A description of this integration mechanism and an implementation plan will be prepared. (SCP Activity 8.3.1.4.3.2.1)

Other Items to Report

Due to SNL YMP staff move to new facilities, computer facilities were significantly disrupted, and some work on the Lynx model was delayed. A new network was installed and is amenable to inter-participant communication and data transfer, which should enhance the USGS/SNL integrated modeling activities.

1.2.3.2.6.2.1 SURFACE FACILITIES EXPLORATION PROGRAM

Major Accomplishments

Criteria for the NRG-8a, NRG-8b, and NRG-8c boreholes were developed for the Job Package for drilling. These shallow boreholes will investigate the depth of alluvium to the west of Exile Hill above the north ramp.

Drilling of NRG-2b was completed, and an updated cross section of the north ramp that includes the stratigraphic data from NRG-2b was prepared.

Status Report on Ongoing Activities

The north ramp will pass through a zone of nonwelded tuff on the west side of the Bow Ridge Fault. Additional geotechnical information is required to plan tunnel boring machine operations for this zone. A plan for additional exploration activities is being developed.

Major Activities Upcoming Next Three Months

Additional exploration activities will be initiated to further evaluate the nonwelded tuff and its implications for tunnel boring machine operation.

SEPTEMBER 1993

**1.2.3.2.6.2.2 SURFACE FACILITIES
LABORATORY TESTS AND
MATERIAL PROPERTY
MEASUREMENTS**

Major Accomplishments

Mechanical properties data (ultrasonic velocities, static elastic properties, and unconfined strength) for core from NRG-3 were measured.

Status Report on Ongoing Activities

Samples from NRG-6 to 416.0 ft are being tested. Samples below 416.0 ft were received from the Samples Management Facility and are being prepared for testing.

Thermal Conductivity Testing

Thermal conductivity testing on oven-dry samples were completed at 30°C, 50°C, and 70°C. The scientific notebooks for testing of fully saturated, air-dry, and oven-dry samples for depths between 0.0 ft and 416.0 ft are being reviewed. These thermal conductivity data will be submitted to the Project database after the scientific notebooks are reviewed and data summary sheets are prepared.

Thermal Expansion Testing

The dilatometer system was reassembled and calibrated. Thermal expansion testing on fully saturated samples from ambient temperature to 110°C is in process. For these measurements, the atmosphere surrounding the sample during testing (i.e., high humidity) will be controlled in a saturation test apparatus to minimize sample dehydration at temperatures below the nominal boiling point of 100°C. When this temperature is reached, the temperature will be held constant for 30 hours and the sample allowed to dehydrate until the length stabilizes. Heating will be restarted and will continue until 300°C is reached. The sample then will be cooled to ambient temperature.

Mineralogy

Mesoscopic descriptions from 17 samples (depths of 22.2 ft to 416.0 ft) were completed. Polished thin sections are being examined and powdered

samples are being prepared for x-ray diffraction and whole rock chemical analysis. These analyses will be used to interpret data from thermal and mechanical tests and to determine if correlations exist between these values and the physical properties of the rock.

Mechanical properties testing is underway on core samples from NRG-5 and NRG-2a. Thermal properties testing is underway on core samples from NRG-6. Soils laboratory tests are being performed on samples from NRG-2b.

Major Activities Upcoming Next Three Months

Thermal properties testing will be completed and reported to the Project Office.

Core samples from NRG-7 will be submitted for mechanical properties testing.

Other Items to Report

Priority has been given to thermal properties testing on samples from NRG-6 until additional test equipment is brought on-line for studies to establish baseline test conditions for site characterization. See WBS element 1.2.3.2.7.1.1, Laboratory Thermal Properties, and WBS element 1.2.3.2.7.1.2, Laboratory Thermal Expansion Testing, for discussion of these activities.

SEPTEMBER 1993

**1.2.3.2.6.2.3 SURFACE FACILITIES FIELD
TESTS AND
CHARACTERIZATION
MEASUREMENTS**

Major Accomplishments

Structural and lithologic logs were completed for NRG-2b and NRG-4. Standard penetration tests were completed in NRG-2b.

Status Report on Ongoing Activities

The scientific notebook for geotechnical core logging, which is used to prepare the geologic and structural logs for boreholes, is being reviewed and revised for issuance as a technical procedure (TP).

Major Activities Upcoming Next Three Months

A soils testing program will be initiated to support design of a booster pump station, water storage tanks, and the ESF muck conveyer system. Geologic and structural logs will be prepared for NRG-7.

**1.2.3.2.7.1.1 LABORATORY THERMAL
PROPERTIES**

Status Report on Ongoing Activities

Study Plan 8.3.1.15.1.1, Revision 1, "Laboratory Thermal Properties," was reviewed and approved by the Yucca Mountain Site Characterization Project Office (YMPO), and copies were transmitted to the NRC. This revision updates the study plan with respect to the current configuration of the ESF and completes SNL Level 3 Milestone OS43 for WBS element 1.2.3.2.7.1.1.

Testing of the air-dry and fully saturated samples for the study of the effects of saturation on thermal conductivity was completed. Testing is in process for oven-dry and two other intermediate saturation states. These experiments will determine whether thermal conductivity has a predictable dependence on the saturation state of the sample and, if so, will describe the nature of the relationship. Results from these experiments will be used to determine the optimal baseline test conditions for thermal conductivity characterization. (SCP Activity 8.3.1.15.1.1.3)

Major Activities Upcoming Next Three Months

Testing activities for the study of the effects of saturation on thermal conductivity will be completed. Three samples of welded devitrified tuff and three samples of nonwelded zeolitic tuff will be used for this study. The thermal conductivity of each sample will be measured at nominal temperatures of 30°C, 50°C, and 70°C at five different saturation states (fully saturated, oven-dry, air-dry, and two other intermediate states). A moisture containment cell will be used for controlling the test environment. (SCP Activity 8.3.1.15.1.1.3)

After test samples are machined and inspected, the study of the effects of fractures on thermal conductivity will be initiated. The thermal conductivity of two air-dry samples from Unit TSw2 will be measured using the comparative method. A nominal temperature of 30°C and stress levels of 0 MPa, 2.5 MPa, 5 MPa, 7.5 MPa, and 10 MPa will be used. After the samples are tested, they will be cut in half and the fracture surface roughened. The halves will

SEPTEMBER 1993

be rejoined, and the thermal conductivity measurements will be repeated. (SCP Activity 8.3.1.15.1.1.3)

Technical and safety procedures for the rock crushing and grinding equipment at the University of New Mexico (UNM) will be developed.

1.2.3.2.7.1.2 LABORATORY THERMAL EXPANSION TESTING

Status Report on Ongoing Activities

Study Plan 8.3.1.15.1.2, Revision 1, "Laboratory Thermal Expansion Testing," was reviewed and approved by the YMPO, and copies were transmitted to the NRC. This revision updates the study plan with respect to the current configuration of the ESF and completes SNL Level 3 Milestone OS44 for WBS element 1.2.3.2.7.1.2.

Priority has been given to thermal expansion testing on samples from NRG-6 (see WBS element 1.2.3.2.6.2.2, Surface Facilities Exploration Program). Until additional test equipment is brought on-line, the studies to establish baseline test conditions for thermal expansion measurements have been delayed.

The dilatometer environmental tube is being modified to be compatible with the saturation test apparatus, and calibration of the dilatometer system is in process.

The study of the effects of sample size on thermal expansion will begin after a successful calibration. Results from these experiments will be used to determine the optimal baseline test conditions for thermal expansion characterization. (SCP Activity 8.3.1.15.1.2.1)

Major Activities Upcoming Next Three Months

Testing activities for the study of the effects of sample size on thermal expansion will be completed. Five samples each of four different lithologies (welded devitrified, welded vitric, nonwelded vitric, and nonwelded zeolitic) will be tested for each sample size. The samples will be right cylinders of two sizes—0.25-in. (0.6-cm) diameter x 1 in. (2.54 cm) and 1-in. (2.54-cm) diameter x 4 in. (10.2 cm) nominally. The samples will be fully saturated before experiments are started. The samples will be heated, and the atmosphere surrounding the sample during testing (i.e., high humidity) will be controlled in a saturation test apparatus to minimize sample dehydration at temperatures below the nominal boiling temperature of 100°C. When this temperature is reached, the temperature will be

SEPTEMBER 1993

held constant and the sample allowed to dehydrate until the length stabilizes. Heating will be restarted and will continue until the temperature reaches 300°C. The sample then will be cooled to ambient temperature (25°C). (SCP Activity 8.3.1.15.1.2.1)

After the study of the effects of sample size on thermal expansion is completed, the study of the effects of sample saturation will be initiated. Five samples each of four different lithologies (welded devitrified, welded vitric, nonwelded vitric, and nonwelded zeolitic) will be tested. Three initial saturation states will be examined— fully saturated, air-dry, and oven-dry. The atmosphere surrounding the sample during testing (i.e., high humidity) will be controlled in a saturation test apparatus to minimize sample dehydration at temperatures below the nominal boiling point of 100°C. When this temperature is reached, the temperature will be held constant and the sample allowed to dehydrate until the length stabilizes. Heating will be restarted and will continue until 125°C is reached. The sample then will be cooled to ambient temperature. (SCP Activity 8.3.1.15.1.2.1)

1.2.3.2.7.1.3 LABORATORY DETERMINATION OF MECHANICAL PROPERTIES OF INTACT ROCK

Major Accomplishments

SAND92-1810, "Unconfined Compression Experiments on Topopah Spring Member Tuff at 22°C and a Strain Rate of 10^{-9}s^{-1} : Data Report," was printed and distributed in September. (SCP Activity 8.3.1.15.1.3.2)

SAND93-2051A, "Strength-Size-Porosity Empirical Model for Yucca Mountain Tuff," has been approved and submitted for publication and presentation at the Fall 1993 American Geophysical Union (AGU) meeting in San Francisco, CA on December 6 through 10.

Status Report on Ongoing Activities

Study Plan 8.3.1.15.1.3, "Laboratory Determination of the Mechanical Properties of Intact Rock," was initially published in May 1991. A revision (Rev. 1) including the present plans for the ESF was submitted to the Project Office on July 7, 1993. Review comments on Rev. 1 have been received, and responses will be prepared in the next two months. (SCP Activities 8.3.1.15.1.3.1 and 8.3.1.15.1.3.2)

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 most recent series of experiments consists of samples of TSw2 tested at a pore pressure of 4.5 MPa, a confining pressure of 5 MPa, and a maximum constant differential stress of 80 MPa. Initially, the experiments are performed at room temperature, followed by an interval at 250°C. At the conclusion of the most recent experiment, the internal furnace was damaged. The furnace has been repaired, and the system is being calibrated. The testing has been suspended because of a lack of funding for FY94. If funding is added for this activity, the testing will continue as soon as possible. (SCP Activity 8.3.1.15.1.3.2)

NER is also performing a study of the mechanical properties of tuff samples from a series of drill holes denoted as NRG (north ramp geology).

SEPTEMBER 1993

These holes are located along the length of the planned position of the north ramp of the ESF. The samples are machined, dried, and saturated prior to testing at uniaxial and triaxial conditions. Other samples are tested in indirect tensile (Brazil) experiments, and velocities are measured. This month, unconfined experiments, Brazil tests, and measurements of average grain density have been completed from samples of UE25 NRG-2A and triaxial experiments have been completed from samples of UE25 NRG-3. The data have been plotted and the results compared with previous existing data from smaller samples. In addition, samples from UE25 NRG-5 were machined. (SCP Activities 8.3.1.15.1.3.1 and 8.3.1.15.1.3.2)

R. Price (SNL) was in White River Junction, VT on September 14 through 17 to meet with the staff at NER. Discussions included plans for an upcoming meeting with the ESF designers, examination of core and test results from NRG drill holes, and the results from time-dependent mechanical properties experiments. (SCP Activities 8.3.1.15.1.3.1 and 8.3.1.15.1.3.2)

Major Activities Upcoming Next Three Months

SAND92-0119, "Experimental Comparison of Laboratory Techniques in Determining Bulk Properties of Tuffaceous Rocks," was submitted to the Project Office on September 22. (SCP Activities 8.3.1.15.1.3.1 and 8.3.1.15.1.3.2)

R. Price, L. Costin, and D. Kessel (SNL) and R. Martin III and P. Boyd (NER) will be in Las Vegas, NV on October 6 to meet with R. Elayer and other members of the Management and Operations (M&O) ESF design team. The meeting will include discussions on the plans for and results from mechanical properties experiments, the use of mechanical property data in the design process, and the schedule for drill holes, sample selection, testing, and design requirements. (SCP Activities 8.3.1.15.1.3.1 and 8.3.1.15.1.3.2)

1.2.3.2.7.1.4 LABORATORY DETERMINATION OF THE MECHANICAL PROPERTIES OF FRACTURES

Major Accomplishments

SAND93-2041A, "Effect of Roughness and Material Strength on the Mechanical Properties of Fracture Replicas," and SAND93-2049A, "Joint Creep in Yucca Mountain Tuff," have been approved and submitted for publication and presentation at the Fall 1993 AGU meeting in San Francisco, CA on December 6 through 10. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

Two SAND reports (SAND92-1853, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Data Report," and 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") were printed in September. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

Status Report on Ongoing Activities

Work is continuing on the development of a computer program to model the dilation, normal stiffness, and shear stiffness of single fractures in rock. An early version of the code was used to study the changes in the aperture of a fracture under normal stress. A bug in the software was discovered during this process. Major modifications to the program are being made and then analysis will continue. (SCP Activity 8.3.1.15.1.4.2)

The data from a long-term creep test on a sawcut in Topopah Spring Member tuff are being analyzed. Under dry, room-temperature conditions, steady-state creep is never attained; only transient creep is observed. A peculiar phenomenon was recorded in two of the several incremental creep tests. Usually, a step increase in the shear stress was associated with a step increase in slip followed by the transient. In two cases, there was a delay of as much as 15 hours before the sudden increase in slip occurred. The effects of this phenomenon are being investigated. (SCP Activity 8.3.1.15.1.4.2)

SEPTEMBER 1993

A comment resolution meeting for Study Plan 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," was held in Las Vegas, NV on August 19. All three authors were at the meeting to respond to comments from the Project Office review. The authors agreed on changes to the plan resulting from the comments, and a plan revision was submitted to the Project Office on September 9. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

Major Activities Upcoming Next Three Months

SAND93-1466A, "Simple Mathematical Model of a Rough Fracture Using the Concepts of Fractal Geometry," will be presented at the national Geological Society of America (GSA) meeting in Boston, MA in October 1993. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

The draft of a new standard test method, "Standard Test Method for Normal and Shear Stiffness of Rock Fractures Using a Compression/Rotary Shear Apparatus," completed the first review and vote by the American Society for Testing Materials (ASTM) Subcommittee D18.12 on Rock Mechanics. The draft was well received, with relatively few technical comments. The draft will be revised in the next two months. (SCP Activities 8.3.1.15.1.4.1 and 8.3.1.15.1.4.2)

1.2.3.2.8.3.3 GROUND MOTION FROM REGIONAL EARTHQUAKES AND UNDERGROUND NUCLEAR EXPLOSIONS

Status Report on Ongoing Activities

Revisions to the study plan entitled "Ground Motion From Regional Earthquakes and Underground Nuclear Explosions" have been completed. The study plan is being prepared for transmittal to the Project Office for comment resolution.

Major Activities Upcoming Next Three Months

The development of a preliminary ground motion model for Yucca Mountain will be initiated.

SEPTEMBER 1993

***1.2.3.6.2.1.6 FUTURE REGIONAL CLIMATE
AND ENVIRONMENTS***

Status Report on Ongoing Activities

A draft study plan has been prepared and is being reviewed internally by staff prior to SNL review. Training was initiated for several National Center for Atmospheric Research (NCAR) staff members. Preparation for the forthcoming readiness review was initiated.

Issues/Potential Problems Needing Resolution and Potential Impacts

The transition plan for transferring global climate work from Pacific Northwest Laboratory (PNL) to SNL has not been issued, and no information has yet been received from PNL. No major impacts are expected. It is anticipated that final PNL reports will be submitted shortly.

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 nine 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 Analyses (1.2.4.2.1.2), Certification of Design Methods (1.2.4.2.3.1), Design Analysis (1.2.4.2.3.2), and Sealing and Design Requirements (1.2.4.6.1).

1.2.4.1.1 REPOSITORY COORDINATION AND PLANNING

Status Report on Ongoing Activities

SNL continued its construction monitoring activities at the ESF starter tunnel being conducted under Study Plan 8.3.1.15.1.8. In the past month, seismic records from construction blasting were recorded and rock mass quality estimates for the first 200 ft of tunnel were developed. Data packages for these two activities are being prepared for submittal to the records system. Rock bolt load cells were installed at two stations and readings were recorded at regular intervals. Additional rock bolts were located for the remainder of the load cells. Installation of these load cells is delayed, pending pull testing of the rock bolts. Locations for the two multiple-point borehole extensometers (MPBXs) were identified, but the drilling of the holes was delayed until early October. Once the drilling is completed, the MPBX gages will be installed, along with wiring to connect the load cells and MPBX gages to an automatic data recording system. The information collected during this investigation is being provided to the M&O design and construction management team so that real-time evaluations of the performance of the excavations, construction techniques, and ground support can be made.

Installation of instrumentation for the north ramp starter tunnel will be completed under Study Plan 8.3.1.15.1.8, "In Situ Design Verification."

Test planning packages will be initiated for the excavation investigations study plan (8.3.1.15.1.5) access convergence test and the continuation of the design validation study plan (8.3.1.15.1.8). Both these tests will be conducted during construction of the north ramp.

Other Items to Report

SNL staff is continuing temporary monitoring of rock mass movement as the ESF starter tunnel is excavated. Several sets of tape extensometer pins have been installed to monitor closure of the pilot heading. This work is not part of the design verification study plan (8.3.1.15.1.8), but is similar in nature to the more permanent monitoring that will be installed under the study plan. This temporary monitoring is being conducted under WBS element 1.2.6.1.1. As permanent in-tunnel monitoring instrumentation is installed, staff will add the data collected from this instrumentation to its weekly report to the M&O Construction Manager. The M&O Construction Manager will have immediate access (weekly reports) to all SNL geotechnical data from the starter tunnel and north ramp.

Major Activities Upcoming Next Three Months

Staff will complete test interference analyses in support of study plan development and ESF design requirements (Milestone OS17).

SEPTEMBER 1993

1.2.4.2.1.1.1 EXCAVATION INVESTIGATIONS

Status Report on Ongoing Activities

Staff continued to incorporate changes to Study Plan 8.3.1.15.1.5, "Excavation Investigations," in response to comments received from Project Office reviewers.

Major Activities Upcoming Next Three Months

Staff will work with Project Office reviewers to finalize the Study Plan 8.3.1.15.1.5, "Excavation Investigations."

1.2.4.2.1.1.2 IN SITU THERMOMECHANICAL PROPERTIES

Status Report on Ongoing Activities

Staff finished work on the rough draft of Study Plan 8.3.1.15.1.6, "In Situ Thermomechanical Properties."

Major Activities Upcoming Next Three Months

The SAND report entitled "Test Instrumentation for the ESF In Situ Thermomechanical Experiments" will be revised to incorporate comments from management review.

Under Los Alamos National Laboratory (LANL) coordination, staff will work with Lawrence Livermore National Laboratory (LLNL) staff to consolidate SNL's ESF thermomechanical testing with LLNL's hydrothermal testing, if possible.

Work will continue on Study Plan 8.3.1.15.1.6.

SEPTEMBER 1993



1.2.4.2.1.1.3 IN SITU MECHANICAL PROPERTIES

Status Report on Ongoing Activities

Staff finished work on the rough draft of Study Plan 8.3.1.15.1.7, "In Situ Mechanical Properties."

As a result of lack of funding in FY94 for this study, no further work on the draft study plan will be done.

1.2.4.2.1.1.4 IN SITU DESIGN VERIFICATION

Status Report on Ongoing Activities

Staff continued construction monitoring of the ESF north ramp starter tunnel. The monitoring plans include seismic monitoring for blasting, rock quality determination, ground support system performance evaluations, and excavation closure monitoring for stability assessments. In this reporting period, seismic blast monitoring was conducted and installation of load cells to be used to monitor rock bolts used as ground support continued. A Sandia letter report summarizing the rock quality determination for the starter tunnel was completed.

As an activity separate from construction monitoring, staff fielded additional monitoring activities in the north ramp starter tunnel to address safety concerns. Convergence monitoring of the tunnel and support girders was conducted, and rock bolt load cells for evaluating ground support were monitored.

Major Activities Upcoming Next Three Months

Staff will continue to field construction monitoring activities and to procure and design instrumentation and a data acquisition system needed for future monitoring activities.

Staff will continue to field the additional monitoring activities in the north ramp starter tunnel to address safety concerns as an activity separate from construction monitoring.

SEPTEMBER 1993

1.2.4.2.1.2 ROCK MASS ANALYSES

Status Report on Ongoing Activities

Work related to laboratory testing of small, layered polycarbonate models continued in September. This month the data from four tests were analyzed, and a report covering the experiments is being drafted. The four tests included a far-field view of loading normal to the plates, a close-up view of loading normal to the plate, a far-field view of loading at 10° to the plate, and a close-up view of loading at 10° to the plate. For the first two experiments, the displacements around the hole are nearly symmetrical, as expected. The experiments did detect joints that exhibited 2 microns to 3 microns of uniform slip. Although these experiments will be very helpful for the code validation efforts, data reduction for these tests is extremely time-consuming. SNL will be exploring ways of either speeding up the data reduction or modifying the tests to obtain the information necessary for code validation. The SAND report entitled "Laboratory Measurements of Fictional Slip on Interfaces in a Polycarbonate Model" will begin technical review the first week in October.

A study of the surface characteristics of natural fractures and how to relate these to the frictional data gathered from replicas of the surface is continuing. This study will place special emphasis on determining whether the fitting parameters in the so-called Barton model for frictional behavior have physical significance. This is being accomplished by investigating the effect on fracture shear strength and dilation with variation in three parameters: normal stress, roughness, and the strength of the rock material. A draft SAND report is being prepared.

Experiments designed to study the effects of a nonstandard loading condition on frictional properties were conducted at the University of Colorado (CU) in 1992. SAND92-1853, "Effect of Boundary Conditions on the Strength and Deformability of Replicas of Natural Fractures in Welded Tuff: Data Report," which details the experiment techniques and the resulting data, has completed management review and has been sent to the Project Office. 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," is being printed.

An abstract summarizing the results of the rotary friction experiments, "Effect of Roughness and Material Strength on the Mechanical Properties of Fracture Replicas," has been accepted for publication and presentation at the Fall 1993 AGU meeting in San Francisco, CA on December 6 through 10.

Major Activities Upcoming Next Three Months

A report presenting the layered plate experiments will be prepared. Design support analyses will be performed for the second section of the north ramp.

SEPTEMBER 1993

**1.2.4.2.3.1 CERTIFICATION OF DESIGN
METHODS**

Status Report on Ongoing Activities

In work at CU, modifications to the discrete element code DDA are being performed to implement an augmented Lagrangian approach for enforcing the contact constraints and a sub-block concept. This month, CU staff worked on a paper describing this work that will begin technical review in October. At SNL, J. Jung implemented a classical Lagrangian approach to explore the sub-blocking concept in a two-dimensional research code. The classical Lagrangian approach was explored as a basis for comparison with the augmented approach. The classical Lagrangian approach yielded exact enforcements of the sub-block constraints, as desired. Because the augmented Lagrangian approach's convergence rate is relatively slow, a classical approach may be desirable. Future work should proceed in two directions: CU staff should investigate accelerating the augmented approach, and SNL staff should investigate efficiently handling the increased number of degrees of freedom from a classical approach.

SNL staff has been working to improve the continuum joint model. This month, a single joint set, three-dimensional version of the successful two-dimensional model was implemented. The model will be tested this month, and a SAND report has been drafted to be reviewed next month. Also, new reformulated generalized models of the existing technology were planned. The new models are expected to allow more joint sets at arbitrary angles, with modifiable joint-slip curves. In addition, increased numerical robustness is anticipated.

This month, the JAC2D manual completed technical review.

Major Activities Upcoming Next Three Months

Testing of a discrete element code sub-blocking concept will continue.

Implementation of the sub-blocking concept into the DDA code will continue.

Development of generalized three-dimensional (two-dimensional) jointed-rock model will continue.

The JAC2D manual will be submitted to the Project Office in October.

SEPTEMBER 1993

1.2.4.2.3.2 DESIGN ANALYSIS

Status Report on Ongoing Activities

Staff reviewed and prepared the report on seismic loading of the ESF north ramp for submittal to the Project Office. An abstract was prepared for submittal to the High Level Nuclear Waste Conference.

Major Activities Upcoming Next Three Months

Analyses of the north ramp design package will be initiated and completed by early January 1994.

1.2.4.6.1 SEALING AND DESIGN REQUIREMENTS

Major Accomplishments

SAND93-1184, "Strategy for Sealing Exploratory Boreholes for the Yucca Mountain Project," was submitted to the Project Office. This report develops a strategy for sealing boreholes based on evaluations of the current and planned borehole system, the potential impacts on performance that the borehole system could have, and the available technologies to seal boreholes at Yucca Mountain.

Status Report on Ongoing Activities

The evaluation of the Y-7 grout mix planned for use in the unsaturated zone (UZ) geophysical characterization program continues. Thin sections and chemical analyses of powdered and hardened samples of this grout mix have been completed. X-ray diffraction of powdered and hardened grout are underway. Existing laboratory data from Raytheon Services of Nevada describing Y-7 grout physical properties are also being evaluated. A summary of all work on characterization of the Y-7 grout mix is being prepared. It is expected that these evaluations will provide guidance for the UZ geophysical program as to the suitability of such a grout for this testing application.

Major Activities Upcoming Next Three Months

SAND93-1184 will be revised based on DOE review comments.

SNL staff will begin work on ESF/repository sealing strategy, interacting closely with M&O designers.

SNL staff will begin work on conducting verification testing of the borehole sealing strategies described in SAND93-1184.

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), Supporting Calculations for Postclosure Performance Analyses (1.2.5.4.7), Development and Verification of Flow and Transport Codes (1.2.5.4.9), and Energy Policy Act Support (1.2.5.5).

1.2.5.1 REGULATORY COORDINATION AND PLANNING

Routine oversight activities of Regulatory elements were conducted.

1.2.5.2.2 SITE CHARACTERIZATION PROGRAM

Major Accomplishments

Support to the Integrated Test Evaluation (ITE) effort was completed September 27 with completion of the report that prioritizes Site Characterization Plan (SCP) activities with respect to design needs.

On September 30, SNL submitted its contribution to the 9th Semi-Annual Site Characterization Progress Report.

SEPTEMBER 1993

1.2.5.3.5 TECHNICAL DATABASE INPUT

Significant Meetings Attended

On September 22, P. Warner and M. Steele attended the Quarterly Data Base Working Group meeting in Las Vegas, NV.

Major Activities Upcoming Next Three Months

M. Shain, P. Warner, and D. Eley will meet with L. Shephard to finalize data base task roles.

B. Lewis (M&O/TRW) will make modifications to the ATDT system on October 4 and 5.

M. Shain and E. James will provide the technical data backlog assessment that the YMPO Technical Data Manager (A. Simmons) requires by October 31.

1.2.5.4.1 TOTAL SYSTEM PERFORMANCE ASSESSMENT

Major Accomplishments

Four extended summaries were submitted to the American Nuclear Society for consideration for the 1994 International High-Level Radioactive Waste Management Conference.

- "An Updated Fracture-Flow Model for the Total System Performance Assessment of Yucca Mountain," by J. Gauthier.
- "Some Results From the Second Iteration of Total System Performance Assessment for Yucca Mountain," by M. Wilson.
- "On Integrating Modeling Software for Application to Total System Performance Assessment," by L. Lewis and M. Wilson.
- "Constraining Local Three-Dimensional Models of the Saturated Zone, Yucca Mountain, Nevada," by G. Barr and S. Shannon.

Significant Meetings Attended

SNL staff hosted a meeting on September 20 in Albuquerque, NM to review progress on TSPA-2. Problem definition and setup, along with preliminary results, were discussed by staff from SNL, Intera, and LLNL. Areas for future work were identified, and initial plans were made for a joint presentation on TSPA-2 results to the DOE in Las Vegas, NV in October. Several significant differences are noted in the SNL and the Intera approaches.

- SNL is incorporating climate change; Intera is basing results on zero infiltration and no change in the water table.
- SNL is using two conceptual models of groundwater flow to represent elements of both fracture and matrix flow; Intera is using the composite-porosity model without fractures.

SEPTEMBER 1993

- SNL is continuing to look at direct releases from human intrusion and volcanism; Intera will run only aqueous and gaseous release models.
- SNL is using heat-conduction results from separate calculations to approximate hydrothermal effects; Intera is running VTOUGH on panel-size regions to determine hydrothermal effects.
- SNL is modeling the saturated zone in detail; Intera is using SNL's velocity vectors to approximate a travel time in the saturated zone.
- SNL is considering eight nuclides to represent most of the releases; Intera is considering 37 nuclides.

Status Report on Ongoing Activities

Some of the last data required for beginning the TSPA calculations, fuel rod temperatures, were received from LLNL and from the M&O. These data, along with information on thermal effects and the saturated zone, were incorporated into the TSPA simulations. The test cases for the aqueous and gaseous flow and transport calculations were completed, and the final Monte Carlo calculations were completed. The calculations, covering a time period of one million years, include climate changes and calculations of both cumulative releases of radioactivity to the accessible environment and doses to individuals. There are four base cases: 57 kW/acre thermal loading with either SCP-type vertical, borehole-emplaced containers or multipurpose, horizontal, in-drift-emplaced containers and 114 kW/acre thermal loading with the same two container options.

Modifications were made to WEEPTSA, the computer program that embodies the weeps model in the TSA. The modifications primarily involved minimizing calls to YMIM in order to reduce run time. Now WEEPTSA performs a look-ahead step to determine whether a container that is hit by a weep actually can fail during the simulation; if not, then YMIM is never called for that container. Along with the new version of YMIM (above), WEEPTSA run times have been reduced by approximately an order of magnitude.

The waste package lifetime studies have been completed. Radionuclide releases from waste packages start when the packages fail. Using the stand-alone version of YMIM, waste package failure times have been calculated for the four analysis cases. These calculations are limited to a determination of the times at which waste packages would fail by corrosion processes modeled in YMIM. Only a limited number of parameters were varied to perform these analyses: corrosion rate, near-field hydrology, and temperature. In general, the packages begin to fail once the temperature drops below 100°C. Time to failure of the first package depends on the amount of water present. This can range from 125 years to 1000 years after dropping below the boiling point. The time it takes for all packages to reach failure can range from 75 years to 10,000 years. Using the modeled conditions, there is no significant difference between the corrosion resistance of the SCP package versus the in-drift package.

The human intrusion baseline analysis was completed. Several different release components are observed in TSPA-2 results that were not present in TSPA-91, due to the increased complexity in the TSPA-2 source term. The maximum releases from in-drift packages are approximately an order of magnitude greater than those from the SCP packages. The complementary cumulative distribution function (CCDF) curves are approximately the same for a given package type, regardless of the areal power density (APD) of the repository.

Much of the preparatory work for the volcanism case has been completed. The physical layout of the repository used for the volcanic disruption calculations was determined, and the VOLCAN model was modified to calculate dike intrusions across both 57 kW/acre and 114 kW/acre repository layouts. Plots have been generated illustrating drift/dike intersections. Work is continuing to determine how to modify YMIM for use in the volcanism analyses.

"Mountain-Scale Modeling of Transient, Coupled Gas Flows, Heat Transfer, and Carbon-14 Migration," by N Lu and B. Ross, was received from Disposal Safety, Inc. and is beginning SNL internal technical review. This report describes mountain-scale, two-dimensional simulations of coupled heat transfer and gas flow at Yucca

SEPTEMBER 1993

Mountain, using TGIF2. The results of the simulation showed that, given an initial APD of 57 kW/acre, carbon-14 travel times to the surface from the repository are on the order of 1000 years or less. The paper was presented at the Focus '93 conference on September 28 in Las Vegas, NV. The information in this paper will be included as part of the TSPA-2 report.

1.2.5.4.3 REPOSITORY PERFORMANCE ASSESSMENT

Major Accomplishments

An SNL letter report entitled "Experimental and Numerical Investigations of Non-Isothermal Flow in Saturated and Partially Saturated Porous Media" was submitted to the Project Office (Level 3 Milestone OS06).

Status Report on Ongoing Activities

Work continued on analyses required to support Phase II of the M&O's thermal loading systems study. Three-dimensional near-field analyses for 17 cases have been completed and are currently being documented. It is anticipated that additional calculations will be required and should be defined through interactions with the M&O during the next three weeks.

SEPTEMBER 1993

1.2.5.4.4 SITE PERFORMANCE ASSESSMENT

Major Accomplishments

The SAND report entitled "Stratigraphy and Hydrogeologic Properties for Total System Performance Assessment 1993" was completed and entered internal technical review. The document presents the TSPA-2 stratigraphy development for the three-dimensional representation of the repository area and the hydrologic parameters developed for each of the model stratigraphy units. Subjects covered are stratigraphy development and hydrogeologic parameter development, which includes matrix, bulk, and fracture parameters. Portions of the document will be summarized and included in the TSPA-2 report. The primary chapters are "Development of Model Stratigraphy" and "Hydrogeologic Parameter Development."

Two extended summaries were submitted to the American Nuclear Society for consideration for the 1994 International High-Level Radioactive Waste Management Conference:

- "Modeling Heterogenous Unsaturated Zone Porous Media Flow at Yucca Mountain," by T. Robey.
- "Stochastic Indicator Models of Lithology, Yucca Mountain, Nevada," by C. Rautman and T. Robey.

Status Report on Ongoing Activities

Documentation

Documentation of the hydrogeologic data development for the TSPA-2 models has been completed for technical review.

Data Base and GIS

The Performance Assessment Data Base (PADB) staff is coordinating the best means of incorporating the expected data from the integration of results from the construction monitoring and thermomechanical and properties testing at Yucca Mountain. Information has been requested on the data in the PADB that has been added since the Site and Engineering Properties

Data Base (SEPDB) was transferred to the Project Office at Las Vegas, NV. The information has been produced and is being forwarded to Las Vegas, NV as requested.

INTRAVAL

Fracture properties for the INTRAVAL tests case have been updated using the information developed for TSPA-2. Work continued on finalizing the calculations. The setup for the north-south calibration problem has been updated to include the possibility of no data on the lateral boundary for an element. The update is necessary because the new adaptive grid algorithm causes some elements to have very small sides.

GWTT Simulations

Work continued on documenting development of two-dimensional ground water travel time calculations. Verification and testing of the numerical approaches are being carried out on the INTRAVAL test case. Three cases have been run for the east-west cross section and seven for the north-south calibration problem. Most of the documentation has been written and is awaiting plotting of the calculation results. The document will be entered into internal technical review during the first part of October.

SEPTEMBER 1993

1.2.5.4.5 INTERACTIVE GRAPHICS INFORMATION SYSTEM

Status Report on Ongoing Activities

Computer systems and network devices have been moved to the new building. Work continues to bring devices on-line and reconfigure network interfaces. The IGIS Vax system remained in its original location and is still available for Calma products. Staff is waiting for the Project Office to decide how the thermal/mechanical products will be provided after the shutdown of the Vax.

Development is continuing on a series of coverages showing the starter tunnel, alcoves, and instrument locations.

Major Activities Upcoming Next Three Months

Staff will begin development of GIS products in support of testing activities and data and continue to develop techniques and personnel expertise in GIS systems.

Alternate sources for three-dimensional model products will be found, and the Calma software will be eliminated.

Staff will plan and initiate the implementation of a user environment that provides access to data obtained from instruments placed in the tunnels at Yucca Mountain. The environment will provide users with several tools to manipulate, visualize, and output the data as needed.

The following jobs are in progress:

- Job 397 for D. L. Eley - Convert GTMs to ARC/INFO
- Job 398 for D. Guerin - Hydrogeologic Drill Holes
- Job 401 for L. H. Skinner - Contours of Yucca Mountain
- Job 405 for C. A. Rautman - Rebuild TSw1 Model per New Input
- Job 406 for L. S. Costin - Starter Tunnel Data Base Cover
- Job 407 for M. L. Jones - Add New Data Coverages
- Job 410 for L. S. Costin - Neutron Holes and NRG 1-6 Holes

SEPTEMBER 1993

**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.

Significant Meetings Attended

M. Siegel presented the paper "Toward a Realistic Approach to Validation of Reactive Transport Models for Performance Assessment" at the FOCUS '93 meeting in Las Vegas, NV on September 28.

Status Report on Ongoing Activities

Flow and Transport Through Single Fractures

The purpose of this task is to challenge existing conceptual models of fracture flow and explore possible rapid transport mechanisms that may be relevant to performance assessment at Yucca Mountain.

The extended summary entitled "Influence of Two-Phase Structure on Fracture Permeability," by M. J. Nicholl and R. J. Glass, was prepared and submitted for presentation at the International High-Level Radioactive Waste Management Conference in Las Vegas, NV, on May 22 through 26, 1994.

Experimentation exploring the effects of fracture wetted structure on relative permeability was initiated. Data were collected for characterizing the analog aperture field through the use of digital images and simple light absorption theory. Permeability of the analog fracture was measured under saturated conditions to provide a baseline. A sequence of experiments was then performed under partially saturated conditions. Wetted structures of varying complexity were created through the application of transient boundary conditions. For each wetted structure considered, the system was brought to steady state and the permeability measured. A tracer was then introduced to allow visualization of the flow

channelization caused by air entrapment. Analysis of the data collected was begun and will continue in October.

Work also continued on the manufacture of fracture casts and other analog fractures. Once these manufacturing technologies are refined, they will be used to produce experimentally controlled fractures for characterization of relative permeability and other flow properties of Yucca Mountain fractures. As a test of the casting process, a natural tuff fracture collected from the Bandelier formation near Los Alamos, NM was prepared for replication. Fractures within the sample, other than the one of interest, were cemented with epoxy to prevent damage during processing. The fracture was then trimmed to a rectangular shape and cast into a fixture. After surface preparation, the fixture will be used to cast negative replicas of the fracture surfaces, which will subsequently be used to produce clear epoxy casts. In addition to replicating natural fractures, direct manufacture of controlled aperture fields is also under development. The numerically controlled mill to be used for this purpose arrived and was installed. Exploration of the capabilities of this equipment was initiated and will continue in October.

To minimize long wavelength disturbances within the analog aperture field, the analog fracture is subjected to a confining pressure of 20 psi. A revised pressure container was designed to allow a greater range of confinement pressures; a Lexan safety shield was also designed and fabricated. Initial testing of the confinement cell led to gasket failure during over-pressured conditions. The methodology for sealing the test fracture to the confinement cell will be revised and tested in October.

Fracture/Matrix Interaction

The purposes of this task are to challenge existing conceptual models describing the transfer of fluids and solutes between fractures and the host matrix (fracture-matrix interaction) and to explore the impact of fracture-matrix interaction on rapid transport mechanisms.

Interactions normal to the fracture plane: The extended summary "Fracture-Matrix Interaction in Topopah Spring Tuff: Experiment and Numerical Simulation," by A. Flint (USGS), R. J. Glass, and

SEPTEMBER 1993

V. C. Tidwell, was prepared and submitted for presentation at the International High-Level Radioactive Waste Management Conference in Las Vegas, NV on May 22 through 26, 1994.

Interactions in the fracture plane: The extended summary "Pressure/Saturation Relation Hysteresis and Wetted Structure in Fractures," by R. J. Glass, M. J. Nicholl, and H. A. Nguyen, was prepared and submitted for presentation at the International High-Level Radioactive Waste Management Conference in Las Vegas, NV on May 22 through 26, 1994.

In late August, the analog fracture being used in this experimentation underwent two successive catastrophic failures. The sintered glass plates used as an analog porous matrix in this experiment are custom-manufactured and cannot be quickly replaced. As a result, Level 3 Milestone OS27, consisting of submission of a paper on fracture wetted structure to the Project Office, will be delayed until spring of 1994; a memo detailing this development was prepared and submitted.

Work was begun to prepare a new fracture-matrix analog. Preparation of the analog matrix requires a significant lead time, as the manufacturing process is outside SNL control. The assembly and experimental procedures are being revised to minimize the risk of additional failures.

Field, Lab, and Numerical Experimentation to Determine Scaling Laws for Effective-Media Properties in Heterogeneous Media

The purpose of this task is to challenge existing conceptual models for the scaling of effective media properties critical to performance assessment at Yucca Mountain.

The extended summary "Scaling Behavior of Gas Permeability Measurements in Volcanic Tuffs," by V. C. Tidwell, was prepared and submitted for presentation at the International High-Level Radioactive Waste Management Conference in Las Vegas, NV on May 22 through 26, 1994.

Twelve boulders from the Yucca Mountain site were collected on September 18 and moved to a staging area near the Field Operations Center. The boulders were selected based on the degree of welding and bedding, as well as the extent and

size of pumice/lithics/lithophysae inclusions. From the staging area, the boulders will be moved to Beatty, NV, where they will be sawn into large blocks and subsequently transported to SNL.

In the SNL flow laboratory, these blocks will undergo systematic measurement of permeability on multiple scales for input to the development and analysis of scaling laws for YMP materials.

Fast Pathway Analysis in Unsaturated Fractured Tuff--Analog Field Site Investigation

This study will address issues concerning the occurrence of localized zones of saturation in otherwise unsaturated media that may act as fast pathways through the unsaturated zone at Yucca Mountain.

The extended summary "Local Saturated Zones Within Tuffaceous Rock Vadose Zones," by W. L. Dam, M. E. Campana, R. J. Glass, and G. E. Barr, was prepared and submitted for presentation at the International High-Level Radioactive Waste Management Conference in Las Vegas, NV, on May 22 through 26, 1994.

Caisson Test

Laboratory tests to characterize caisson test materials and interactions continued. A new set of lithium (Li) sorption experiments with Wedron sand under both carbon dioxide (CO₂)-free and atmospheric conditions was completed. The results confirm that previous Li analyses with the AA were flawed due to the lack of ionization suppressant, that Li sorption is relatively unaffected by CO₂, and that the K_d for Li is about 0.2 ml/g.

Nickel (Ni) sorption onto acid-washed Min-U-Sil in batch experiments under CO₂-free conditions, using the equivalent surface area of goethite as what is believed to be present in 20 g of Wedron sand (the weight used in previous sorption experiments), has been measured. The sorption curve does not resemble the sharp edge seen for Wedron 510 sand at pH 6.5; instead, sorption shows a steady increase with pH, from ~20% at pH 4.5 to 95% at pH 9.

Ni sorption by goethite with a surface area equivalent to that of 20 g Wedron sand over a pH range of 5 to 9 was measured under atmospheric

SEPTEMBER 1993

conditions. A sharp sorption edge at about pH 7 was observed and is similar to that exhibited by the Wedron 510 sand.

Reactive Transport Experimentation

Development of methods to carry out in situ batch sorption studies in unsaturated media continued at the Massachusetts Institute of Technology (MIT). Technical review was completed of a paper describing methods to estimate the pH of pore water in unsaturated sand from pH titration data obtained at different solution/solid ratios and methods to extract pore solutions from unsaturated sand for pH and uranium analyses. Kinetic studies of uranium sorption/desorption were carried out. Uranium sorption measurements carried out under unsaturated conditions indicate that the K_d increases slightly as saturation decreases.

Potentiometric titration data from acid-washed Min-U-Sil quartz have been analyzed by the double-extrapolation method for intrinsic acidity (K_{a2}) and sodium (Na) association (K_{Na}) constants. A test data set on Min-U-Sil from the British Geological Survey yielded a similar value for K_{a2} ($\sim 10^{-7}$), and a higher value for K_{Na} ($\sim 10^7$ vs. $< 10^{-6}$). Several aspects of data reduction are under continuing examination, including sensitivity to surface parameters (site density and surface area), development of a rigorous correction for uncertainties in the acid added between titration runs, and a means of accurately calibrating the NaOH titrant using the autotitrator. A second data set on acid-washed Wedron 510 has been collected, but it has not yet been examined to see if procedural improvements have eliminated the erratic behavior seen in the first set.

A draft technical procedure describing the potentiometric titration method, data reduction, and double-extrapolation technique has been written. This will become an appendix to the milestone report for caisson-related activities.

Reactive Transport Model Development

A strategy for using the LEHGC code for simulations of colloidal transport in porous and fractured media was devised. Responses to the comments obtained from the technical review of "User's Manual for LEHGC: A Lagrangian-Eulerian

Model of HydroGeoChemical Transport in Saturated - Unsaturated Media - Version 1.0" were prepared by G. Yeh (Pennsylvania State University).

Major Activities Upcoming Next Three Months

Staff will complete the review of the User's Guide for the LEHGC code. Staff will continue modifications of the LEHGC code to run the code on a massively parallel computer.

The summary paper on geochemical characterization of materials for the caisson experiment will be completed.

Ni transport will be modeled in support of caisson experiment.

Development will continue of a model for adsorption of Ni and uranium (U) by mixtures of minerals found in Yucca Mountain tuffs (clay, quartz, iron-oxyhydroxides, zeolite) over a range of pH and solids concentrations from the properties of the component minerals using surface-complexation models.

SEPTEMBER 1993

1.2.5.4.7 SUPPORTING CALCULATIONS FOR POSTCLOSURE PERFORMANCE ANALYSES

Documentation of ESF Analysis #13 will be continuing, with SAND93-1182 to be completed by the end of FY93 (Level 3 Milestone OS14).

Major Accomplishments

The report for ESF Performance Assessment (PA) Analysis #13, SAND93-1182, has completed technical and management review and is being prepared for submittal on October 1 to the Project Office for programmatic review (Level 3 Milestone OS14).

Significant Meetings Attended

S. Sobolik attended a meeting in Las Vegas, NV on September 20 that was a dry run for the DOE/NRC Technical Exchange on the ESF Title II Design.

Status Report on Ongoing Activities

The ESF PA Analysis #14 investigating the sensitivity of previous analyses to uncertainty in the hydrologic properties of the nonwelded Paintbrush Tuff will be redefined as a result of the PACS planning activities for FY94. This analysis will be redefined to include sensitivity studies for the effects of underground ventilation and for the usage of different computational and conceptual models. Work Agreement (WA)-0089 will be revised to reflect these changes. This PA analysis has been identified as an activity with Level 3 Milestones for FY94; milestones include recommendations for Appendix I of the ESFDR, a SAND report, and a paper for the 1995 International High-Level Radioactive Waste Management Conference.

Programmatic review comments for the report SAND92-2248 were resolved this month, and the revision was returned to the Project Office.

Major Activities Upcoming Next Three Months

S. Sobolik will participate in a DOE/NRC Technical Exchange on the ESF Title II Design on October 5. The presentation will be concerned with the underground water analysis (ESF Analysis #13) specifically relating to fire suppression.



Sandia
National
Laboratories

SEPTEMBER 1993

***1.2.5.4.9 DEVELOPMENT AND VERIFICATION
OF FLOW AND TRANSPORT CODES***

Status Report on Ongoing Activities

Processing of software QA records is continuing.

Preparation is underway for training sessions to be given to SNL staff in early October.

1.2.5.5.2 ENERGY POLICY ACT SUPPORT

No significant activity to report.

SEPTEMBER 1993

1.2.6 EXPLORATORY STUDIES FACILITY

The objective of the Exploratory Studies Facility element includes work scope related to the design, construction, and operation of the Exploratory Studies Facility. The Exploratory Studies Facility element includes the Exploratory Studies Coordination, Planning, and Technical Assessment (1.2.6.1.1) task.

1.2.6.1.1 ESF COORDINATION, PLANNING, AND TECHNICAL ASSESSMENT

Status Report on Ongoing Activities

Staff provided input to the LANL Test Coordination Office for revisions to the test planning package, the job package, and the work plan for construction monitoring in the ESF. These revisions are associated with the extension of the starter tunnel and the construction of the first alcove.

Major Activities Upcoming Next Three Months

Under LANL coordination, staff will work with LLNL staff to consolidate SNL's ESF thermomechanical testing with LLNL's hydrothermal testing, if possible.

Staff will support development of tracer requirements for testing in the ESF facility.

Staff will supply a preliminary estimate of support needed from the Integrated Data-acquisition System (IDS) by the SNL in situ field experiments in order to aid the designers of the IDS system to develop the IDS system.

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

Staff participated in a number of interactions and meetings with project staff in Las Vegas, NV, many of which centered on FY94 budget projections.

1.2.9.2.2 PROJECT CONTROL

Major Accomplishments

SNL YMP staff supported the YMP audit during the week of September 13 through 17. Budget revisions were transmitted to the Project Office on September 10. Staff expended considerable effort responding to multiple Project Office requests with short deadlines for cost and budget detail information:

- List of FY94 staffing levels
- FY93 FTE projections
- List of FY94 FTE and budget projections

In addition, staff revised the SNL case structure to be compatible with the FY94 activities.

SAND93-1184, "A Strategy to Seal Exploratory Boreholes in Unsaturated Tuff," by J. A. Fernandez (7053) and J. B. Case, C. A. Givens, and B. Clayton Carney (IT Corporation), was submitted to the Project Office on September 10. This satisfies Level 3 Milestone OS24.

SLTR93-0002, "Experimental and Numerical Investigations of Non-Isothermal Flow in Saturated and Partially Saturated Porous Media," by C. K. Ho (6115), K. S. Maki (6115), and R. J. Glass (6115), was completed September 22. This satisfies Level 3 Milestone OS06. (WBS 1.2.5.4.3)

SAND93-1182, "Evaluation of the Effects of Underground Water Usage and Spillage in the Exploratory Studies Facility," by E. Dunn (6312) and S. R. Sobolik (6313), was submitted to the Project Office September 30. This satisfies Level 3 Milestone OS14. (WBS 1.2.5.4.7)

SEPTEMBER 1993

Status Report on Ongoing Activities

Work is continuing on accommodating and preparing for changes in processing due to the move to new offices and also to changes in the SNL financial systems. Work is also progressing in preparing for changes due to the change in fiscal year. SNL is continuing budget revisions due for submittal to the Project Office in October.

Major Activities Upcoming Next Three Months

SNL will submit budget revisions and final FY93 cost information by the October 13 deadline. SNL will send a representative to attend the PACS workstation user group meeting on October 6. SNL will continue modifying the current reporting processes to accommodate changes to SNL financial systems to become effective November 1.

SEPTEMBER 1993



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

SNL hosted an audit team representing the Yucca Mountain QA Division as they performed QA Audit YMP-93-17. The audit covered a number of quality assurance program elements, as well as the following technical activities: Soil and Rock Properties Investigation; ESF Starter Tunnel Geotechnical Investigation; and Laboratory Determination of Thermal Properties of Rock, Mechanical Properties of Fractures, and Thermal Expansion Testing of Rock.

Major Activities Upcoming Next Three Months

A combined audit and readiness review is scheduled at NCAR in late October.

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

Routine oversight activities of Information Management elements were conducted.

1.2.12.2.2 LOCAL RECORDS CENTER OPERATION

Major Accomplishments

The Local Records Center (LRC) relocated to the new facility during the month of September. The new facility was out of business for only two days. The DOE audit was not inconvenienced.

Significant Meetings Attended

On September 13 and 17, the Records Coordinator and Supervisor attended opening and closing DOE audit meetings.

On September 22, LRC staff toured the Central Records Facility (CRF) and met with personnel in Las Vegas, NV.

Status Report on Ongoing Activities

Meetings are planned with QA staff to revise procedures to include more complete records requirements.

Staff will meet with N. Ortiz to assure that all contracts are received in the LRC.

One Technical Procedures Package is being held for a Document Deficiency and Justification Form. Three Technical Procedures Packages and one Technical Calibrations Records Package were sent to the CRF.

SEPTEMBER 1993

Major Activities Upcoming Next Three Months

LRC and Training Guidances are being rewritten at this time. The projected completion date is November 1.

A new reader printer received September 29 will speed verification of microfilm against hardcopy dual storage records.

The Disaster Preparedness and Recovery Plan for the YMP Records Management Program checklist was revised to focus on vital records. A preliminary design for the flyer has been completed. The committee will continue to work on this.

A meeting will be held to finalize the process by which milestones for Sandia reports, Technical Data Information Forms, letter reports, and conference papers are tracked and scheduled.

Issues/Potential Problems Needing Resolution and Potential Impacts

AIMS and RIS disconnect time is still a concern.

1.2.12.2.3 PARTICIPANT RECORDS MANAGEMENT

Major Accomplishments

The Program Plan for the Records Management staff for 1994 is being worked on by the Records Coordinator and the Supervisor. The plan will be finalized shortly.

Significant Meetings

The Records Manager attended the Nuclear Information and Records Management Association Symposium in Atlanta, GA on August 29 through September 3. Much good information was obtained, and the presentation on QA records was well received. The Records Manager will chair a committee on QA Records.

SEPTEMBER 1993

1.2.12.2.5 DOCUMENT CONTROL

Status Report on Ongoing Activities

Work continued on integrating the Document Control data base with the Training data base to eliminate duplication of effort in data entry.

Document Control staff has completed a comprehensive update of the Person Table to verify and update data in the Document Control system prior to integration with the Training data base.

Controlled Documents Tracking:

Number of new documents added: 43
Number of superseded documents: 21
Number of recalled documents: 30
Number of ICNs added: 1

Major Activities Upcoming Next Three Months

Obsolete records will be eliminated from the Document Control system to significantly reduce the number of records that will have to be recoded before integration with the Training database. Hard copies of these records have been made and stored for future reference.

Integration of the Document Control and Training database will be completed in October.

1.2.15 SUPPORT SERVICES

The objective of the Support Services element includes work 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

Status Report on Ongoing Activities

Routine oversight activities of Support Services elements were conducted.

1.2.15.2 ADMINISTRATIVE SUPPORT

Major Accomplishments

Procurements

Contract forecasts were adjusted and limits of obligation placed on contracts to reduce end-of-year commitments. Reclassifications were completed to adjust costs and contract amounts.

The procurement data base (Budproc) was cleaned up. Closed contracts from the 1980s were eliminated from the data base, and contracts to be closed were noted.

Budget

Daily outlay projections for the Nuclear Waste Fund (NWF) for October 1993 through September 1994 were submitted to the Albuquerque DOE office on September 30. The projected outlays will enable DOE Headquarters to make optimum investments of cash within the NWF.

Updates, changes, and additions were made in Budpnew. A new Task Leader List for FY94 has been generated. Time records for FY94 were produced from the data base.

A review of subcases in Case 2378 was made. Old subcases were closed, and new subcases were issued for new FY94 summary accounts.

Major Activities Upcoming Next Three Months

Procurements

Contracts will be reclassified to reflect proper subcases for FY94, and adjustments made to forecasts and contract amounts.

SEPTEMBER 1993

Property

A physical inventory will be taken of all property in the basement of Building 823. The property data base will be updated, and staff will request approval from DOE to send this equipment to Sandia Reapplication. A report of all loan agreements issued on YMP/NWF property during FY93 and a synopsis of any loss or theft reports filed in FY93 will be submitted to DOE/YMP by October 8.

A request for excess YMP equipment from DOE/YMP will be completed in October. This equipment will be shipped to the University of Nevada, Reno, before the end of October.

Listings of YMP capital equipment assets and sensitive equipment assets will be submitted to DOE/YMP office by October 29. A schedule of walk-through inspections of YMP areas anticipated to be conducted within FY94 will also be submitted.

1.2.15.3 YMP SUPPORT FOR THE TRAINING MISSION

Major Accomplishments

The design of the Training Center has been completed, and materials and equipment have been ordered.

SNL QAIP 2-5 has been distributed, and training is being scheduled.

Number of individual self-study assignments: 32
Number of trainees: 77
Number of new trainees: 4
Number of active SNL/YMP employees: 211
Newly certified persons for SNL/YMP: ---
Total assigned training assignments: 179
Number of completed training assignments: 107

Ratio of completed training to assigned to date: 90%

Ratio of completed training to assigned for interval: 60%.

Status Report on Ongoing Activities

Staff continues to use parallel entry into FoxPro and Informix while the effort continues to develop a relational database integrating the Training and Controlled Document data bases.

Major Activities Upcoming Next Three Months

Work has begun on eliminating inactive training records from the data base prior to integrating the Training data base with the Controlled Document data base, which is scheduled to occur in October. Hard copies of the inactive records have been made and stored for future reference.

Several professional development programs have been identified and are being evaluated for inclusion in the training program.

The Training Manager will work with the Project Office's training staff to have the Planning and Control System (PACS), General Employee Training (GET), and Underground Worker training conducted at SNL by Project Office staff.

SEPTEMBER 1993

Because of requests, the feasibility of conducting another geology course next fiscal year will be explored.

The hydrology course will be conducted in the next fiscal year.