U.S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVE REPORT

NUMBER OR-96-11

FOR THE REPORTING PERIOD OF November 1-30, 1996

Chad Glenn for William Belke 12/19/96
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Sr. On-Site Licensing
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REPORT DETAILS

1.0 INTRODUCTION

The principal purpose of the On-Site Licensing Representative (OR) reports is to alert NRC staff, managers and contractors to information on the U.S. Department of Energy (DOE) programs for site characterization, repository design, performance assessment, and environmental studies that may be of use in fulfilling NRC's role during pre-licensing consultation. The principal focus of this and future OR reports will be on DOE's programs for the Exploratory Studies Facility (ESF), surface-based testing, performance assessment, data management systems and environmental studies. Relevant information includes new technical data, DOE's plans and schedules, and the status of activities to pursue site suitability and ESF development. In addition to communication of this information, any potential licensing concerns, or opinions raised in this report represent the views of the ORs and not that of NRC headquarters' staff. The reporting period for this report covers November 1-30, 1996.

2.0 OBJECTIVES

The function of the OR mission is to principally serve as a point of prompt informational exchange and consultation and to preliminarily identify concerns about site investigations relating to potential licensing issues. The ORs accomplish this function by communicating, consulting and identifying concerns. Communication is accomplished by exchanging information on data, plans, schedules, documents, activities and pending actions, and resolution of issues. The ORs consult with the DOE scientists, engineers, or managers with input from NRC Headquarters management on NRC policy, philosophy, and regulations. The ORs focus on such issues as quality assurance (QA), design controls, data management systems, performance assessment, and key technical issue resolution. A principle OR role is to identify areas in site characterization and related studies, activities, or procedures that may be of interest or concern to the NRC staff.

3.0 SUMMARY AND CONCLUSIONS

Over this reporting period the, TBM advanced to station 70+72 meters (23,202 feet). ESF activities continue to focus on the excavation of the Connecting Drift for the Heated Drift Test in Alcove 5, and the excavation of the Northern and Southern Ghost Dance Fault Alcoves (Alcoves 6 and 7). Recent ESF testing activities include: geothermal testing of the Ghost Dance Fault in Alcove 6; ongoing

monitoring of temperature and humidity in Alcoves 3, 4 and the ESF main drift; and geologic mapping and sampling. Surface-based activities include the continuation of the fourth tracer test at the C-Hole Complex, and preparations for the start up of the Fran Ridge Heater Test.

4.0 QUALITY ASSURANCE, ENGINEERING, AND NRC KEY TECHNICAL ISSUES

(SEE SECTION 6.0, "GENERAL" SECTION OF THIS REPORT FOR QA)

5.0 EXPLORATORY STUDIES FACILITY (ESF) AND KEY TECHNICAL ISSUES

Exploratory Studies Facility (ESF) Testing:

As of November 27, 1996, the Tunnel Boring Machine (TBM) advanced to station 70+72 meters (23,202 feet). Geologic mapping and photogrammetry progressed approximately to station 69+90 meters. Preliminary mapping indicates that the ESF penetrated the Dune Wash Fault at approximately station 67+90. Over this reporting period, alcove construction and testing activities were focused in Alcoves 5, 6, and 7. However, investigators continue to collect temperature and humidity data in Alcoves 3 and 4 and at several locations in the ESF main drift. There was no testing activity in Alcoves 1 and 2 over this period. Instrument installation and data collection for construction monitoring continues. The location of alcoves and preliminary tunnel stratigraphy is summarized in Enclosure 1.

Alcove 5 (Thermal Testing Facility Access/Observation Drift and Connecting Drift)
Excavation of the Connecting Drift to the Heated Drift Test area was completed over this reporting period. The Plate Loading Test Niche was also excavated in the right rib of the Connecting Drift Extension adjacent to the face of the Heater Drift Test area. The excavation of the Heated Drift is scheduled to start in early December 1996 using the Alpine Miner. Over this reporting period, air permeability testing was conducted in instrumented boreholes in the Access/Observation Drift to establish baseline conditions for the Heated Drift Test. Other instrumentation holes continue to be drilled into the Heater Test area. This test will heat approximately 15,000 cubic meters of rock in the repository horizon to 100 degrees centigrade or greater to investigate coupled processes under thermal loading. This test is presently scheduled to begin in December 1997.

Alcove 5 (Thermomechanical Alcove)
The Single Heater Test started on August 26, 1996. Instruments are reported to be working properly and the collection of test data continues. In the first half of November 1996, preliminary instrumentation

measurements indicate a rock mass temperature in excess of 50 degrees centigrade at a distance of 1.5 meters from the heater element. This test is designed to eventually heat approximately 25 cubic meters of rock to 100 degrees centigrade or greater to investigate thermomechanical properties of rock in the potential repository horizon.

Alcove 6 (Northern Ghost Dance Fault Alcove)
Testing in Alcove 6 is designed to investigate the hydrochemical and pneumatic properties of the Ghost Dance Fault. In October 1996, a radial borehole drilled from Alcove 6 penetrated the fault zone at a distance of 143 to 155 meters from the ESF centerline. Over this reporting period, investigators conducted geothermal testing across this fault through the radial borehole in this alcove. Planned testing in this borehole will provide information on the geothermal, hydrologic, and pneumatic properties of the Ghost Dance Fault.

Alcove 7 (Southern Ghost Dance Fault Alcove)
On November 27, 1996, the excavation of Alcove 7 advanced approximately 16 meters from the ESF centerline using an Alpine Miner. Over this reporting period, a 29 meter borehole was drilled in the crown of this alcove to determine the location of the TSw1/TSw2 thermomechanical unit contact.

SURFACE-BASED TESTING

Fran Ridge Large Block Heater Test
Preparations are underway to initiate the Large Block Test (LBT) at Fran Ridge in February 1997. The duration of this test (heat-up and cool-down) is expected to be completed within approximately 8 months. The purpose of the LBT is to gather data to evaluate thermal, mechanical, hydrological, and chemical processes in rock similar to potential repository horizon at Yucca Mountain. In the coming weeks, test equipment will be emplaced in instrumentation boreholes in preparation for the start of this test.

Borehole Testing:
The location of boreholes referenced in this section is provided in Enclosure 2.

C-Hole Complex
Tracer testing at the C-Hole Complex is conducted in the Bullfrog interval of the Crater Flat Tuff for the purpose of determining hydrologic properties in the saturated zone. Over this reporting period, investigators continued the sampling of tracers (lithium bromide, microspheres, and polyflourobenzoic acid) used in the tracer test initiated in

October 1996. In December 1996, investigators plan to start convergent testing using conservative (non-sorbing) tracers. This testing is designed to determine the relative change in groundwater flow characteristics in the direction both parallel and perpendicular to the dominant fault and fracture pattern in the vicinity of the C-Wells.

G-2 Testing

Automatic recording of water-level recovery data from the pump test conducted in April 1996 continues. Over this reporting period, the water level in this borehole appears to be approximately one-third of a meter below the pre-test water level. Water level recovery data from the pump test will provide information on the high hydraulic gradient in the vicinity of G-2.

Pneumatic Testing in Boreholes

Pneumatic data recording continues at boreholes UZ-4, UZ-5, UZ-7a, SD-12, NRG-7a, SD-7 and NRG-5. DOE terminated pneumatic monitoring at NRG-6 in September 1996 because the test objectives for this borehole had been met. DOE is evaluating the need for continued pneumatic monitoring of instrumented boreholes in FY 97. Nye County continues to record pneumatic data in NRG-4 and ONC-1 as well as collecting temperature, pressure, and humidity data from instrumentation installed on the TBM.

OTHER ACTIVITIES

Several Yucca Mountain Project "synthesis reports" that may relate to NRC KTIs have recently been reviewed and accepted by DOE. These reports include: 1) Borehole and Surface Geophysics Synthesis Report; 2) Synthesis of Quaternary Response of the Yucca Mountain Unsaturated and Saturated Zone Hydrology and Climate Change; and 3) Summary and Synthesis Report on Radionuclide Retardation for the Yucca Mountain Site Characterization Project.

Borehole and Surface Geophysics Synthesis Report

The primary purpose of this report is to derive a consistent geophysical model(s) of Yucca Mountain and vicinity integrating the various types of geophysical data collected over the past several years (FY94-96). These data include seismic, gravity, magnetic, electrical data at regional and repository scales, and borehole geophysical logs. The report suggest that geologists should use the geophysics from this report along with other data to derive a "best fit" geological model. Volume I of this report contains a synthesis of recent surface geophysical studies. Volumes II and III contains a synthesis of borehole geophysics studies. The use of Q and non-Q data is identified in this report.

Synthesis of Quaternary Response of the Yucca Mountain Unsaturated and Saturated Zone Hydrology to Climate Change
This report summarizes and synthesizes available paleoclimate information for Yucca Mountain and the surrounding area. The objectives of this activity were to collect, analyze, and interpret paleoenvironmental data in order to infer past climatic and hydrologic periods in the Yucca Mountain region. The report documents the current state of paleoclimate knowledge for the Yucca Mountain area that can be used to support bounding estimates of future climatic changes that could impact waste containment and waste isolation at a Yucca Mountain repository. The report concludes that interpretations of various climate and hydrological data sets now appear to converge towards a single interpretation of the response of the unsaturated and saturated zone hydrology to climate forcing functions. The use of Q and non-Q data is identified in this report.

Summary and Synthesis Report on Radionuclide Retardation
The purpose of this report is to present the state of knowledge with respect to the different elements of the natural barrier for radionuclide transport at Yucca Mountain: groundwater chemistry, radionuclide solubility, sorption, and diffusion. The use of Q and non-Q data is identified in this report.

6.0 GENERAL

1. Meetings/Interactions/Audits

- Attended the regularly scheduled meeting with W. Barnes Yucca Mountain Site Characterization Office (YMSCO) Project Manager, Deputy Project Manager, YMSCO Assistant Managers, and the YMSCO QA Manager. (See Enclosure 3 for the subject matter discussed at this meeting.) At this meeting, DOE management personnel expressed concern about the recent NRC budgetary constraints and their effect in limiting NRC QA and technical reviews on DOE potential licensing products. Two of DOE's concerns were cited, namely, the stoppage/deferral of work on three Key Technical Issues and the potential of NRC not being able to review Seismic Topical Report #3. (NOTE: Subsequent to the above discussion, the NRC issued a November 12, 1996, letter from J. Greeves to R. Milner notifying DOE of the fiscal year changes to the NRC High-Level Waste Program in the Division of Waste Management. This letter also provided the criteria that NRC will utilize in order to determine what DOE products will be reviewed.)

- The ORs participated in observing a DOE QA performance - based audit of the U.S. Geological Survey (USGS) conducted in Las Vegas, NV (November 4-8, 1996), and

Denver, CO, November 12-14, 1996. The complete details of this observation audit will be documented in NRC Audit Observation Report OA-97-01. The purpose of the audit was to evaluate the adequacy and effectiveness of the USGS QA program as applied to the ESF mapping facilities. These activities have resulted in the report,"Geology of the North Ramp - Stations 4+00 to 28+00 Exploratory Facility, Yucca Mountain Project, Yucca Mountain, Nevada."

The KTI related to this audit is "Structural Deformation and Seismicity" that seeks to ensure that significant structural deformation and seismicity conditions and hazards are identified, sufficiently understood, fully considered, and used appropriately to evaluate repository performance.

Overall, the DOE audit team concluded that mapping products and associated processes met program requirements and were acceptable. The NRC ORs agree with this conclusion. Two deficiencies were noted - one for instances of inadequate documentation and one for the report reviewers' failure to detect an error in the report that was found by the audit team.

The auditors also noted that two of the software programs were not verified and validated. These programs are used for fracture analysis. The rationale for not verifying and validating these programs stems from Supplement 1 in the DOE Quality Assurance Requirements and Description document (QARD) which states that statistical analysis software programs are not required to be qualified in accordance with the Supplement in the QARD. Rather than document this potential deficiency in a deficiency report, the audit team decided to further pursue this matter with DOE management. Consequently, the NRC staff initiated an inquiry requesting a documented response as to why the subject software was not subject to appropriate QA controls.

7.0 REPORTS

Over this reporting period the following reports were received in the NRC Las Vegas office.

LAWRENCE LIVERMORE

UCRL-ID-125300 MODELING PITTING DEGRADATION OF CORROSION RESISTANT ALLOYS, 11/96, G. Henshal

UCRL-ID-125645 DEGRADATION MODE SURVEY GALVANIC CORROSION OF CANDIDATE METALLIC MATERIALS FOR HIGH-LEVEL RADIOACTIVE WASTE DISPOSAL CONTAINERS, 11/96, A. Roy, D. Jones, R. McCright

LOS ALAMOS

MINERALOGY AND TEMPORAL RELATIONS OF COEXISTING AUTHIGENIC MINERALS IN ALTERED SILICIC TUFFS AND THEIR UTILITY AS POTENTIAL LOW-TEMPERATURE DATEABLE MINERALS, G. WoldeGabriel, D. Broxton, F. Byers, Jr. (Reprinted from Journal of volcanology and geothermal research)

U.S. GEOLOGICAL SURVEY

YUCCA MOUNTAIN PROJECT BRANCH USGS PROGRESS REPORT, Oct., 1996

SANDIA NATIONAL LABORATORIES

SAND94-1902 BULK AND MECHANICAL PROPERTIES OF THE PAINTBRUSH TUFF RECOVERED FROM BOREHOLES UE25 NRG-2, 2A, 2B, AND 3: DATA REPORT, 9/96, P. Boyd, R. Price, R. Martin, J. Noel

SAND94-2138 BULK AND MECHANICAL PROPERTIES OF THE PAINTBRUSH TUFF RECOVERED FROM BOREHOLES UE25 NRG-4 AND -5: DATA REPORT, 9/96, P. Boyd, R. Price, J. Noel, R. Martin

SAND95-1896 THREE-DIMENSIONAL MODELING OF FLOW THROUGH FRACTURED TUFF AT FRAN RIDGE, 9/96, R. Eaton, C. Ho, R. Glass, M. Nicholl, B. Arnold

SAND95-2182 FRICTIONAL SLIDING IN LAYERED ROCK: LABORATORY-SCALE EXPERIMENTS, 9/96, B. Buescher, Jr., K. Perry, Jr., J. Epstein

SAND95-0819 FLOW CALCULATIONS FOR YUCCA MOUNTAIN GROUNDWATER TRAVEL TIME (GWTT-95), 9/96, S. Altman, B. Arnold, R. Barnard, G. Barr, C. Ho, S. McKenna, R. Eaton

SAND96-1474 GEOLOGY OF THE USW SD-7 DRILL HOLE, YUCCA MOUNTAIN, NEVADA, 9/96, C. Rautman, D. Engstrom

ESF TUNNEL STRATIGRAPHY*

STATION	
0+00 to 0+99.5m	Tiva Canyon crystal poor upper lithophysal zone.
	Alcove #1 (centerline station intersection):0+42.5
0+99.5 to 1+90m	Tiva Canyon crystal poor middle nonlithophysal zone
	Alcove #2 (centerline station intersection):1+68.2
1+90 to 1+99.5m	Tiva Canyon crystal poor lower lithophysal zone.
1+99.5 to 2+02m	Bow Ridge Fault Zone (placing Pre-Ranier Mesa Tuff against Tiva Canyon Tuff)
2+02 to 2+63.5m	Pre-Ranier Mesa bedded tuffs
2+20	Fault (4.3m offset)***
2+63.5 to 3+33m	Tuff "X"
3+33to 3+49.5m	Pre-Tuff "X"
3+49.5 to3+59.5m	Tiva Canyon vitric zone
3+59.5 to 4+34m	Tiva Canyon crystal rich nonlithopysal zone
4+30m	Fault (~10m offset)***
4+34 to 4+39m	Tiva Canyon crystal rich lithopysal zone
4+39 to 5+53m	Tiva Canyon crystal poor upper lithophysal zone
5+50m	Fault (~5m offset)***
5+53to 5+87m	Tiva Canyon crystal poor middle nonlithophysal zone

ESF TUNNEL STRATIGRAPHY CONTINUED*

Alcove #6 (centerline intersection): 37+37

Alcove #7 (centerline intersection): 50+64

57+30	Splay of the Ghost Dance Fault - Offset is approximately 2 meters
63+08 to 64+55**	Topopah Spring crystal poor upper lithophysal zone
63+25	Fault with the offset estimated as 3.8 meters
64+55 to 64+95**	Topopah Spring crystal rich lithophysal zone
64+95 to 66+32**	Topopah Spring crystal rich nonlithophysal zone
66+32 to 66+41.5**	Topopah Spring vitric zone
66+41.5 to 67+19**	Pre-Pah Canyon tuffs
66+38**	PTn contact
67+19 to 67+90**	Tiva Canyon crystal poor vitric zone
67+90**	Dune Wash fault (offset is greater than 10m)
67+90 to ?	Topopah Spring crystal poor upper lithophysal zone
? to 69+76**	Topopah Spring crystal rich non lithophysal zone
69+76 to 70+03**	

Note: Starting at station 57+02 and ending at 59+80, the crystal poor lower lithophysal zone is exposed in the lower portion of the tunnel (below springline).

* All stations given are referenced to the right springline unless otherwise noted.Station 0+00 is located at coordinates N765352.7, E569814.4.

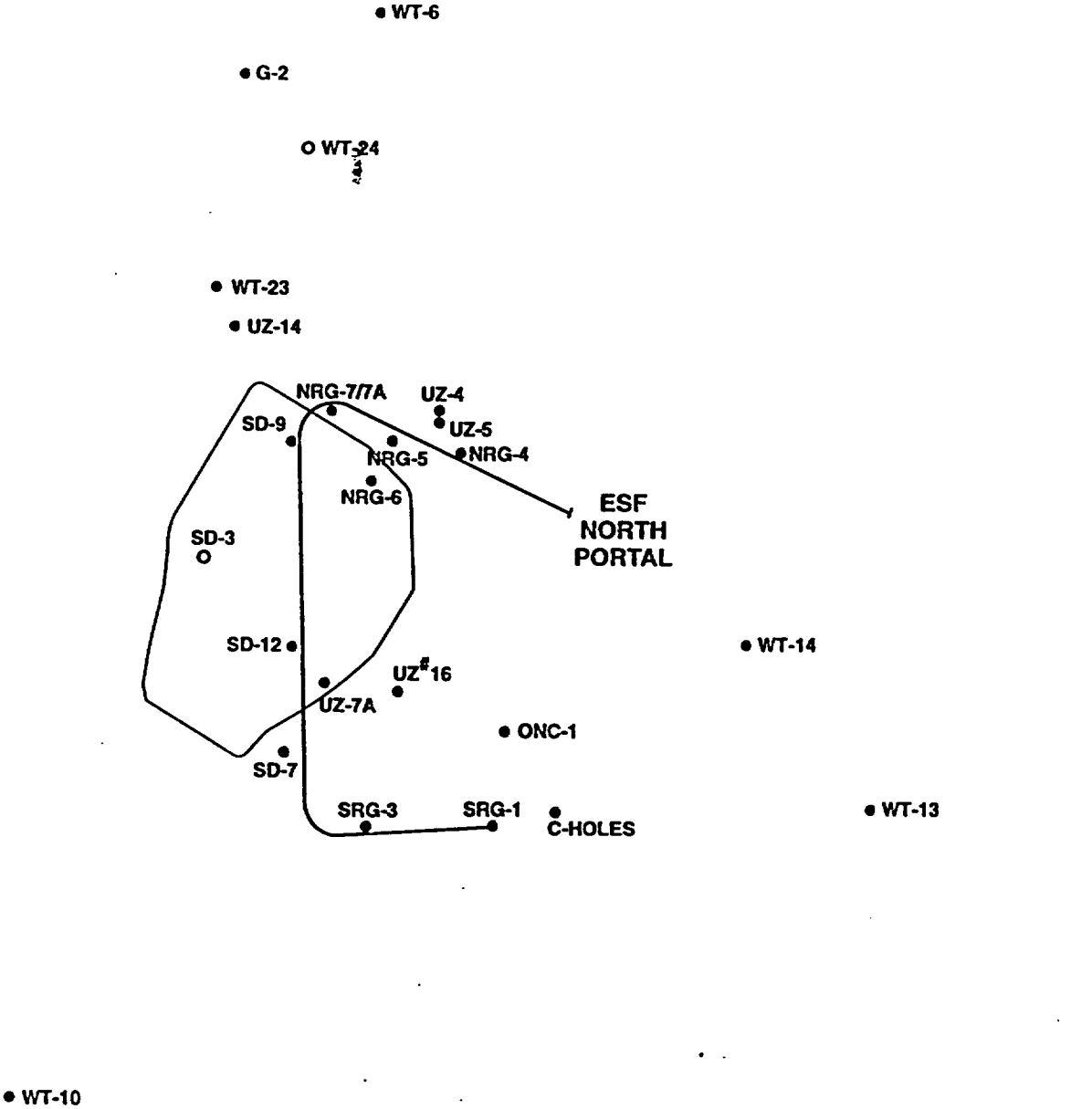
** Indicates that contact is preliminary and has not been verified by USGS geologists.

*** Only significant faults are noted on the table.

ESF TUNNEL STRATIGRAPHY CONTINUED*

5+87 to 6+17m	Tiva Canyon crystal poor lower lithophysal zone
6+17 to 7+77m	Tiva Canyon crystal poor lower nonlithophysal zone
7+00m	Fault (~20m? offset)***
	Alcove #3 (centerline station intersection):7+54.
7+77 to 8+69m	Tiva Canyon crystal poor vitric zone
8+69 to 8+72.5m	Pre-Tiva Canyon bedded tuffs
8+72.5 to 8+73.5m	Yucca Mountain bedded tuffs
8+73.5 to 9+12m	Pre-Yucca Mountain bedded tuffs
9+12 to 10+20m	Pah Canyon Member.
10+20 to 10+51.5m	Pre-Pah Canyon bedded tuffs
	Alcove #4 (centerline station intersection):10+27.8
10+51.5 to 12+00m	Topopah Spring crystal rich vitric zone
12+00 to 17+17m	Topopah Spring crystal rich nonlithophysal zone
17+17 to 17+97m	Topopah Spring crystal rich lithophysal zone
17+97 to 27+20m	Topopah Spring crystal poor upper lithophysal zone
27+20 to 63+08m	Topopah Spring crystal poor middle nonlithophysal zone
	Alcove #5 (centerline station intersection):28+27
35+93m	Sundance fault (most prominent fault plane, minor fracturing reported between Stations 35+85 and 36+40)

Selected Borehole Locations



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ENCLOSURE 2

AGENDA FOR 11/19/96 W. BARNES MEETING

- LSS Update/Progress
- October Stakeholder Meeting Results
- NRC Observation of USGS Audit
- OR Office Move Update
- Update on Completed DOE Yucca Mountain Office Reorganization
- DOE Status on: Qualified Data Task Force
  Proposals for Drilling Additional Boreholes
  Management Assessment
  TBM Board of Consultant's Report
  Response to Nye County Concerns on Water Usage in ESF
  Pneumatic Monitoring Program
- DOE/NRC feedback on any other pending issues

ENCLOSURE 3