



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

February 16, 2001

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

FROM: William L. Belke, Sr. On-Site Licensing Representative
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SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING
REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT
FOR NOVEMBER 1, 2000 THROUGH DECEMBER 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 November 1, 2000, through December 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: February 16, 2001

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U. S. NUCLEAR REGULATORY COMMISSION
ON-SITE LICENSING REPRESENTATIVES REPORT

NUMBER OR-00-06

FOR THE REPORTING PERIOD OF NOVEMBER 1, 2000 THROUGH DECEMBER 31, 2000

/s/

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Enclosures

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ON-SITE LICENSING REPRESENTATIVE REPORT
NUMBEROR-00-06

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1.0 EXECUTIVE SUMMARY

QUALITY ASSURANCE ENGINEERING AND KEY TECHNICAL ISSUES

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

The U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (OR) review of the NCR log indicated that NCRs have remained open for extended periods of time as much as four years.

The Civilian Radioactive Waste Management System Management and Operating Contractor (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. The U.S. Department of Energy's Office of Quality Assurance (OQA) also initiated actions to modify the implementing procedure for controlling nonconformances. This modification will provide instructions for performing and documenting impact reviews of nonconforming conditions associated with software or data which support products related to Site Recommendation or potential License Application. Based on the corrective actions initiated and implemented by the M&O and the DOE OQA, this open item is closed.

MANAGEMENT & OPERATIONS TRANSITION PROCESS

On November 14, 2000, DOE announced the selection of Bechtel SAIC Company, as the new M&O contractor for the department's Office of Civilian Radioactive Waste Management program which includes the Yucca Mountain Site Characterization Project. As stated by the DOE, Bechtel SAIC Company will assume the responsibility for planning, integrating and managing the proposed high-level waste repository at Yucca Mountain on February 12, 2000. As an expedient to this process, the DOE has established a transition management schedule and a detailed transition plan which used lessons learned from other DOE projects. The transition team also benchmarked their program against DOE and industry experience. As determined by the OR's, the transition plan identifies and prioritizes those issues which require transition resolution plans, turnover work scope packages and other closeout documents. The transition plan also establishes orientation briefings designed to familiarize the new M&O with the status of ongoing work activities and to provide the new contractor with the transition-related issues resolution plans.

During this reporting period, the OR's attended several transition orientation sessions including the briefings for Waste Package Design, Data/Software Verification and Qualification and Subsurface Design. These briefings which addressed functional reporting relationships, design considerations, test results, data verification and software qualification issues, turnover package status, project schedules and milestones and other issues reflected significant management involvement and effective implementation of the transition plan.

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.

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. DOE continues to experience problems with the loss of electrical power to a number of instrument stations monitoring this test, thus limiting data collection capabilities. DOE has not yet developed a detailed test plan for the passive hydrologic test.

CI-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 two laboratories. Over this period, these laboratories completed tests of sample splits to determine what effect different leaching procedures may have on Chlorine-36 analyses.

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 completed 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 March 29, 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. On February 8, 2001, UNLV scientists plan to meet in Las Vegas to provide an update on this study.

Surface-Based Testing

Waste Handling Building Geotechnical Investigation

DOE completed the field work supporting 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. 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. In December 2000, the first alluvial tracer test was completed at Nye County well NC-EWDP-19D/D1.

Busted Butte Unsaturated Zone Transport Test Facility

Phase II tracer testing was terminated and post-test characterization initiated over this period. 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

DOE continues EBS testing at their Pilot Scale Test Facility located in North Las Vegas. The DOE Phase I pre-closure ventilation test, which started on September 19, 2000, was completed over this period. This phase of testing simulates the ability of ambient ventilation air to maintain sub-boiling temperature at the emplacement drift wall. DOE also completed a column test using crushed tuff over this period.

YUCCA MOUNTAIN PROJECT FY-01 RE-PLANNING

On December 22, 2000, DOE directed its Managing and Operating Contractor to re-plan previously baselined FY01 work. DOE identified the following activities that should be included in the FY01 re-plan:

- Develop a low temperature operating mode concept for SR design and include this in TSPR-SR, Revision 01.
- Complete the uncertainty activities described in the current FY01 baseline
- Complete a non-Quality Assurance TSPA that includes the results of the realistic hydrologic case and results of the uncertainties activities.
- Complete the AMRs necessary to capture the low-temperature operating mode concepts.
- Complete and document the ongoing analyses for the realistic hydrologic flow and transport model case.
- Complete planning and site preparation for new testing to address uncertainties and DOE commitments to resolving KTIs (e.g., cross-drift heater test).
- Reschedule planned revisions to the PMRs to incorporate into one revision both the revised AMRs and the new low-temperature AMRs.
- Plan for addressing DOE's commitments to the NRC's KTIs
- Plan for a technical update to the draft SRCR for incorporating new information that would be of interest to the public.

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 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 November 1, 2000, through December 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 00-2 -LENGTH OF TIME TO CLOSE NONCONFORMANCE REPORTS (NCRs)

Background:

The OR review of the DOE NCR log and tracking system database 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 Corrective Action Requests and Deficiency Reports 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 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 NCR 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 issuance and control of NCRs is delineated in Yucca Mountain Site Characterization Project Procedure AP-15.2Q, "Control of Nonconformances." Unlike Administrative Procedure AP-16.1Q for activities subject to QA program controls, AP15.2Q 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, AP-15.2Q does not describe provisions which assign individuals to be accountable for closure. Rather, AP-15.2Q assigns the "responsible organization" for further action.

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. The DOE OQA also initiated actions to modify AP-15.2Q. This modification will provide instructions for performing and documenting impact reviews of nonconforming conditions associated with software or data which support products supporting Site Recommendation (SR) or potential License Application (LA). This committed action has been verified through the review of the Document Action Request to change AP15.2Q to address SR and potential LA impacts. Based on the corrective actions initiated by the M&O and the DOE OQA, this open item is closed. The OR will continue to monitor the process for issuance and control of NCRs.

PROCESS VALIDATION AND RE-ENGINEERING PROGRAM

Background:

The Process Validation and Re-engineering (PVAR) program was instituted in the later part of 1998 to provide a review process for the numerous project procedures which contained duplicate information. Specifically, the goal of the PVAR program was to standardize and reduce the number of quality affecting technical procedures in place for Laboratory participants, eliminate procedural redundancy, provide clear guidance to end-users and to establish an effective training program. PVAR, as a focused initiative, was completed on June 30, 1999, subsequent to the implementation of project procedures and the completion of training for key personnel.

Current Status:

During this reporting period the OR's reviewed a selected sample of the data tracking numbers (DTN's) which had been qualified based on the use of post June 1999 PVAR procedures. The purpose of this review was to confirm that the qualified/accepted data

had been developed in accordance with post June 1999, PVAR procedures and that data traceability had been maintained through the use of the Technical Data Management System (TDMS). It is noted that the project uses DTN's to assign a unique identifier to each data item tracked in the TDMS.

Based on the review of the selected DTN's it was ascertained that the data had been properly developed or acquired under the PVAR program and that appropriate documentation and traceability existed in the TDMS to verify the source of the data, including the identification of superseded data. Within the areas evaluated no deficiencies were identified and it was generally concluded that data which has been developed or acquired in accordance with post June 1999 PVAR procedures had been properly documented in accordance with established project configuration management controls.

DATA VERIFICATION CHECKLIST REVIEW/DATA QUALIFICATION REPORT REVIEW

Background:

As previously documented in the On-Site Representatives Report dated April 26, 2000, the OR's reviewed the data qualification/verification processes implemented for technical product inputs to Analysis and Model Reports (AMRs) and Process Model Reports (PMRs). These processes are primarily governed by Procedure AP-3.15Q, Managing Technical Product Inputs, (for verification) and Procedure AP-SIII.2Q, Qualification of Unqualified Data and the Documentation of Rationale for Accepted Data (for qualification). The verification process applies to data used in AMRs/PMRs, which are characterized as qualified but to-be-verified (TBV), and ensured documentation of traceability of pedigree for data used as inputs to AMRs/PMRs. The qualification process applies to data used in AMRs/PMRs, which are unqualified, and establishes the bases for making these data qualified. Both processes apply to both acquired and developed data.

Based on the results of the verification reviews, the ORs determined that the AP-3.15Q process provided for completion of confirmation checklists, development of record road maps, and identification of supporting records (including traceability to the TDMS and between records within a TBV Resolution Package). It was also determined that the verification process established controls to evaluate procurement activities associated with data per Procedure LP-16.1Q-OCRWM, Review of Procurement Records for Use in the Verification Confirmation of Data of Technical Information. Further, the verification process addressed data-related software documentation per Procedure AP-SI.1Q, Software Management.

Based on the results of the qualification reviews, the ORs determined that the APSIII.2Q process provided for qualification of data via one or a combination of the following approaches: 1) Equivalent Quality Assurance Program, 2) Corroborating Data, 3) Confirmatory Testing, 4) Peer Review, and 5) Technical Assessment.

Current Status:

During this reporting period the OR's reviewed the AP-3.15Q, Attachment 2, checklists process activities and the AP-SIII.2Q data qualification process activities for selected DTN's used as inputs to AMRs/PMRs. The purpose of these reviews was to confirm the technical adequacy of the resulting checklist and data qualification report documents.

With respect to the verification review, the checklist process was evaluated to determine whether corrective actions identified in the Corrective Action Report (CAR) Management Plan for CAR LVMO-98-C-002, related to deficiencies in the documentation of data listed as "Qualified" in the TDMS before June 30, 1999 were appropriately addressed. Specifically, the OR's reviewed verification and qualification work performed for the following DTN's:

- DTN# LL990702804224.100 Qualification of Pore Water Data (qualification activity)
- DTN# GS950808312212.001 Volumetric Water Content Calculated from Field Calibration Equations Using Neutron Counts from 97 Boreholes at Yucca Mountain; 1 Oct. 1994 to May 1995 (verification activity)
- DTN# GS930708312312.019 Second Quarter 1993 Periodic Network Logbook (verification)

Based on the results of these reviews it was determined that the data confirmation/verification checklists appropriately characterized supporting documentation to demonstrate the traceability of data used in AMRs/PMRs to evaluate "principal factors" for the post-closure safety case or potential disruptive events. It was also determined that, despite the varying levels of prescriptiveness in the confirmation/verification checklist (i.e., 12 part versus a 3 part checklist, as controlled by specific revisions of Procedure AP-3.15Q), the final TBV Resolution Packages appropriately established linkages to objective evidence demonstrating the qualification of the data (i.e., DTN's).

No deficiencies were identified during the review of verification/qualification work performed on the selected DTN's. It was generally concluded the AP-3.15Q verification checklist process and the AP-SIII.2Q qualification process are conducted at the appropriate level of detail and rigor to justify the conclusions documented in the TBV Resolution Packages and the Data Qualification Report.

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. 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. DOE plans to continue this test through FY2001.

Current Status:

As noted in the September/October 2000 OR report, DOE continues to experience 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. In January 2001, DOE plans to correct this problem when the bulkheads are opened briefly to service instruments and equipment.

DOE presently lacks a detailed test plan for this test. The September/October 2000 OR Report, suggested that DOE consider developing a detailed plan describing the test purpose and objective, approach, pre-test predictions, schedule and use of data collected. In the OR view, such a plan would provide greater confidence that test results will address data needs for DOE-NRC issue resolution activities. DOE scientists indicate that a detailed plan for the Passive Hydrologic Test will be developed. The OR will continue to monitor the development of this test plan.

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 approximately 20 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. DOE plans 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. To date, 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. DOE scientists report that subsequent analyses of this gouge material indicate the presence of smectite (clay that swells with water).

To enhance the infiltration and seepage processes along this fault, DOE scientists have enlarged the infiltration plot. A trench (roughly 15 centimeters deep, 40 centimeters wide, and 4 meters long) was 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 restart infiltration on this fault in early FY2001. Once seepage testing is completed on the fault, infiltration will begin on the 3 X 4 meter plot. Finally, DOE is also considering moving the small infiltration plot to a location near the Alcove 8 bulkhead. This testing is expected to continue through FY2001.

EXPLORATORY STUDIES FACILITY (ESF) TESTING

DOE has completed moisture monitoring and testing in Alcoves 1, 2, 6, and Niches 1, 2. Limited moisture monitoring and seepage testing continues at Alcoves 3, 4, 7 and Niches 3 and 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. Approximately 60 samples have been collected 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 completed independent analyses of sample splits to determine what effect different leaching procedures have on the release of rock chloride and Chlorine-36 analyses. The laboratories plan to compare their results, and develop a common procedure for analyzing the remaining Chlorine-36 samples for this study.

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 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 December 21, 2000, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 197.2° Centigrade (387° Fahrenheit), rock-mass surface temperature of 194.4° Centigrade (382° Fahrenheit), and air temperature of 200.0° Centigrade (392° Fahrenheit). DOE scientists continued moisture monitoring via geophysical logging of selected boreholes. Over this period, DOE completed Side Wall Sampling in selected boreholes to evaluate any dissolution and precipitation of minerals from fluid flow induced by this heater test. The next DOE

sponsored thermal test workshop is presently scheduled for March 29, 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.

Current Status:

To date, over 150 samples from the ESF and ECRB have been characterized to better understand the development of secondary minerals and spatial distribution of fluid inclusions. In November 2000, UNLV scientists presented preliminary results of this study at the Geological Society of America 2000 meeting. On February 8, 2001, UNLV scientists plan to meet in Las Vegas to provide an update on this study. A final report on this study is expected to be completed in the Spring 2001 time frame.

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 continues with the construction of strainmeter niche monuments. The LSM testing is presently expected to begin in the Spring 2001 time frame.

SURFACE-BASED TESTING

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 (Enclosure 3) 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, the first single-well tracer test was completed in NC-EWDP-19D/D1. This test was conducted in the uppermost screened alluvial interval (412-431 feet) in this well. Reactive and non-reactive tracers were injected in this well. The test sequence included a two day shut-in period, followed by a two week pump-back and a two week well recovery period. The results of this testing are presently being analyzed.

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.

Current Status:

Over this period, DOE completed the drilling and geophysical logging of approximately 15 shallow boreholes. Geologic logs of boreholes and test pit maps are under development. 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. When Phase I tracer testing was completed in 1998, Phase II tracer injection was started in a separate 10 X 10 X 6 meter block of rock exposed in this underground facility.

Current Status:

Over this period, Phase II tracer injection was terminated and DOE started 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 multi-phase 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. This testing is expected to be completed by the end of FY2001.

Current Status:

Phase I of the EBS ventilation test started on September 19, 2000, and was completed in December 2000. This phase of testing simulates the ability of ambient ventilation air to maintain sub-boiling temperature at the emplacement drift wall.

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. The column testing was completed in December 2000.

Yucca Mountain Project FY01 Re-Planning

On December 22, 2000, DOE directed its Managing and Operating (M&O) contractor to re-plan previously baselined FY01 work consistent with current Project needs. DOE directed that the M&O submit a baseline change proposal (BCP) to DOE by the end of January 2001. In its guidance to the M&O, DOE identified the following activities that should be included in the FY01 re-plan:

- Develop a low temperature operating mode concept for SR design and include this in TSPR-SR, Revision 01.
- Complete the uncertainty activities described in the current FY01 baseline
- Complete a non-Quality Assurance TSPA that includes the results of the realistic hydrologic case and results of the uncertainties activities.
- Complete the AMRs necessary to capture the low-temperature operating mode concepts.
- Complete and document the ongoing analyses for the realistic hydrologic flow and transport model case.
- Complete planning and site preparation for new testing to address uncertainties and DOE commitments to resolving KTIs (e.g., cross-drift heater test).
- Reschedule planned revisions to the PMRs to incorporate into one revision both the revised AMRs and the new low-temperature AMRs.
- Plan for addressing DOE's commitments to the NRC's KTIs
- Plan for a technical update to the draft SRCR for incorporating new information that would be of interest to the public.

The activities identified above are subject to modification based on the development of a resource loaded plan.

6.0 GENERAL

1.0 Appendix 7 Interactions

On November 14, 2000, the OR's accompanied three representatives from the NRC Technical Training Center on a visit to the Yucca Mountain facilities. The purpose of this visit was to gain a better understanding of the Yucca Mountain project in order to develop a course on health physics issues for a high-level waste facility.

On November 16, 2000, the ORs accompanied two representatives from the NRC Office of the Inspector General on a visit to the Yucca Mountain facilities and the Area 25 Low-Level Radioactive Waste Management Site. The purpose of this visit was for the recently appointed NRC Assistant Inspector General to better understand these areas relative to future issues they may surface in his respective areas of responsibility.

On December 5, 2000, the ORs accompanied a representative of the NRC Division of Waste Management on a visit to the Yucca Mountain facility.

December 21, 2000 the ORs accompanied a representative of the NRC Division of Waste Management on a visit to the Yucca Mountain facility.

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

2.0 Other

On November 1 and 2, 2000, the ORs and OR Office Administrator attended the DOE Nuclear Culture briefing in Las Vegas, NV. The purpose of this briefing was to present to DOE and M&O Management, the basic legal requirements protecting employees and their rights to raise safety issues, refuse to conduct work that is unsafe or unlawful, and to request regulator intervention in areas of concern without harassment, intimidation, retaliation, or discrimination. The briefing emphasized that failure to establish a safety conscious work environment could result in personal or project sanctions and NRC intervention.



