U.S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVE REPORT

NUMBER OR-97-05

FOR THE REPORTING PERIOD OF MAY 1-31, 1997

William L. Belke
Sr. On-Site Licensing
Representative
Performance Assessment &
High-Level Waste Integration
Section
Division of Waste Management

Chad J. Glenn
Sr. On-Site Licensing
Representative
Performance Assessment &
High-Level Waste Integration
Section
Division of Waste Management

Reviewed and approved by:

Sandra L. Wastler
Acting Section Leader
Performance Assessment &
High-Level Waste Integration
Section
Division of Waste Management

TABLE OF CONTENTS

U.S. NUCLEAR REGULATORY COMMISSION
ON-SITE LICENSING REPRESENTATIVE REPORT
NUMBER OR-97-05

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. The ORs also participate in activities associated with resolving NRC Key Technical Issues (KTI). 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 May 1-31, 1997.

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 QA, design controls, data management systems, performance assessment, and KTI 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

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The OR's participated in the May 12, 1997, NRC/DOE Quality Assurance video-conference meeting held in Washington, D.C., and Las Vegas, NV. The ORs continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to KTIs and their resolution.

4.0 QUALITY ASSURANCE, ENGINEERING, AND NRC KEY TECHNICAL ISSUES

- An NRC/DOE QA meeting was held on May 12, 1997. Enclosure 1 provides the agenda for this meeting. The summary of this meeting is currently under review by NRC and DOE management. At this meeting, it was agreed to hold and schedule future QA meetings on an "as needed" basis instead of periodically. In view of this scheduling, the OR report will reflect the monthly status and progress of the NRC Open QA Issues (Enclosure 2 [3 pages]) in order to keep interested participants informed on a regular basis.

  Relative to Open Items 1, 2, and 3 in Enclosure 2, a meeting was scheduled with DOE by the OR's for the purposes of clarifying what was considered open and what was considered closed as a result of the April 3-5, 1995, NRC verification effort. Once this was clarified, an Appendix 7 meeting was scheduled for June 12, 1997, for the NRC to obtain the necessary review information leading towards closure of these open items. Enclosure 3 reflects the NRC's view of what is considered open and where more information may be needed for total closure. The ultimate NRC goal of this exercise is to obtain sufficient technical information and confidence, that Sections 7.3.2.1 and 7.3.2.2 in the NRC High-Level Waste Program Annual Progress Report FY 1996, on ten KTI's issues can be satisfactorily closed.

- In the OR Report for the months of March and April 1991, dated May 20, 1991), it was noted that a DOE workshop was held in April 1991, on the QA grading process. Members participating in this workshop consisted of DOE and DOE contractors. The purpose of this workshop was to identify specific problems with the grading process and to develop recommendations to improve the grading process.

  The recommendations of this workshop were documented in a QA Grading Workshop Report which the OR office forwarded to NRC Headquarters at that time. The OR inquired whether any of these 1991 recommendations had been implemented or were at all applicable to the current DOE operations.

  The DOE response to this inquiry was that the recommendations of this grading workshop were addressed in implementing procedures QAP-2-0, "Conduct of Activities, QAP-2-3, "Classification of Permanent Items", and NLP-2-0, "Determination of Importance Evaluations" (recently revised).

  DOE is still looking into means to improve the grading effort in view of the recent revised Q-List methodology as

discussed at the recent May 12, 1997, NRC/DOE QA meeting. Lastly, DOE is very interested in the methodology being developed by the NRC Office of Nuclear Reactor Regulation as discussed in the OR Reports for March and April 1997. This methodology is due to be released for public comment possibly within the next month in the form of a draft Regulatory Guide (RG). At this time, NRC Headquarters Division of Waste Management staff will review this draft RG and offer suggestions of where pertinent parts or all of this RG could be applied toward the area of high-level waste.

5.0 EXPLORATORY STUDIES FACILITY AND KEY TECHNICAL ISSUES

Exploratory Studies Facility (ESF) Testing:

The Tunnel Boring Machine (TBM) is being dismantled at the South Portal of the ESF. Geologic mapping and ESF construction and testing activities continue in the South Ramp and in Alcoves 5, 6, and 7. Temperature, pressure, relative humidity, and air velocity measurements are being collected at several locations in the ESF main drift. Investigators also continue to collect barometric pressure, temperature, and relative humidity data in Alcove 4 and monitor an evaporation test outside Alcove 3. Tensiometers and heat dissipation probes installed in the South Ramp and in Alcove 4 continue to measure the dry-out of tunnel wall rock. Seismographs in Alcoves 1 and 5 continue to monitor seismicity. There was no new testing activity conducted in Alcoves 1 and 2 over this reporting period. The location of alcoves and preliminary tunnel stratigraphy is summarized in Enclosure 4.

Alcove 5 (Thermal Testing Facility Access/Observation Drift, Connecting Drift, and Heated Drift)
Constructors poured the concrete invert (floor) in concrete-lined portion of the Heated Drift over this reporting period. The location of heater and instrument holes for the Heated Drift Test continue to be drilled and surveyed. This effort is largely complete and will be followed by the installation and hook-up of instruments and equipment. This test is designed to heat approximately 15,000 cubic meters of rock in the repository horizon to 100 degrees centigrade or greater to investigate coupled thermal-hydrologic-mechanical-chemical processes. This test is scheduled to begin in December 1997.

Alcove 5 (Thermomechanical Alcove)
The Single Element Heater Test started on August 26, 1996. This test is designed to heat approximately 25 cubic meters of rock to 100 degrees centigrade or greater to investigate thermomechanical properties of rock in the potential

repository horizon. All instrumentation, with the exception of some chemistry probes, are reported to be working properly and the collection of test data continues. On May 27, 1997, preliminary instrumentation measurements in the block indicated rock mass temperatures of approximately 159 and 78.4 degrees centigrade at distances of 0.33 and 1.5 meters, respectively, from the midpoint of the heater element. DOE terminated the heat-up phase of this test on May 28, 1997, since the objectives for this phase of testing had been met.

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. The excavation of this alcove was completed over this reporting period. This alcove intersects the fault at station 1+54. The fault is approximately 1 meter wide with vertical offset of less than 10 meters. Two radial boreholes were also drilled through the Ghost Dance Fault to prepare for hydrochemistry testing.

Alcove 7 (Southern Ghost Dance Fault Alcove)
Constructors previously excavated this alcove to station 1+34 meters and then drilled a horizontal radial borehole from the end of this alcove to locate the Ghost Dance Fault. This borehole cut a splay and the main trace of the Ghost Dance Fault at depths of approximately 30 and 63 meters, respectively. The alcove was then excavated an additional 16 meters to prepare for the first phase testing across the splay of this fault. Over this reporting period, investigators cleaned out the radial borehole across the splay of the Ghost Dance Fault to prepare for hydrochemistry testing.

Niche Study
DOE has initiated work to reduce the uncertainty in amount of percolation flux through the potential repository horizon at Yucca Mountain. Investigators are preparing to excavate two niches in the right rib of the ESF Main Drift between Alcoves 5 and 6. Niche #1 (station 35+66) represents an area of potential fast percolation flux and Niche #2 (station 36+50) represents an area of potential slow percolation flux, based on the results of Chlorine 36 studies. Investigators hope to characterize these areas to identify any difference in ambient conditions in potential fast and slow percolation flux areas.

Over this reporting period, investigators started dry drilling a series of 10 meter radial boreholes at each niche location. Niche study activities include borehole logging, air permeability testing, and tracer

injection, and seepage testing. These niches will be excavated approximately 5 meters. Once excavated, additional radial boreholes will be drilled and instrumented inside each niche. Niche entrances will be sealed and allowed to equilibrate. Borehole instrumentation will monitor ambient conditions from outside the niches. After ambient conditions are established an aqueous tracer will be injected via boreholes above these niches and seepage monitored by this instrumentation. These niches are expected to be excavated in the June-July 1997 time frame.

Surface-Based Testing:

Fran Ridge Large Block Heater Test

The Fran Ridge Large Block Test (LBT) started on February 28, 1997, and continues its heat-up phase. The heaters are expected to be turned off in August 1997, followed by a 4-month cool-down period. Rock mass temperatures are projected to reach approximately 140 degrees centigrade (near heaters) and 60 degrees centigrade (away from heaters). At the end of this reporting period, preliminary temperature measured in the plane of the heaters was approximately 113 degrees centigrade. The purpose of this test is to gather data to evaluate thermal-hydrologic-mechanical-chemical processes in rock similar to potential repository horizon. This test will investigate: the development of a dry-out region around the heaters and a rewetting front after cessation of boiling; the development of heat pipes and the role of fractures in the reflux of condensed water; and the effects of changes in chemistry and mineralogy and their effect on hydrology. This test is also expected to help discriminate among alternate conceptual models.

Borehole Testing:

The location of boreholes referenced in this section is provided in Enclosure 5.

C-Hole Complex

Tracer testing at the C-Hole Complex is currently being conducted in the Bullfrog-Upper Tram interval of the Crater Flat Group for the purpose of determining hydrologic properties in the saturated zone. Conservative (non-sorbing) tracer testing continues at the C-Hole Complex. On January 9, 1997, investigators injected up to 4 kilograms of the tracer Pryidone into borehole C#1 and up to 15 kilograms of the tracer 2,6 difluorobenzoic acid (DFBA) into borehole C#2. Breakthrough of DFBA occurred on January 16, 1997. Peak concentration values of DFBA were measured on January 21, 1997. In April 1997, Pyridone tracer was detected in low concentrations (0.116 parts per billion) in water

samples collected from borehole C#3. Project scientists indicate that initial breakthrough may have occurred in March 1997. Sampling and analyses of water pumped at C#3 is expected to continue through June 1997. Testing of the overlying Prow Pass interval of the Crater Flat Group is planned to begin by December, 1997.

New Boreholes Planned

DOE is proceeding with plans to drill two new boreholes in the Yucca Mountain area in FY97. One borehole (SD-6) will be located on the crest of Yucca Mountain and will penetrate the potential repository block. A second borehole (WT-24) will investigate the large hydraulic gradient north of the potential repository block. Based on current planning, these boreholes will be dry-drilled to depths ranging from 2500 to 3000 feet, and selected stratigraphic intervals will be cored in these boreholes. A standard suite of geophysical logs will also be run in each of these boreholes. Drilling of WT-24 is expected to start in late July 1997 followed by the drilling of SD-6.

Pneumatic Testing

Pneumatic data recording continues at boreholes UZ-4, UZ-5, UZ-7a, SD-12, NRG-7a, SD-7 and NRG-5. Gas sampling and pneumatic monitoring is being conducted in UZ-14. Nye County continues to record pneumatic data in boreholes NRG-4 and ONC-1.

OTHER ACTIVITIES

6.0 GENERAL

1. Meetings/Interactions

- May 12, 1997, NRC/DOE Quality Assurance video-conference.

2. Appendix 7 Site Interactions

- The ORs have made preparations for NRC contractor personnel from the Center for Nuclear Waste Regulatory Analyses (CNWRA) to conduct field work on infiltration June 5-9, 1997, in the Shoshone Mountain area.

- Preparations have also been arranged for (CNWRA) personnel to conduct ground magnetic geophysical surveys during the week of June 9, 1997. The purpose of these surveys are to investigate aeromagnetic anomalies that may represent buried igneous features.

- The OR's will accompany NRC Headquarters and CNWRA personnel on site visits on June 4, 1997, and June 10, 1997, respectively.

3. Other

- The ORs attended the regularly scheduled Director's Program Review Video-conference Meeting as presented to Mr. Lake Barrett, Acting Director of the Office of Civilian Radioactive Waste Management on May 1, 1997. The agenda and subjects discussed at this meeting are provided in Enclosure 6.

- The regularly scheduled meeting with the ORs and the Yucca Mountain Site Characterization Office (YMSCO) management with Russ Dyer (Acting Project Manager), YMSCO Assistant Managers, YMSCO QA Representative, and various YMSCO staff was held on May 13, 1997. The agenda for the items discussed at this meeting is provided in Enclosure 7.

7.0 REPORTS

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

DOE

DOE/RW-0498 SITE CHARACTERIZATION PROGRESS REPORT: YUCCA MOUNTAIN, NV, NUMBER 15, 4/97

DOE/EM-0319 LINKING LEGACIES, (Connecting the Cold War Nuclear Weapons Production Processes to Their Environmental Consequences) 1/97

AGENDA
NRC/DOE QUALITY ASSURANCE MEETING
May 12, 1997
VideoConference: DOE/LV, Blue Room; NRC Headquarters, T2B1

8:00 AM PST (11:00 EST)

- **OPENING REMARKS**
- **QA TOPICS**

- Status of Open Items	NRC/DOE
- Overview of Transition Plan	DOE
- QARD Revisions	DOE
- Data Qualification	DOE
- Status of Response to Management Assessment Recommendations	DOE
- Trend Program	DOE
- QA Oversight Function of the State of Nevada	NV
- NRC QA Involvement	NRC
- 10 CFR, Part 21	NRC
- Graded Approach Efforts	NRC/DOE
- Proposed Revisions to the Q-List	DOE

- **CLOSING REMARKS** — ALL
- **ADJOURN**

10:30 PM PST (1:30 PM EST)

NRC QA ISSUES (OPEN ITEMS)

5/12/97

N = WAITING NRC ACTION
D = WAITING DOE ACTION
O = NO FURTHER ACTION NEEDED

	ISSUE	REFERENCE	STATUS
1	M&O DESIGN CONTROL PROGRAM	BERNERO TO DREYFUS LTR. 10/13/94	OPEN (N)
2	POTENTIAL OF CONSTRUCTION WORK TO IMPACT SITE CHARACTERIZATION OR THE WASTE CAPABILITY OF THE SITE	BERNERO TO DREYFUS LTR. 10/13/94	OPEN (N)
3	REQUEST FOR MORE DETAILS REGARDING QA CONCERNS AS WELL AS THE DESIGN OF THE ESF	BERNERO TO DREYFUS LTR. 10/13/94	OPEN (N)
4	LICENSE APPLICATION ANNOTATED OUTLINE (LAAO) INCOMPLETE AND EDITORIALLY POOR	HOLONICH TO MILNER LTR. 8/15/95	OPEN (N)
5	LAAO CHAPTER 10 HEADINGS DO NOT REFLECT NRC GUIDANCE	HOLONICH TO MILNER LTR. 8/15/95	OPEN (N)
6	QUALITY CONTROLS APPLIED TO THE LAAO	HOLONICH TO MILNER LTR. 8/15/95	OPEN (N)
7	USGS TECHNICAL PROGRAM EFFECTIVENESS	HOLONICH TO MILNER LTR. 11/2/95	OPEN (D)
8	DATA QUALIFICATION	AUSTIN TO MILNER LTR. 3/18/96	OPEN (N)
9	LEVEL OF QUALITY OF WORK PRODUCTS	AUSTIN TO MILNER LTR. 10/24/96	OPEN (D)
10	EXEMPTION OF STATISTICAL ANALYSIS PROGRAMS FROM QA REQUIREMENTS	OBSERVER INQUIRY OF 11/12/96	CLOSED SEE #11 BELOW
11	DOE QARD SUPPLEMENT I GUIDANCE/REQUIREMENTS UNCLEAR FOR STATISTICAL ANALYSIS PROGRAM	SECTION 4.0 OF NRC ON-SITE FEB. 1997 REPORT	OPEN (D)

NRC QA ISSUES 1-10 WERE PRESENTED/DISCUSSED AT THE 12/5/96, QA MEETING. ISSUE 11 HAS BEEN ADDED SINCE THAT MEETING, THEREBY CLOSING ISSUE 10 SINCE THIS PROBLEM INVOLVES A LARGER PROBLEM THAN THE ORIGINAL OBSERVER INQUIRY.

NOTE: ALL THE ABOVE QA COMMENTS ARE DIRECTLY RELATED TOWARD IMPROVING INPUT AND ACQUISITION OF DATA FOR THE NRC KTI EFFORTS.

RESOLUTION STATUS OF THE NRC OPEN QA ISSUES

ISSUE	STATUS
1,2,3	DOE responded to NRC in its September 25, 1996, letter (Brocoum to Bell). In general, the QA portion is considered acceptable based on: 1) the NRC November 14, 1994, verification exercise; 2) revisions improvements to the overall design process; 3) the recent DOE QA Transition Plan, NRC observations of DOE audits/surveillances of the design process and; 4) meeting and observations of the design process by the ORs. The technical portion for this open item is presently being reviewed. An Appendix 7 meeting has been scheduled for June 12, 1997, in order for the NRC Technical Lead to obtain additional review information which may assist in the closure of the open items (W. Belke QA Lead, M. Nataraja NRC Technical Lead).
4,5,6	DOE responded to NRC in its March 21, 1997, letter (Brocoum to Thoma). In this letter, DOE indicates that the LAAO development will be terminated. It is also indicated that, should a repository licensing application be recommended in the future, information from the LAAO may be used in addition to other current NRC guidance. Should DOE submit such documentation in the future, the NRC comments that surfaced during its review of the DOE LAAO submittal will be considered. NRC will document its rationale for closure of these items in a formal letter to DOE.
7	DOE has initiated a comprehensive technical review of three key USGS technical documents. Should this review yield no major technical deficiencies, NRC will close this item at a subsequent QA meeting or in the monthly OR Report.
8	In late 1996, in response to the NRC August 19, 1996, letter (Austin to Brocoum), DOE organized a working group for improving the requirements and process for qualification of existing data. This was tracked by the ORs and was presented at the 5/12/97 QA meeting, and discussed at an Appendix 7 type meeting if necessary. From the OR perspective, this revised methodology appears to be responsive to the NRC position expressed in the above August 19, 1996 letter. Should the review by the NRC HQ staff of this revised methodology be acceptable, this open item will be closed in a subsequent QA meeting and in the monthly OR Report.
9	As a result of the LANL audit, DOE wrote 4 Deficiency Reports. Corrective action to close these Deficiency Reports is scheduled for completion in July 1997. If this corrective action satisfactorily addresses the NRC Open Item, it can be closed.

10	Closed
11	DOE has discussed the content of a future proposed clarification to the QARD for this open item with the ORs. This may be discussed at the 5/12/97, QA meeting. From the OR perspective, this proposed QARD clarification should close this open item.

o NRC CHECKLIST FROM APRIL 3-5, 1995, VERIFICATION:

Phase 2 Checklist Question	Remarks/Status
15, 16	(Corrective Action/Trending) W. Belke has documented problems in this area in several OR Reports, (especially for USGS) and it was discussed at the May 12, 1997 NRC/DOE QA meeting. DOE indicated that under the QA consolidation effort, there will be one system to monitor trends and therefore, trending should improve. The ORs will monitor this improvement and document their findings. **RECOMMEND CLOSURE**
18	(Selected design calculations and drawings are correct) M&O checking group much improved and well qualified. Raj looking into. **RECOMMEND CLOSURE**
19	(2nd bullet, "G" Values) See Para. 7.8.6 of NRC 6/16/96 NRC letter. **RAJ LOOKING INTO**
30	(DIE) Not sure what NRC wants here. **RAJ - HELP NEEDED HERE**
31	(Impacts minimalized - chlorides, diesel use) This is being done and do not know what else is needed to close. **RECOMMEND CLOSURE**
32	(PTn Issue) **RAJ LOOKING INTO- MAYBE CAN CLOSE**
34	(DIE design input) **RAJ LOOKING INTO**
37-41	(GROA issues) **RAJ LOOKING INTO - DOE WILL PROVIDE RATIONALE**
46	(DOE applicable 10 CFR Part 60 reqt's.) NRC in process of responding to DOE September 25, 1996, letter to M. Bell. **NRC REVIEWING - PROBABLY CAN CLOSE**

o NRC JUNE 16, 1995, LETTER ON APRIL 3-5, 1995, VERIFICATION SUMMARY/RESULTS :

- NRC finds that within scope of NRC's Phase 2 activities, DOE/M&O compliance is satisfactory.

- Three recommendations to be followed up during NRC phase 3:
  1) numerical modeling of rock bolts be expanded to include all pertinent types and applications,
  2) AP-6.14 be clarified regarding reportable conditions,
  3) DOE/M&O re-evaluate the quality classification of pre-cast concrete inverts.

- OTHER ITEMS TO BE VERIFIED DURING NRC PHASE 3 VERIFICATION :

  - Para. 7.1 - CAR actions to prevent recurrence to be looked at during Phase 3 to determine whether effectively implemented.

  - Para. 7.6 - Identification and implementation of corrective measures that address root causes to be verified during Phase 3.

  - Para. 7.8.4 - Verification of the numerical analyses of the stability of the openings of rock bolts.

  - Para. 7.8.5 - Interface control process to be monitored by the NRC staff as the design of the GROA is finalized.

  - Para. 7. 8.6 - "G" values used in design package 2C for seismic design need to be verified when repository seismic design parameters are finalized.

  - Para. 7.8.11 - NRC staff recommended AP 6.14 (Reportable Geologic Conditions) be clarified regarding reportable conditions.

  - Para. 7.9 - Open Item 1 remain open (Comment in 10/13/94 Bernero letter to DOE). M&O QA program not being effectively implemented.

  - Para. 8.1 - NRC recommends DOE re-evaluate the quality classification of pre-cast concrete inverts.

  - Para. 8.2 - Technical issue related to pneumatic pathways under review by NRC staff.

  - Para. 8.3 - Revision process and revised drawings will be reviewed by NRC staff during Phase 3.

  - Para. 8.4 - Open Item 3 remain open (Question 2 in 10/13/94 Bernero letter to DOE). Impacts to site characterization and waste isolation capability of the site that are associated with completion of work under design Package 2C. Also, the point in the construction of the ESF north ramp that there is a potential to impact site characterization and the waste capability of the site needs to be determined.

  - Para. 9.4 - How SCPB fits into overall document hierarchy to be examined during Phase 3.

  - Para. 9.5 - Open Item 4 remain open (Question 3 in 10/13/94 Bernero letter to DOE). GROA, ESF testing and design strategy.

- NUREG/CR-6513,NO.1 PARA'S ES.7 AND 7.3.2 DESIGN CONTROL PROCESS

  - Pending DOE's response and evaluation by Raj of the GROA aspect, this KTI issue could possibly be closed. From the QA perspective (W. Belke), it can be closed.

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 crystal rich 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
5+87 to 6+17m	Tiva Canyon crystal poor lower lithophysal zone

ESF TUNNEL STRATIGRAPHY CONTINUED*

STATION	
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 Tuff
8+73.5 to 9+12m	Pre-Yucca Mountain bedded tuffs
9+12 to 10+20m	Pah Canyon Tuff
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)
	Alcove #6 (centerline intersection): 37+37
	Alcove #7 (centerline intersection): 50+64

ESF TUNNEL STRATIGRAPHY CONTINUED*

STATION	
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 65+07	Topopah Spring crystal rich lithophysal zone
65+07 to 65+25	Topopah Spring crystal rich nonlithophysal zone
65+23	Fault
65+25 to 65+27	Topopah Spring crystal rich lithophysal zone
65+27 to 66+33	Topopah crystal rich nonlithophysal zone
66+33 to 66+49	Topopah Spring vitric zone
66+49 to 66+80.5	Bedded tuffs
66+80.5 to 67+26	Tiva Canyon crystal poor vitric zone
67+26 to 67+62	Tiva Canyon crystal poor lower nonlithophysal zone
67+62 to 67+70	Tiva Canyon crystal poor vitric zone
67+70 to 67+88	Tiva Canyon crystal poor lower nonlithophysal zone
67+88 to 67+91	Dune Wash fault (offset is greater than 10m)
67+91 to 68+47	Topopah Spring crystal poor upper lithophysal zone
68+47 to 68+85	Topopah Spring crystal rich lithophysal zone
68+85 to 69+90.5	Topopah Spring crystal rich nonlithophysal zone
69+90.5 to 69+96	Topopah Spring crystal rich vitric zone
69+96 to 70+58	Bedded tuffs

ESF TUNNEL STRATOGRAPHY CONTINUED*

STATION	
70+58	Fault (Offset greater than 10 meters)
70+58 to 71+68?	Topopah Spring crystal poor middle nonlithophysal zone
71+31?	Fault
71+68 to 73+02	Topopah Spring crystal poor upper lithophysal zone
73+02 to 73+41	Topopah Spring crystal rich lithophysal zone
73+41? to 74+40	Topopah spring crystal rich nonlithophysal zone
74+40 to 74+50.5	Topopah Spring vitric zone
74+50.5 to 74+96	Bedded tuffs
74+96 to 75+15	Tiva Canyon crystal poor vitric zone
75+15 to 76+03	Tiva Canyon crystal poor lower nonlithophysal zone
76+03 to 78+40	Tiva Canyon crystal poor middle nonlithophysal zone
76+32	Fault - offset estimated to be 0.2 meters
78+40 to 78+77	Tiva Canyon crystal poor upper lithophysal zone

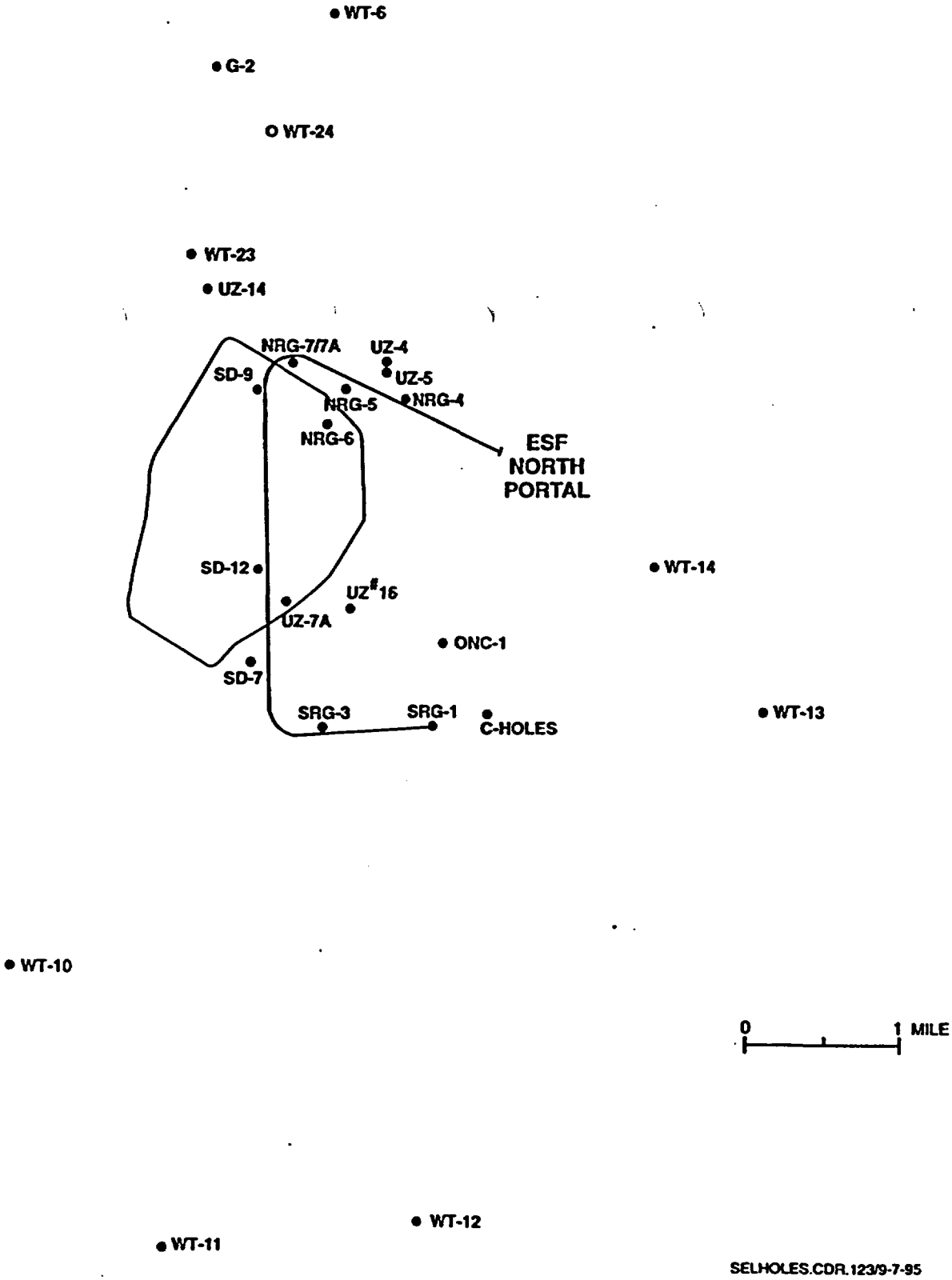
Note: Starting at station 57+02 and ending at 59+80, the crystal poor lower lithophysal zone is exposed in the lower portion of the tunnel (below springline).

* 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.

Selected Borehole Locations



SELHOLES.CDR.123/9-7-95

ENCLOSURE 5

AGENDA
Director's Program Review
Thursday, May 1, 1997
Videoconference Rooms: M&O Contractor (Dunn Loring),
DOE/Forrestal, Room GF-277, and YMSCO Blue Room

Time (PST)	Subject	Presenter
7:00 AM - 7:05 AM	Recognition of Visitors	Conner
7:05 AM - 7:10 AM	Opening Remarks	Barrett
7:10 AM - 7:25 AM	Program Status Overview	Rousso
	Program Performance Status	
7:25 AM - 8:20 AM	YMSCO	
	Overview	Barnes
	Implement Detailed Planning	
	Viability Assessment Change Request	Williams
	Enhanced Characterization of the	
	Repository Block	Adams
	YMP Performance Measurement	Spence
8:20 AM - 8:50 AM	WAST Project	
	Overview	Shelor
	Waste Acceptance and Transportation	Carlson
	Storage and Engineering Technology	Kouts
	WAST Performance Measurement	Bokhari
8:50 AM - 9:05 AM	Quality Assurance	Horton
	Overview	
	QA Performance Measurement	
9:05 AM - 9:25 AM	Program Management and Administration	
	Overview	Rousso
	PM&A Performance Measurement	Trebules
9:25 AM - 9:35 AM	Review of the Day's Action Items	Conner
9:35 AM - 9:45 AM	Questions from Visitors	All
9:45 AM - 10:00 AM	Lunch at Seats	
10:00 AM - TBD	Executive Session	

AGENDA FOR MAY 13, 1997, MEETING WITH W. BARNES

- FEEDBACK - NRC SITE VISITS FROM NRC INSPECTOR GENERAL APRIL 10, 1997, COMMISSIONER K. ROGERS VISIT, APRIL 30, 1997 (DOE/NRC)
- AGENDA/FEEDBACK FROM, MAY 12, 1997, PERIODIC NRC/DOE QA MEETING (NRC)
- STATUS DOE TECHNICAL REVIEW OF USGS TECHNICAL REPORTS (DOE)
- DATA QUALIFICATION EXERCISE (NRC)
- STATUS OF DOE REVIEW OF MAY 1996, STATE OF NEVADA REPORT FROM SZYMANSKI THAT WAS DISCUSSED AT LAST NWTRB MEETING IN PARUMPH (DOE)
- DOE YAP 30.12 REVIEW PROCESS (DOE/NRC)
- Q-LIST PRESENTATION (SCHEDULED FOR 4/22/97 CANCELLED MEETING) OR - - WILL THIS BE COVERED AT 5/12/97 QA MEETING ?
- STUDY PLAN STATUS - I.E., NRC RECEIVED DOCUMENT RECEIPT NOTICE TO CANCEL OR MARK MATERIAL OBSOLETE AND THEN NOTICE WITHDRAWN
- DOE TO RELY ON ENGINEERED BARRIER AS DISCUSSED AT 4/30/97 NRC/DOE MANAGEMENT MEETING ? (DOE)
- BRIEF OVERVIEW OF PROPOSED E/W DRIFT (DOE)

ENCLOSURE 7