UNITED STATES
NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20555-0001

December 18, 2000

MEMORANDUM TO: C. William Reamer, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Materials Safety and Safeguards

FROM: William L. Belke, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Chad J. Glenn, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Robert M. Latta, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT FOR SEPTEMBER 1, 2000 THROUGH OCTOBER 31, 2000

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (ORs) report for the period of September 1, 2000, through October 31, 2000.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The ORs continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTIs) and their resolution. During this reporting period, the ORs continued to observe activities associated with Yucca Mountain Site Characterization, KTIs, and auditing. The ORs also attended a number of meetings and accompanied NRC staff on visits to Yucca Mountain.

If you have any questions on this report or its enclosures, please call William L. Belke on (702) 794-5047, Chad J. Glenn on (702) 794-5046 or Robert Latta on (702) 794-5048.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives Report
ESF/ECRB Plan View, Alcove, Niche & Boreholes Testing Locations
Early Warning Drilling Program - Nye County, Nevada

Distribution list for Memorandum to C. William Reamer dated: December 18, 2000

R. Loux, State of Nevada
S. Frishman, State of Nevada
L. Barrett, DOE/Washington, DC
A. Brownstein, DOE/Washington, DC
S. Hanauer, DOE/Washington, DC
C. Einberg, DOE/Washington, DC
J. Carlson, DOE/Washington, DC
N. Slater, DOE/Washington, DC
A. Gil, YMPO
R. Dyer, YMPO
S. Brocoum, YMPO
R. Clark, YMPO
S. Mellington, YMPO
C. Hanlon, YMPO
T. Gunter, YMPO
G. Dials, M&O
J. Bailey, M&O
D. Wilkins, M&O
M. Voegele, M&O
S. Echols, Winston & Strawn
B. Price, Nevada Legislative Committee
J. Meder, Nevada Legislative Counsel Bureau
D. Bechtel, Clark County, NV
E. von Tiesenhausen, Clark County, NV
A. Kalt, Churchill County, NV
G. McCorkell, Esmeralda County, NV
L. Fiorenzi, Eureka County, NV
A. Johnson, Eureka County, NV
A. Remus, Inyo County, CA
B. Duke, Lander County, NV
R. Massey, Lander County, NV
J. Pitts, Lincoln County, NV
M. Baughman, Lincoln County, NV
J. Wallis, Mineral County, NV
J. Shankle, Mineral County, NV
L. Bradshaw, Nye County, NV
M. Murphy, Nye County, NV
J. McKnight, Nye County, NV
D. Weigel, GAO
W. Barnard, NWTRB
R. Holden, NCAI
A. Collins, NIEC
R. Arnold, Pahrump County, NV
J. Larson, White Pine County
R. Clark, EPA
F. Marcinowski, EPA
R. Anderson, NEI
R. McCullum, NEI
S. Kraft, NEI
J. Kessler, EPRI
D. Duncan, USGS
R. Craig, USGS
W. Booth, Engineering Svcs, LTD
J. Curtiss, Winston & Strawn
S. Besser, NV Congressional Delegation
N. Rice, NV Congressional Delegation
T. Story, NV Congressional Delegation
J. Reynoldson, NV Congressional Delegation
J. Pegues, City of Las Vegas, NV

December 18, 2000

MEMORANDUM TO: C. William Reamer, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Materials Safety and Safeguards

FROM: William L. Belke, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Chad J. Glenn, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Robert M. Latta, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT FOR SEPTEMBER 1, 2000 THROUGH OCTOBER 31, 2000

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (ORs) report for the period of September 1, 2000, through October 31, 2000.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The ORs continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTIs) and their resolution. During this reporting period, the ORs continued to observe activities associated with Yucca Mountain Site Characterization, KTIs, and auditing. The ORs also attended a number of meetings and accompanied NRC staff on visits to Yucca Mountain.

If you have any questions on this report or its enclosures, please call William L. Belke on (702) 794-5047, Chad J. Glenn on (702) 794-5046 or Robert Latta on (702) 794-5048.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives Report
ESF/ECRB Plan View, Alcove, Niche & Boreholes Testing Locations
Early Warning Drilling Program - Nye County, Nevada

cc: See attached list

**DISTRIBUTION:** w/Enclosures

| | | | | | |
|---|---|---|---|---|---|
| File Center | NMSS r/f | HLWB r/f | Public | | |
| LDeering | EO'Donnell | KHooks | RNataraja | WPatrick | JGreeves |
| JHolonich | SWastler | TMcCartin | KStablein | JTrapp | KChang |
| PJustus | JBradbury | BLeslie | NColeman | JFirth | |

DOCUMENT: ADAMS/NMSS-DWB-HLWB/Repository Site/OR Report/OctNovORReport.wpd
Accession #ML003765087 *SEE PREVIOUS CONCURRENCE*

| OFC | HLW/RSS | HLW/RSS | HLW/RSS | HLWRS | |
|---|---|---|---|---|---|
| NAME | WBelke/vlm/s/ | CGlenn /s/ | RLatta /s/ | DBrooks /s/ | |
| DATE | 11/13/00 | 11/13/00 | 11/13/00 | 12/18/00 | |

**OFFICIAL RECORD COPY**

ACNW: YES X NO_____ Delete file after distribution: YES_____NO_____

1) This document should/should not be made available to the PUBLIC __

2) This document is/is not related to the HLW program. If it is related to HLW, it should/should not be
placed in the LSS. _____ _____

U. S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVES REPORT
NUMBER OR-00-05

FOR THE REPORTING PERIOD OF SEPTEMBER 1, 2000 THROUGH OCTOBER 31, 2000


/s/

William L. Belke
Sr. On-Site Licensing Representative
Repository Site Section
High-Level Waste Branch
Division of Waste Management

/s/

Chad J. Glenn
Sr. On-Site Licensing Representative
Repository Site Section
High-Level Waste Branch
Division of Waste Management

/s/

Robert M. Latta
Sr. On-Site Licensing Representative
Repository Site Section
High-Level Waste Branch
Division of Waste Management

Reviewed and approved by: /s/

Dave Brooks
Section Leader
Repository Site Section
High-Level Waste Branch
Division of Waste Management


Enclosures

TABLEOFCONTENTS

U.S.NUCLEARREGULATORYCOMMISSION
ON-SITELICENSINGREPRESENTATIVEREPORT
NUMBER OR-00-05

PAGE

APPROVALSHEET ..... i

TABLEOFCONTENTS ..... ii

REPORTDETAILS

1.0 EXECUTIVESUMMARY ..... 1

2.0 INTRODUCTION ..... 4

3.0 OBJECTIVES ..... 4

4.0 QUALITYASSURANCE,ENGINEERING,ANDNRCKEYTECHNICAL ISSUES ..... 4

5.0 EXPLORATORYSTUDIESFACILITYANDNRCKEYTECHNICAL ISSUES ..... 8

6.0 GENERAL ..... 15

## 1.0 EXECUTIVE SUMMARY

**QUALITY ASSURANCE ENGINEERING and KEY TECHNICAL ISSUES**

U.S. Nuclear Regulatory Commission (NRC) OPEN ITEM 99-1: Suppliers not including appropriate technical or Quality Assurance (QA) requirements in sub-tier supplier's documents.

Initially documented in the August/September 1999 On-Site Licensing Representative's (OR) Report. Subsequent OR reviews identified a total of 21 examples.

During the month of September 2000, the Civilian Radioactive Waste Management System Management and Operating Contractor (M&O) issued a procurement notice to all suppliers alerting them of this recurring deficiency of suppliers failing to pass on appropriate technical and quality requirements in their procurement documents to their sub-tier suppliers. Since the issuance of this letter, there have been no supplier audits/surveillances indicating this deficiency has recurred. Therefore this open item is closed. The OR will continue to monitor the DOE supplier audit/surveillance reports for the effectiveness of this corrective action.

**NRC Open Item 00-2: Length of time to close Nonconformance Reports (NCRs)**

The OR review of the NCR log indicates that some NCRs have remained open almost four years. A similar NRC Open Item (98-1), was noted in January 1998, whereby extended periods of time were required to close Corrective Action Requests and Deficiency Reports. The open item was ultimately closed in the March/April 2000, OR Report.

The M&O initiated actions to: 1) assign a responsible manager to each NCR; 2) determine the disposition of each NCR; and 3) establish a closure date for each NCR.

**Condition/Issue Identification Reporting System (CIRS)**

On June 6, 2000, DOE established and implemented CIRS for the Yucca Mountain Project. This system was designed and implemented in response to concerns raised by several oversight groups.

The CIRS is a single type project wide system used as a tool for identifying, evaluating, tracking, and resolving conditions/issues. CIRS is unique as a single type system rather than relying on multiple systems that could diminish the ability to trend issues, anticipate problems and prioritize tasks to be resolved. Based on the ORs reviews and discussions with cognizant DOE and M&O personnel, it was determined that CIRS, although still under development, has the potential to facilitate problem identification and resolution of process work activities.

**Document Action Request (DARs)**

The ORs reviewed the status of Document Action Requests (DARs), associated with the Process Model Report audit recommendations. The recommendations were issued to insure the completeness and accuracy of administrative procedures. Based on the results of this review and discussions with representatives from the Office of Quality Assurance, it was determined that adequate corrective actions had been initiated to properly address the identified backlog of administrative procedure changes.

## EXPLORATORY STUDIES FACILITY (ESF) & NRC KEY TECHNICAL ISSUES

ESF/Enhanced Characterization of the Repository Block (ECRB) Testing
DOE continues efforts to maximize the amount of data available to support their Total System Performance Assessment -Site Recommendation (SR), Rev. 1. DOE's cut-off date for data/analyses to be considered in this revision is December 2000.

### Seepage Testing

DOE is conducting water release and seepage testing at several locations in the Topopah Spring Tuff. Passive hydrologic testing also continues where sealed bulkheads isolate sections of the ECRB from the effects of ventilation to allow drifts to return to ambient conditions in an effort to observe any natural seepage. Over this period, a number of instrument stations monitoring this test lost electrical power thus limiting data collection capabilities. DOE is exploring options to correct this problem. This seepage testing is expected to continue through FY2001.

### Cl-36 Validation Study

Testing to verify the presence of bomb pulse Chlorine-36 in the vicinity of the Sundance and Drill Hole Wash Faults continues. DOE reports that preliminary Tritium and Chlorine-36 analyses completed, to date, have not confirmed the presence of bomb pulse Chlorine-36; however, additional analyses await completion. DOE is proceeding with steps to determine if differences in sample preparation techniques, might explain differences in analytical results from these laboratories. A final report is expected to be submitted to DOE by the end of FY2001.

### Thermal Testing

DOE continues to maintain drift wall-rock temperatures below 200. Centigrade in the Alcove 5 thermal test. In conjunction with this testing, DOE initiated Side Wall Sampling in selected boreholes to evaluate any changes in fracture mineralogy, and completed a Plate Loading Test to access changes in rock properties. The next DOE sponsored thermal test workshop is scheduled for February 15, 2001.

### Fluid Inclusion Study

University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to determine the origin and age of fluid inclusions in calcite at Yucca Mountain. This study is presently expected to be completed in the Spring 2001 time frame.

### Surface-Based Testing

Waste Handling Building Geotechnical Investigation
DOE continued with a geotechnical investigation at the Yucca Mountain North Portal area to collect rock property and geophysical data for input to the design of a waste handling building for a potential repository at Yucca Mountain. The data collection portion of this work is presently scheduled to be completed by December 2000, and a final report is expected to be submitted to DOE by the June 2001 time frame.

### Nye County Early Warning Drilling Program

Nye County continued their Phase II drilling and sampling program. Hydrologic testing continues at Nye County well NC-EWDP-19D/D1 in preparation for alluvial tracer testing.

**Busted Butte Unsaturated Zone Transport Test Facility**
Phase II tracer testing continued over this report period. DOE presently plans to terminate tracer injection in early FY2001 and begin post-test characterization. Atomic Energy of Canada, LTD., continues radionuclide tracer testing on a block of tuff extracted from the Busted Butte Test Facility.

**Engineered Barrier System (EBS)Testing**
In September 2000, DOE continued EBS testing at their Pilot Scale Test Facility located in North Las Vegas. One test involves the restart of a column test using crushed tuff. A ventilation test is designed to simulate pre-closure conditions in the proposed repository.

## REPORT DETAILS

## 2.0 INTRODUCTION

The principal purpose of the OR report is to inform NRC staff, managers, and contractors to information on the 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. The ORs also participate in activities associated with resolving NRC Key Technical Issues (KTIs). In addition to communication of this information, this report may raise potential licensing concerns, or express opinions; these items represent the views of the ORs. The reporting period for this report covers September 1, 2000, through October 31, 2000.

## 3.0 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 DOE scientists, engineers, and 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 principal 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.

## 4.0 QUALITY ASSURANCE, ENGINEERING AND NRC KEY TECHNICAL ISSUES

The current listing and the progress of the NRC QA Open Items is as follows:

NRC OPEN ITEM 99-1 -QA/TECHNICAL REQUIREMENTS NOT INCORPORATED

***Background:***

CAR-VAMO-98-C-005 was closed September 16, 1999. This CAR pertained to the M&O for failing to implement effective programs for the procurement of items and services, and for ineffective corrective actions at each of the affected organizations (National Laboratories, and U.S. Geological Survey). Part of the requirements for the M&O and affected organizations are to include requirements for the suppliers to incorporate the appropriate DOE Quality Assurance Requirements and Description (QARD) document requirements into any sub-tier supplier-issued procurement document. They are also required to ensure that all applicable QA/technical requirements are included into M&O procurement documents to suppliers. The DOE considered that the M&O initiated sufficient corrective actions to address this deficient condition and closed CAR VAMO-C-98-005 with respect to the M&O's procurement responsibilities that were passed on to the suppliers. The OR review of DOE supplier audit/surveillance reports generated

during the period of March1999 through May 2000, indicated that there were problems with 21 suppliers not including QA/technical requirements into their sub-tier supplier's documents. This problem was initially reported by the OR in the August/September 1999 OR Report. DOE considered this an isolated instance because it only occurred once with each supplier to sub-tier supplier procurement. Based on the audit/surveillance findings, DOE considered the actual findings to be insignificant and did not warrant removal of the suppliers from the Qualified Supplier's List (QSL) and that overall, the DOE QA supplier audit program is working.

Not incorporating appropriate QA/technical requirements into subtier supplier procurement documents appears to be a problem area with enough of the OCRWM qualified suppliers such that it may require attention and improved communication with all qualified suppliers. The NRC OR recommended in October 1999, that DOE issue a generic letter directing all suppliers to fully comply with the DOE QARD requirements (analogous to "lessons learned"). This would include special attention to ensure appropriate QA/technical requirements are included into suppliers and subtier suppliers procurement documents. A letter was issued three months later to the nine suppliers identified in the September/October 1999, OR report rather than to the entire population listed on the QSL.

***Current Status:***
During the month of September 2000, the M&O issued a procurement notice to all suppliers alerting them of this recurring deficiency of suppliers failing to pass on appropriate technical and quality requirements in their procurement documents to their sub-tier suppliers. Since the issuance of this letter, there have been no supplier audits/surveillances indicting this deficiency has recurred. Therefore, this open item is closed. The OR will continue to monitor the DOE supplier audit/surveillance reports for the effectiveness of this corrective action.

**NRC OPEN ITEM 00-2 -LENGTH OF TIME TO CLOSE NONCONFORMANCE REPORTS (NCRs)**

***Background:***
The OR review of the DOE NCR log and tracking system runoff indicated an example of an NCR remaining open nearly four years and other examples of NCRs open over two years. A similar NRC review (Open Item 98-1) of the CAR and DRs reported in the January/February 1998 OR Report, noted that these deficiencies remained open well in excess of one year. NRC Open Item 98-1 was closed in the March/April 2000 OR Report which noted significant improvements in timely closure for these types of deficiencies.

NCRs provide the vehicle for documenting nonconforming items, samples, and products both subject to and not subject to the requirements of the Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description document ("Q" and non-"Q"). It is recognized that certain of these NCRs may not have a high degree of safety significance. However, the large number of NCRs remaining open for extended periods of time, does not meet the full intent of the requirements of Title 10 of the Code of Federal Regulations (10 CFR), Part 60, Subpart G (which references 10 CFR Part 50, Appendix B). Criterion XVI of Appendix B requires in part, "...nonconformances are promptly identified and corrected."

This issue was briefly discussed with DOE and it was noted that closing some of the issues are not of the utmost priority due to lack of safety significance and budgetary constraints. DOE also noted that with recent improved communication efforts, NCR closure times have improved.

The process for controlling the issuance and control of NCRs is delineated in Yucca Mountain Site Characterization Project Procedure YAP-15.1Q, "Control of Nonconformances." Unlike Administrative Procedure AP-16.1Q for activities subject to QA program controls, YAP-15.1Q does not provide specific requirements on establishing an agreed upon timely closure date and an extension date if necessary, by the involved responsible individuals, for a particular deficiency. Also, unlike AP-16.1Q, YAP-15.1Q does not describe provisions which assign individuals to be accountable for closure. Rather, YAP-15.1Q assigns the "responsible organization" for further action. The OR recommends that YAP-15.1Q be reviewed for possible improvements.

***Current Status:***
The M&O initiated actions to: 1) assign a responsible manager to each NCR; 2) determine the disposition of each NCR; and 3) establish a target closure date for each NCR. This open item first surfaced from the ORs review of the NCR data base dated 6/28/00 listing a total of 65 open NCRs. As of 9/13/00, the M&O initiated timely corrective action and closed 26 of the 65 (40%). This was a commendable effort by the M&O and the OR was on the verge of closing this open item pending further information. However, only four NCRs have been closed between 09/13 and 10/19/00. Planned closure dates have slipped and have required extensions, thus causing further delays in NCR closure. This in turn lowers confidence that an effective NCR closure process is in place. The OR is waiting for a response to a request to explain how each NCR is evaluated to determine whether the nonconforming condition could have any impact on site recommendation or potential license application. Based on the current status, this item remains open.

**Evaluation of Condition/Issue Identification and Reporting/Resolution System (CIRS)**
***Background:***
The Yucca Mountain Project has decided to use a single, project-wide system by which employees can report issues and/or conditions rather than relying on multiple systems that could diminish the ability to trend issues, anticipate problems, and prioritize tasks to be resolved. On June 6, 2000, this program-wide procedure and on-line system was implemented. This system was designed and implemented in response to concerns raised by the Nuclear Energy Institute, the DOE FY 2000 Quality Assurance Management Assessment Report (9/8/00), the DOE Office of Oversight, and initiatives from the nuclear culture.

This program which is defined in Procedure AP-REG-004, "Condition/Issue Identification and Reporting/Resolution System," (CIRS) is intended to provide a consolidated reporting system for identifying and correcting conditions adverse to quality, tracking and trending deficiencies, providing status information, tracking commitments and project process issues, and to identify opportunities for improvement. Additionally, this web based system has the capability to access several other business process databases where condition/issues reside, including items concerning quality deficiencies, environmental items, safety, and health issues.

***Current Status:***
During this reporting period the ORs performed a preliminary review of DOE's program for implementing an integrated problem identification and tracking system. In order to gain additional insights into this condition identification and resolution process the ORs conducted discussions with DOE and M&O personnel involved in the development and implementation of the CIRS program. As a result of these discussions it was ascertained that the CIRS program, as currently envisioned, will apply to all affected organizations including the Office of Civilian Radioactive Waste Management (OCRWM) and direct support contractors, the Management and Operating Contractor and applicable elements within the U.S. Geological Survey. The ORs also determined that the CIRS program is not intended to replace established procedural controls defined in AP-5.1Q, Procedure Preparation, Review, and Approval, AP-16.1Q, Management of Conditions Adverse to Quality, or YAP-15.1Q, Control of Nonconformances, related to the identification and resolution of deficiencies. Furthermore, the CIRS program is not intended to replace the present OCRWN Concerns Program which maintains anonymity for sensitive issues. However, the CIRS program may be used if project personnel are uncertain as to the proper mechanism for reporting a suspected condition or if the condition/issue does not fall within the scope of an existing process. Subsequent to the identification of a potential condition/issue, it is evaluated by the CIRS Condition Screening Team which assigns the condition/issue to the appropriate organization/individual for resolution. Future plans for the CIRS program are to incorporate the existing data base used for Corrective Action Requests, Deficiency Reports and Nonconformance Reports, which will contain provisions for trending both safety and non-safety category items and services.

Based on the ORs reviews and discussions with cognizant DOE and M&O personnel it was generally determined that the CIRS program, although still under development, has the potential to facilitate the problem identification and resolution process for work activities related to the Civilian Radioactive Waste Management System. The ORs will continue to monitor the development and implementation of the CIRS program and provide a status update during a future reporting period.

**Document Action Requests (DAR's)**
***Background:***
As previously documented in the NRC's Observation Audit Report No. OAR-00-10, dated October 2, 2000, during the conduct of the Process Model Report (PMR) audits, the DOE identified numerous recommendations related to the technical completeness and adequacy of administrative controls associated with the analytical modeling and process model development programs. These recommendations, which required responses from the audited organizations, typically involved procedural implementation and/or technical adequacy issues. For those recommendations that resulted in proposed procedural changes, Document Action Requests (DARs) were initiated in accordance with procedure AP-5.1Q, "Plan and Procedure Preparation, Review, and Approval."

In order to evaluate the effectiveness of the corrective actions associated with the resolution of the DOE audit recommendations the NRC observers reviewed the outstanding DARs for a selected sample of administrative procedures. As a result of this review the NRC observers noted several examples of DARs which, although they had been accepted for immediate action, remained open for a prolonged period of time (i.e., 6-12 months).

***Current Status:***
The ORs provided follow-up action on this issue and reviewed the status of approximately 30 additional DARs associated with an expanded sample of 12 administrative procedures. As a result of this review the ORs determined that numerous DARs which had been approved for immediate action, concerning revisions to administrative procedures, had remained unincorporated for extended periods of time, with some remaining open for over a year. Examples of these DARs included: software qualification (DAR-23718, dated 1/26/00); tracking of inputs for TBV/TBD assignments; (DAR-22866, dated 9/21/99); conflicting terminology related to accepted data (DAR24395, dated 1/25/00); coordination of impact reviews (DAR-22761, dated 9/8/99); electronic data management control, (DAR-22576, dated 8/25/99); control of scientific notebooks (DAR-22374.dated 8/10/99); and the submittal of data as QA records (DAR24368, dated 2/10/00).

The ORs discussed the status of the backlog of procedure changes with representatives from DOE. Based on these discussions it was ascertained that the DAR data base incorrectly identified at least two of these procedure changes as being open (i.e., DAR24667 and DAR-22769) when in fact the required actions had been completed and the DARs should have been closed. DOE acknowledged these data base errors and provided additional information on October 11, 2000, related to the current status of outstanding DARs. As indicated by DOE, 169 procedure change requests had been initiated since June 1999, of which 38 remained open for more than 90 days. DOE further stated that their assessment of these 38 outstanding DARs concluded that none of the changes would adversely impact site recommendation activities. Specifically, DOE stated that most of the 38 DARs (that had been open for more than 90 days) involved minor corrections and editorial changes and that only 7 of the subject procedure changes contained clarifications. With respect to these procedural clarifications, DOE stated that none of these DARs were determined to have an adverse impact on the technical content of the documents governed by the procedures. Based on the above reviews and discussions it was determined that adequate corrective measures were in place to address the identified backlog of administrative procedure changes.

## 5.0 EXPLORATORY STUDIES FACILITIES (ESF), AND NRC KEY TECHNICAL ISSUES

### ENHANCED CHARACTERIZATION of the REPOSITORY BLOCK (ECRB)

DOE continues ECRB construction and testing activities to maximize the amount of data available to support DOE Total System Performance Assessment (TSPA) -Site Recommendation Rev.1. DOE's cut-off date for data/analyses to be considered for this revision is December 2000. Enclosure 2 provides ESF and ECRB test locations. ECRB construction and testing activities are summarized below.

***Background:***
The excavation of the ECRB, completed on October 13, 1998, allows the collection of scientific and engineering data in stratigraphic units that constitute the bulk of the potential repository horizon.

## Passive Hydrologic Test

***Background:***

Since June 1999, sections of the ECRB have been isolated from the rest of the underground facility by the construction of sealed bulkheads. These bulkheads are located at Stations 17+63, 25+03 and 26+00. No forced ventilation occurs beyond the bulkheads, except during brief entries to collect data and perform maintenance. This is a passive test designed to allow the isolated parts of the ECRB to return to ambient (pre-construction) moisture and temperature conditions to determine if dripping from the rock-mass can be observed. Hundreds of moisture monitoring probes are installed in tunnel walls at depths of up to 2 meters. While some test probes show evidence of rewetting, DOE scientists state that moisture conditions in this section of the ECRB have not fully re-equilibrated.

In July 2000, DOE opened the bulkheads and completed several weeks of work in support of this test. This work involved the installation of: 1) drip indicators (pH treated cloth) and additional moisture monitoring instrumentation; 2) a third bulkhead (Station 26+00) between the Tunnel Boring Machine and Solitario Canyon Fault; and, 3) new wiring to better control instrumentation and equipment. On August 2nd, the bulkheads were closed. DOE currently plans to continue this test through FY2001.

***Current Status:***

Over this period, DOE started experiencing problems with the loss of electrical power to instrument stations. The high humidity condition behind the bulkheads is suspected to be tripping Ground Fault Circuit Interrupters (GFCI) resulting in the loss of power to instrument stations. Batteries provide a back-up power source for instrument stations; however, the life of these batteries is generally limited to several weeks. DOE scientists estimate that 75 percent of their data collection capabilities behind these bulkheads have been lost as a result of this problem. DOE is presently considering options to correct the problem.

The OR requested a copy of DOE's technical work plan for this section of the ECRB. DOE provided several Technical Work Packages (TWPs) which provide high-level planning information on this work. Based on these TWPs, ongoing work is described as an extension of DOE's moisture monitoring activities. In the OR view, DOE should consider developing a detailed plan describing the test purpose and objective, approach, pre-test predictions, schedule and use of data collected. Such a plan could promote greater confidence that test results will address data needs for DOE-NRC issue resolution activities.

## Niche #5

***Background:***

This niche is constructed at Station 16+20 to conduct seepage testing in the Topopah Spring lower lithophysal zone. Over two-thirds of the potential repository is planned to be located in this rock unit. Niche walls and boreholes have been instrumented with moisture monitoring equipment. Test results will feed the unsaturated zone flow and transport process model report.

***Current Status:***

DOE scientists continue preparations to begin Seepage Threshold Testing in early FY2001. This testing is expected to continue through FY2001.

**Systematic Hydrologic Characterization (SHC)**

***Background:***

DOE scientists are conducting SHC testing to investigate the spatial variability of hydrologic properties affecting seepage processes induced by the introduction of large amounts of traced water at different distances above the ECRB drift. DOE is drilling a number of boreholes in the Topopah Spring lower lithophysal zone between Stations 14+44 and 17+63. The boreholes are used for air permeability and liquid release testing in percolation and seepage studies. Test results will feed the near-field and unsaturated zone flow and transport process model reports.

***Current Status:***

DOE continues to drill and conduct SHC testing in boreholes. SHC testing is planned in approximately 20 boreholes. DOE has approved funding to continue this testing through FY2001.

**Alcove 8:**

***Background:***

This alcove is constructed at Station 8+00 to conduct seepage testing from the Topopah Spring upper lithophysal zone to the underlying Topopah Spring middle nonlithophysal zone. DOE completed drilling a series of boreholes downward from this alcove for moisture monitoring. Niche #3, previously constructed in the Topopah Spring middle nonlithophysal zone, is situated directly below this alcove (approximately 20 meters) and will be used in this test. Infiltration systems constructed on the floor of Alcove 8 will apply traced water at a measured rate. Boreholes in Alcove 8 and Niche #3 will be used to monitor changes in moisture content and other properties of the rock-mass. DOE scientists plan on monitoring these boreholes using ground penetrating radar, neutron logging, and acoustic tomography. Test results will feed near field and unsaturated zone flow and transport process model reports.

***Current Status:***

Two infiltration plots have been constructed on the floor of this alcove. Each plot is designed to allow water to be ponded over the plot. One plot is approximately 1 X 1 meter, and the second plot is approximately 3 X 4 meters. The small plot is constructed on a segment of a fault exposed both on the floor of Alcove 8 and the roof of Niche 3. Since August 2000, DOE scientists have ponded water on this small plot and monitored moisture conditions in Niche 3 to determine the breakthrough time of traced water on this fault. The water infiltration rate on the plot is approximately 1-2 centimeters per day.

As of October 31, 2000, DOE scientists report that there has been no breakthrough of traced water. According to DOE scientists, this fault is filled with gouge (clay like material) which may be inhibiting flow.

To enhance the infiltration and seepage processes along this fault, DOE scientists plan to enlarge the small infiltration plot. A trench (roughly 15 centimeters deep, 40 centimeters wide, and 4 meters long) will be constructed along this fault. This trench will allow water to be ponded over the entire length of the fault exposed in the floor of Alcove 8. DOE plans to construct this trench in the weeks ahead and resume infiltration in early FY2001. Once seepage testing is completed on the fault, infiltration will begin on the 3 X 4 meter plot. This testing is expected to continue through FY2001.

## Cross Drift Drainage Benches

***Background:***

Four drainage benches have been excavated and testing initiated. Drainage bench sites correspond to locations used in DOE's small scale fracture study. These 1 meter X 1 meter X 0.5 meter high benches are designed to characterize fracture properties for evaluation of seepage and drift drainage. A constant head infiltrometer (approximately 60 centimeters in diameter) is mounted on the surface of each bench. Traced water is applied to the surface of these benches to determine the infiltration rate and flow path of water through the rock mass.

***Current Status:***

This testing was terminated over this period since this work is not funded in FY2001.

## Cross Drift Thermal Test (CDTT)

***Background:***

In FY2000, DOE completed a plan for thermal testing in the Topopah Spring lower lithophysal zone at Station 16+95.

***Current Status:***

The CDTT is presently not funded for FY2001.

## EXPLORATORY STUDIES FACILITY (ESF) TESTING

DOE has now completed moisture monitoring and testing in Alcoves 1, 2, 6, and Niches 1, 2, and 3. Remaining work related to these locations will be limited to demobilization activities and preparing final data packages for submittal to DOE's Technical Data Management System. Very limited moisture monitoring and seepage testing continues at Alcoves 3, 4 and 7, and Niche 4. Ongoing ESF testing activities are summarized below.

## CHLORINE-36 VALIDATION STUDY

***Background:***

DOE scientists are proceeding with a study to validate the presence of bomb-pulse chlorine-36 at two locations in the ESF. DOE scientists completed the collection of approximately 60 samples in the vicinity of the Drill Hole Wash Fault and the Sundance Fault where elevated concentrations of chlorine-36 were detected in a previous study. These samples are being analyzed for chlorine-36, tritium, technetium-99, and supplemented by analyses of uranium, thorium, iodide-129 and radium isotopes. To date, this validation study has detected no elevated chlorine-36 values; however, additional samples await analyses. According to DOE scientists, one possible explanation for the apparent disagreement between results of this study and an earlier study may lie in sample preparation and processing techniques. One of the two laboratories is thought to have used a more aggressive crushing technique which may release more rock chloride thus reducing the ratio of chlorine-36 to chlorine. To determine the effect of two different sample preparation and processing techniques, a bulk sample has been collected from the ECRB, crushed to a uniform size, and sample splits shipped to the two laboratories for analyses. According to DOE, the results of these analyses will be compared and the two laboratories will agree to a standard sample processing method for subsequent Chlorine-36 analyses. The two laboratories will synthesize their results and prepare a report documenting their findings including

implications for conceptual models of unsaturated zone flow and transport. A final report is expected to be completed by the end of FY2001.

***Current Status:***
Over this period, the two laboratories initiated analyses of sample splits to determine what effect different leaching procedures may have on the release of rock chloride and Chlorine-36 analyses.

**Alcove 5 (Thermal Testing Facility Access/Observation Drift, Connecting Drift, and Heated Drift)**
***Background:***
DOE initiated the heating phase of this test on December 3, 1997. The four-year heat-up phase will be followed by a four-year cool-down phase. Heat generated by nine electrical floor heaters and 50 electrical wing heaters simulate heat from emplaced waste. This test is designed to heat approximately 15,000 cubic meters of rock in the proposed repository horizon to 100° Centigrade (212° Fahrenheit) or greater to investigate coupled thermal-hydrologic-mechanical-chemical processes. These processes are monitored by approximately four thousand sensors positioned in 147 radial boreholes around the heated drift. A data collection system records measurements from these sensors.

***Current Status:***
DOE scientists continue to maintain drift wall-rock temperatures below 200° Centigrade (392° Fahrenheit). DOE plans to hold these wall-rock temperatures for another year to evaluate the effect of sustained heating on the hydrologic, chemical and mechanical behavior of the rock. On October 25, 2000, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 198.9° Centigrade (390° Fahrenheit), rock-mass surface temperature of 195.0° Centigrade (383° Fahrenheit), and air temperature of 199.4° Centigrade (391° Fahrenheit). DOE scientists continued moisture monitoring via geophysical logging of selected boreholes. Over this period, DOE initiated Side Wall Sampling in selected boreholes to evaluate any dissolution and precipitation of minerals from fluid flow induced by this heater test. DOE also completed a Plate Loading Test to access any changes in rock-mass properties as a result of thermal testing. The next DOE sponsored thermal test workshop is presently scheduled for February 15, 2001, in Las Vegas.

**Fluid Inclusion Study**
***Background:***
University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to determine the origin and age of fluid inclusions found in secondary minerals (calcite and silica) at Yucca Mountain. The characterization of over 150 samples collected from the ESF and ECRB continues in an effort to better understand the development of secondary minerals and spatial distribution of fluid inclusions. A final report on this study is expected to be completed in the Spring 2001 time frame.

***Current Status:***
On September 20, 2000, UNLV scientists presented an update of their study to NRC's Advisory Committee on Nuclear Waste. In this presentation, UNLV scientists reported that the formation temperatures of fluid inclusions generally range from 45-60° Centigrade (113-140° Fahrenheit), and that there are two distinct types of fluid inclusions. Those that occur in the outer (younger) calcite layer are single-phase (liquid)

fluid inclusions indicating meteoric origin. Those that occur in the inner (older) calcite layer are two-phase (gas and liquid) fluid inclusions indicating degassing subsequent to the formation of the host calcite containing the fluid inclusion. UNLV scientists plan to present the latest results of this study at the Geological Society of America 2000 meeting in November 2000.

**Laser Strainmeter Test**

***Background:***

Under a cooperative agreement with the Yucca Mountain Site Characterization Office, the University of California, San Diego will install and monitor a long-baseline strainmeter (LSM) in the ESF. The LSM experiment will supplement Global Positioning System surveys conducted at five sites in the Yucca Mountain area from 1991 to 1997, which indicated higher crustal elongation rates (strain rates) than those indicated by the volcanic and tectonic history of the region. The general test description consists of the installation and operation of the LSM along the South Ramp of the ESF. A laser will measure the distance between two end monuments.

***Current Status:***

DOE initiated excavation of the strainmeter niches in October 2000. The LSM testing is presently not expected to begin until the Spring 2001 time frame.

**SURFACE-BASED TESTING**

**Nye County Drilling and Testing**

***Background:***

Phase II (FY2000) of the Nye County drilling and testing program continued over this period. Completed Phase II wells include the following: NC-EWDP-4PA, 4PB, 7S, 5SB, 19D/D1, and 2DB. Phase III (FY2001) drilling plans are presently under consideration. Enclosure 3 shows the location of planned and completed well locations.

***Current Status:***

At NC-EWDP-2DB, Nye County installed well casing to a depth of 2690 feet. This well was previously drilled to a total depth of 3075 feet. According to Nye County, Paleozoic rocks were encountered at a depth of approximately 2865 feet. Hydrologic testing and sampling of the carbonate aquifer is presently planned in early FY2001. Over this period, Nye County also collected water samples from NC-EWDP-4PA, 4PB, 5SB, 7S, 12PA, 12PB, 12PC, and 15P.

**Alluvial Tracer Complex (ATC)**

***Background:***

The ATC is a joint Nye County and DOE Cooperative Program to investigate flow and transport properties of the saturated alluvium and volcanic interface. The ATC test will be conducted at well NC-EWDP-19D/D1 and include both hydrologic and single well tracer injection testing. Nye County drilled 19D/D1 to a depth of 1438 feet and encountered water at 366 feet and volcanic rocks at 810 feet. This well was completed to isolate six water bearing zones (4 in alluvium and 2 in volcanic rocks). Nye County instrumented wells NC-EWDP-4PA, 4PB, 19P, 15P and Washburn to monitor ATC hydrologic testing.

***Current Status:***
Over this period, DOE continued isolated interval testing in 4 alluvial water bearing zones in NC-EWDP-19D/D1. The results of this testing will be used to select one of these zones for subsequent tracer testing.

**Waste Handling Building Geotechnical Investigation**
***Background:***
DOE is conducting a geotechnical investigation at the Yucca Mountain North Portal area to collect data for the design of a waste handling building for a potential repository. This activity involves drilling a series of boreholes and excavating trenches/test pits to further characterize this area. Geophysical data will be collected to obtain shear wave and compression wave velocities. DOE also plans to characterize near surface velocity over the potential repository using surface wave recordings generated by explosions in three boreholes on the crest of Yucca Mountain.

***Current Status:***
DOE continued drilling and geophysical logging of approximately 15 shallow boreholes. The excavation and field testing in 4 test pits to obtain soil density data was also completed. Geologic logs of boreholes and test pit maps are under development. Field work for this investigation is expected to be completed by December 2000. A final report is expected to be submitted to DOE by June 2001.

**Busted Butte Unsaturated Zone Transport Test**
***Background:***
The planned hydrologic and tracer testing at Busted Butte is designed to provide data to help model flow and transport of radionuclides in the unsaturated zone under the proposed repository. The Busted Butte underground facility includes a 72.5 meter main drift and 19 meter test alcove. The test is fielded in the base of the Topopah Spring non-to-partly-welded vitric sub-zones and the top of the Calico Hills Formation. Phase I tracer testing was completed in 1998.

***Current Status:***
Phase II tracer injection continued in a separate 10 X 10 X 6 meter block of rock exposed in this underground facility. In early FY2001, DOE plans to stop tracer injection and begin post-test characterization work. This work includes: overcoring selected injection boreholes, partial mine-back of the Phase II block, and rock sampling and analyses to better characterize the distribution of reactive and nonreactive tracers. This work is expected to be completed during the third quarter of FY2001. Atomic Energy of Canada, LTD., continues radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility.

## ENGINEERED BARRIER SYSTEM (EBS) TESTING

The Engineered Barrier System Operations (EBSO) Office of the Yucca Mountain Project continues to perform EBS testing. The EBS tests are performed in a Pilot Scale Test Facility located in North Las Vegas. Test results feed the EBS degradation and transport process model report.

## PILOT SCALE TESTING

### Pre-closure Ventilation Test

***Background:***

DOE's System Design Description for the emplacement drift system states that the subsurface ventilation will remove 70 percent of the heat generated by the waste packages during pre-closure. DOE is conducting a pre-closure ventilation test in the EBS test facility. The objectives of this test are to (1) develop data to support the design of the ventilation system for the potential repository to maintain sub-boiling emplacement drift temperatures; and (2) provide data to support computer models used for ventilation calculations.

***Current Status:***

DOE completed the construction of the EBS ventilation test and started testing on September 19, 2000. This test is expected to conclude by the end of FY2001.

### Column Testing

***Background:***

In December 1999, DOE started column testing using crushed tuff. This testing is designed to replicate a previously reported test by Rimstidt (Rimstidt and Williamson 1991). The purpose of this testing is to determine the potential changes in permeability due to Thermal Hydrologic Coupled (THC) effects in backfill/invert materials.

To date, three column tests have been initiated, however equipment and contamination difficulties have delayed the completion of this testing.

***Current Status:***

On September 19, 2000, DOE restarted this test. This testing is expected to continue for a period of approximately two months

## 6.0 GENERAL

1. **Appendix 7 Interactions:**

   On September 11, 2000, the ORs accompanied two representatives from the NRC's Division of Waste Management on a visit to the Yucca Mountain facilities. The site visit included an overview of DOE's site characterization activities and examination of underground testing operations.

   On September 25, 2000, DOE scientists briefed the ORs on the status of stratigraphic workbooks supporting DOE's Integrated Site Model of Yucca Mountain. These workbooks integrate and document a variety of geologic data supporting this geologic model.

   On October 30, 2000, the OR attended a briefing by DOE scientists on the use of seismic tomography in characterizing structural and lithologic features. This instrumentation is used in shallow boreholes in the ESF/ECRB to image structural and lithologic features in the rock mass. This instrumentation may also prove effective in imaging flow paths from seepage testing, and construction induced effects on rock around drifts.

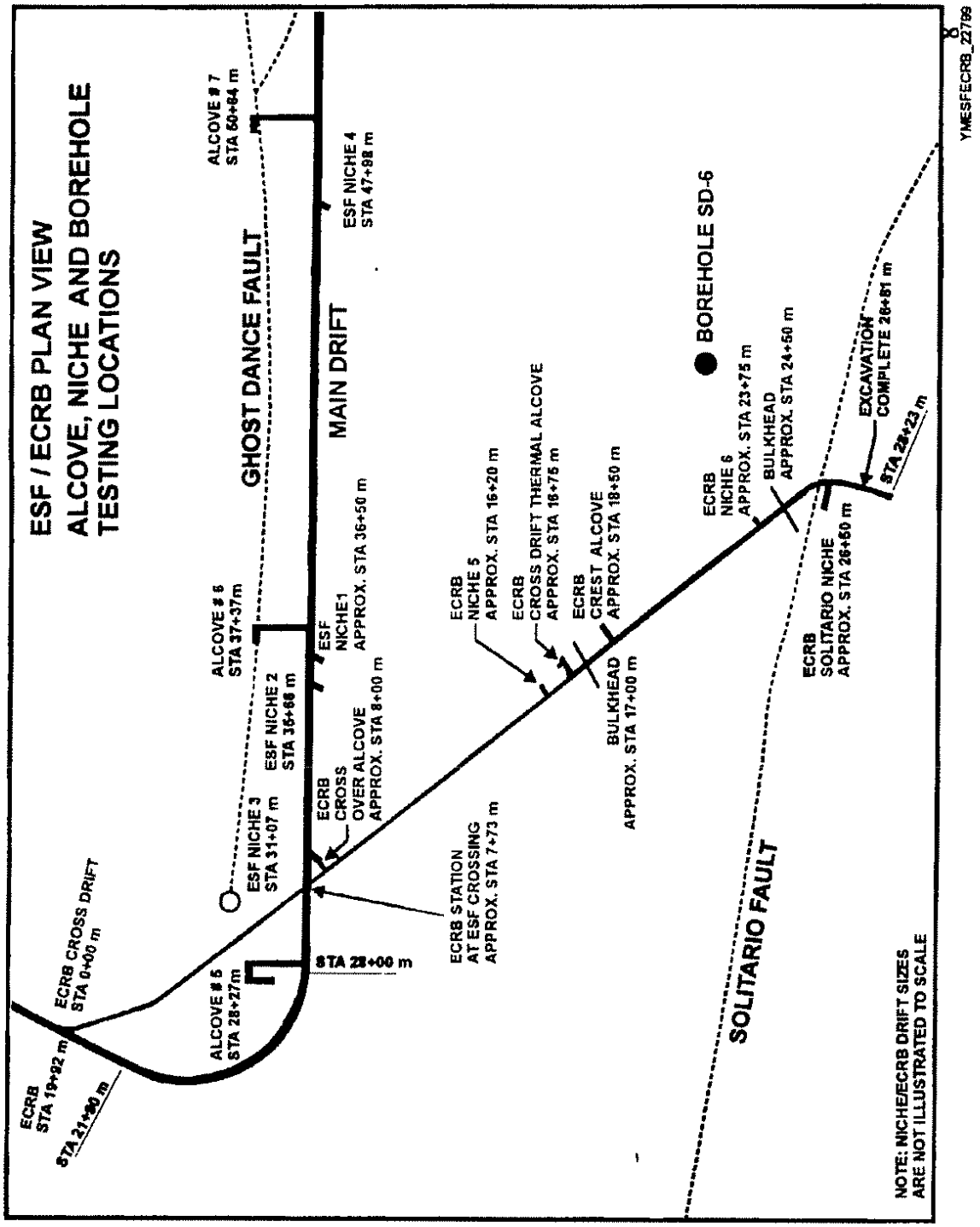
The purpose of the site visit was to obtain an overview of DOE's Yucca Mountain site characterization activities. There were no outstanding issues raised as a result of these visits.

2. **Other**

On September 19-21, 2000, the ORs attended the NRC Advisory Committee on Nuclear Waste meeting with DOE in Las Vegas, NV and accompanied this group on a tour of Yucca Mountain.

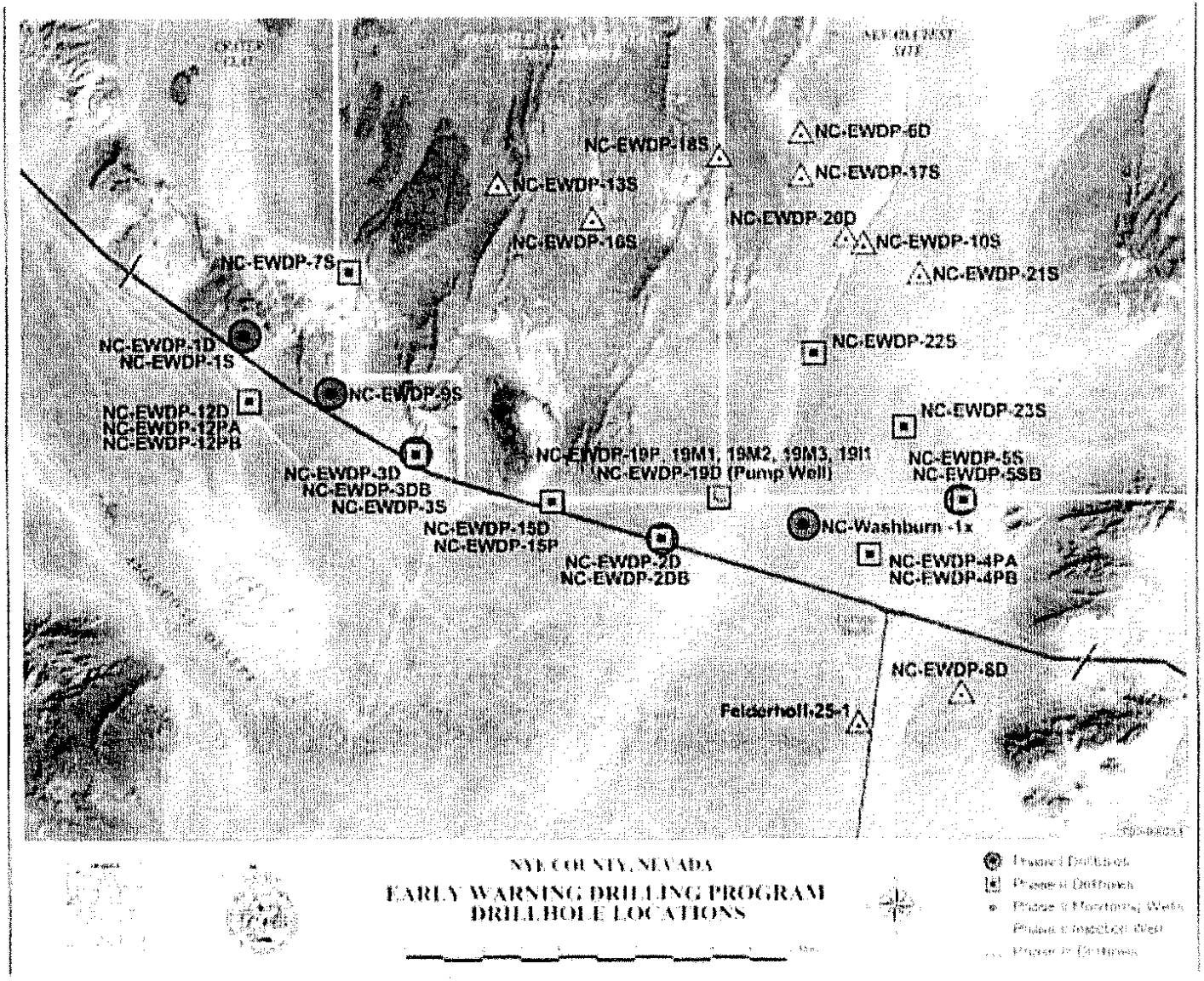
On September 27, 2000, the ORs attended the NRC/DOE management meeting in Las Vegas, NV. Discussion topics included DOE and NRC program updates; DOE Site Recommendation Consideration Report; DOE Process Model Reports/Analyses Modeling Reports; NRC Sufficiency Review; and NRC status on Key Technical Issues.

On October 25, 2000, the ORs attended a public meeting of the Clark County Yucca Mountain Nuclear Waste Advisory Committee. During this meeting the ORs presented an overview of the NRC's independent oversight role and its current function with respect to the proposed High-Level Waste Repository at Yucca Mountain. This presentation allowed for the constructive exchange of information with the affected units of local government, citizen representatives and Tribal constituents. The Advisory Committee members were receptive to the presentation and the meeting was regarded as an effective extension of the NRC's outreach program.


ESF / ECRB PLAN VIEW
ALCOVE, NICHE AND BOREHOLE
TESTING LOCATIONS
GHOST DANCE FAULT
MAIN DRIFT
SOLITARIO FAULT
BOREHOLE SD-6
ECRB CROSS DRIFT STA 0+00 m
ECRB STA 19+92 m
STA 21+90 m
ALCOVE # 5 STA 28+27m
ESF NICHE 3 STA 31+07 m
ALCOVE # 6 STA 37+37m
ESF NICHE 2 STA 35+66 m
ECRB CROSS OVER ALCOVE APPROX. STA 8+00 m
ESF NICHE1 APPROX. STA 36+50 m
STA 28+00 m
ECRB STATION AT ESF CROSSING APPROX. STA 7+73 m
ECRB NICHE 5 APPROX. STA 16+20 m
ECRB CROSS DRIFT THERMAL ALCOVE APPROX. STA 16+75 m
ECRB CREST ALCOVE APPROX. STA 18+50 m
BULKHEAD APPROX. STA 17+00 m
ECRB NICHE 6 APPROX. STA 23+75 m
BULKHEAD APPROX. STA 24+50 m
ECRB SOLITARIO NICHE APPROX. STA 26+50 m
EXCAVATION COMPLETE 26+81 m
STA 28+23 m
ALCOVE # 7 STA 50+84 m
ESF NICHE 4 STA 47+88 m
NOTE: NICHE/ECRB DRIFT SIZES ARE NOT ILLUSTRATED TO SCALE
YMESFECRB_22799

Enclosure 2

Enclosure 3


NC-EWDP-18S
NC-EWDP-6D
NC-EWDP-17S
NC-EWDP-13S
NC-EWDP-20D
NC-EWDP-16S
NC-EWDP-10S
NC-EWDP-7S
NC-EWDP-21S
NC-EWDP-1D
NC-EWDP-1S
NC-EWDP-22S
NC-EWDP-9S
NC-EWDP-12D
NC-EWDP-12PA
NC-EWDP-12PB
NC-EWDP-23S
NC-EWDP-19P, 19M1, 19M2, 19M3, 19I1
NC-EWDP-19D (Pump Well)
NC-EWDP-5S
NC-EWDP-5SB
NC-EWDP-3D
NC-EWDP-3DB
NC-EWDP-3S
NC-Washburn -1x
NC-EWDP-15D
NC-EWDP-15P
NC-EWDP-4PA
NC-EWDP-4PB
NC-EWDP-2D
NC-EWDP-2DB
NC-EWDP-8D
Felderhoff-25-1
NYE COUNTY, NEVADA
EARLY WARNING DRILLING PROGRAM
DRILLHOLE LOCATIONS