U.S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVE REPORT

NUMBER OR-96-07

FOR THE REPORTING PERIOD OF JULY 1-31, 1996

8/19/96

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REPORT DETAILS

1.0 INTRODUCTION

The principal purpose of the On-Site Licensing Representative (OR) reports is to alert NRC staff, managers and contractors to information on the U.S. Department of Energy (DOE) programs for site characterization, repository design, performance assessment, and environmental studies that may be of use in fulfilling NRC's role during pre-licensing consultation. The principal focus of this and future OR reports will be on DOE's programs for the Exploratory Studies Facility (ESF), surface-based testing, performance assessment, key technical issue resolution, data management systems and environmental studies. Relevant information includes new technical data, DOE's plans and schedules, and the status of activities to pursue site suitability and ESF development. In addition to communication of this information, any potential licensing concerns, or opinions raised in this report represent the views of the ORs and not that of NRC headquarters' staff. The reporting period for this report covers July 1-31, 1996.

2.0 OBJECTIVES

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

3.0 SUMMARY AND CONCLUSIONS

During this reporting period, the ORs continued to monitor the actions being taken by the DOE Office of Quality Assurance to resolve problems identified with the implementation of the U.S. Geological Survey (USGS) QA Program. These problems were reported in detail in the NRC April/May 1996, and June 1996 OR reports. Information is also provided on the DOE trending program, proposed QA

organization consolidation effort, DOE document hierarchy, and problems identified during a surveillance for the collection of core samples by Los Alamos National Laboratory (LANL) within the ESF.

The ORs continue to monitor ESF and surface-based testing activities. Progress at the ESF remained steady and the tunnel boring machine (TBM) advanced from station 58+83 meters (19,301 feet) to station 60+92 meters (19,988 feet) during the month of July 1996. The C-Hole complex hydraulic interference testing and G-2 pump tests continue to be monitored. Pneumatic data recording and gas sampling continues at boreholes UZ-4, UZ-5, NRG-6, UZ-7a, SD-7, SD-9, SD-12, UZ-6s, and NRC-7a. Section 5.0 of this report also identifies several recently issued documents that may have a bearing on NRC Key Technical Issues.

4.0 QUALITY ASSURANCE, ENGINEERING, AND NRC KEY TECHNICAL ISSUES

1. In the April/May, and June 1996, OR reports, the ORs expressed concern about the lack of effectiveness of the USGS QA program both from a QA and technical perspective. The concerns were in the areas of QA Program Elements 4.0 Procurement), 7.0 Purchased Items and Services), and 16.0 (Corrective Action). These program elements were found to be unsatisfactory in DOE audits conducted in 1994, 1995, and 1996, which indicated that the deficiencies were of a repetitive nature. The NRC OR questioned the effectiveness of the overall trending program. There was also a concern expressed in the OR report that reviews conducted under the USGS QA program may not adequately verify the correctness, technical adequacy, completeness, accuracy, and compliance with established requirements of technical documents. As a result, DOE recognized there were problems associated with the effective implementation of the USGS QA program and initiated aggressive corrective action measures.

   The ORs participated in a conference call on July 31, 1996, with the DOE QA liaison stationed at the USGS offices in Denver, CO., and the Yucca Mountain QA Director to obtain information on the status and progress of the corrective action measures initiated by DOE. The QA Liaison indicated that comments have been incorporated into the revised USGS procedure for procurement and it is expected to be issued shortly. Supplier reports have also been reviewed and several USGS CARs have been closed. The re-review of technical reports for technical accuracy is expected to commence shortly. Based on this conference call, it appears corrective action is progressing in an expeditious manner.

2. In the OR Reports for April/May 1996, and June 1996, the DOE trending program effectiveness in general, was questioned. A series of meetings were scheduled with DOE representatives to better understand the process for identifying and reporting quality trends through the classification and evaluation of documented QA program deficiencies such as nonconformances and conditions adverse to quality.

   In the past year, Administrative Procedure, AP-16.3Q, "Trend Evaluation and Reporting," was revised to provide better insight of the effectiveness of implementation of the QA program. This revision is intended to identify problem areas and assist management in prioritizing those areas needing improvement. The procedural improvements require that when deficiencies are found and even corrected during an audit or surveillance, they must be entered into a database. A Trending Coordinator periodically evaluates the database in accordance with established trend evaluation guidelines, to identify potential trends adverse to quality. When adverse trends are identified, a Corrective Action Request is initiated to ensure the trend is corrected as soon as practical.

   From the database, the deficiencies are reported in a QA Program Trend Report (TR). The TR identifies the deficiencies and categorizes them into the following: 1) QA Program Element; 2) Deficiency Cause; 3) Hardware Trends; 4) Quality Program Trends; and 5) Suspected Trends.

   The ORs believe that the revised trending system, coupled with the recently issued root cause determination (AP-16.4Q, "Root Cause Determination" effective 7/15/96) if properly implemented, will identify adverse trends in a more expeditious manner and compel action to be taken to correct deficiencies. DOE has indicated that additional improvements to this system may be forthcoming based on "lessons learned." The ORs will continue to monitor this system to determine its effectiveness from a licensing perspective.

3. Twenty-one technical documents and eleven QA documents were selected from the OR office library to determine their relationship in the DOE document hierarchy, status, and how they are used. The technical documents were discussed with the DOE Systems Team Leader (STL). The STL was extremely knowledgeable and informative on all of the twenty-one documents selected. It was noticed that several of the NRC OR controlled documents were obsolete, superseded or are no longer being used (e.g., ESF Subsystem Design Requirements Document, Exploratory Shaft

Facility Title 1 Design Acceptability Analysis and Comparative Evaluation of Alternative ESF Locations, and Plan for the Phased Approach to ESF Development and Implementation). With the OR office and perhaps with other document holders, these documents are still maintained as controlled documents. The ORs recommend that DOE consider reviewing the document system and issue notifications to the document holder for those documents that are obsolete, superseded, or no longer being used to either decontrol or destroy the document.

The STL explained that an effort is underway to consolidate and eliminate redundancy in the DOE technical document hierarchy system. (The NRC ORs have commented several times on the complexity and redundancy of this system.)

In the November 1995, OR Report, the flowdown of the Title 10 of the Code of Federal Regulations (CFR), Part 60, technical requirements into the DOE technical document hierarchy was delineated (See Enclosure 1). This complex system will be revised to make it more user friendly. The MGDS-RD, RDR, and EBDR documents will essentially be combined. The SD&TRD, SBTFRD, ESFDR, Design Analysis, Design Package, etc. will be combined and will be archived with the ESF final proposed design. The actual requirements will be incorporated into MGDS-RD and translated into Systems Description Documents as depicted in the revised technical baseline (Enclosure 2). The ORs have not had the opportunity to gain an understanding whether the flowdown of the 10 CFR requirements flowdown through the documents in the revised technical baseline. However, the ORs believe the concept of the revised system will be a definite improvement over the previous technical baseline.

4. The DOE Office of Civilian Radioactive Waste Management (OCRWM) QA Director briefed the ORs and NRC Headquarters QA personnel shortly thereafter, on a proposed consolidation of the QA functions under the OCRWM Office of Quality Assurance. The consolidation is intended to enhance performance of QA activities in a more cost-effective manner. The rationale for this effort precipitated from a study that concluded that the present OCRWM QA organization was not presently structured to effectively perform the QA function in a cost effective manner given the current budgetary constraints imposed on the program. The study found that there were multiple layers of management causing a high management to staff ratio. This did not promote direct and effective involvement by the OCRWM Office of QA and consequently, the flow of information was weak and the current

structure lacked total interface in its ongoing operations. The above study revealed that the current layered type organization produced redundancy in certain activities such as reviews, surveillances, and procedures.

This proposed effort may eliminate certain management and staff positions within the various current QA organizations. This effort will also offer an increased level of QA independence and allow a more consistent standardized application of QA controls.

With the proposed consolidation, the OCRWM QA Director will be responsible for direct management of the QA organization and will be supported by QA Directors, QA Coordinators, and support contract management. This will also allow for total independence and require issues to be reported directly to OCRWM management for action to be taken. If this proposed recommendation is approved, it is anticipated that the consolidation will be completed within FY 1997.

The ORs have reviewed the information presented to them by DOE and believe the proposed consolidation effort will represent an improvement over the existing organizational structure. In view of the recent increase of deficiencies that have surfaced during recent audits of USGS, Los Alamos National Laboratory, and Sandia National Laboratories, timing of this proposed QA consolidation effort may be appropriate. However, the ORs have reservations on whether DOE can assemble the necessary experts in the appropriate disciplines vital to their mission, especially with the ongoing work at the national laboratories and USGS. DOE has indicated that they will evaluate existing personnel and if necessary, contract additional technical personnel where necessary. This may not be a major item of concern since it is estimated that the bulk of the national laboratory work is scheduled for completion in late 1997. Doe has also indicated that this proposed consolidation effort will be accomplished through a phased transition plan. The NRC will continue to monitor this effort in its observations of audits and surveillances to determine effectiveness.

5. A surveillance of the M&O at the Los Alamos National Laboratory (LANL) facilities at the Yucca Mountain Site, NV, was conducted by DOE on May 15 through June 17, 1996. The purpose of the surveillance was to verify compliance with the appropriate requirements associated with the collection of core samples. One Performance Report and one Deficiency Report (See Enclosure 3) were issued as a result of this surveillance and the overall adequacy of

LANL's implementation of the quality and technical requirements for the collection of drill hole core was found to be unsatisfactory. In the surveillance report, the background of the project history explains how considerable time and monies were expended on how to handle and process core samples. Several documents from NRC and DOE are referenced citing previous concerns and deficiencies. Not mentioned is the NRC staff May 8, 1990, report (J. Linehan to R. Stein) which provided comments and recommendations on the prototype drilling and core samples process conducted at Apache Leap and the Sample Management Facility.

The Deficiency Report issued for this surveillance essentially indicates that certain technical requirements for the collection of the core were not specified and/or established in the implementing documents. The initiator of the Deficiency Report noted that certain of these requirements originally specified as a result of NRC and DOE concerns and deficiencies had been deleted from the procedures.

From the OR licensing perspective, it would appear that due to the problems experienced with core sampling in the mid to late nineteen eighties, there would be a "lessons earned" effort at this point in time. "Lessons learned" being that most of the core collected during that time frame was rendered unacceptable for the licensing effort as determined by DOE. This unacceptable core was also extremely costly to the Yucca Mountain Project.

The ORs periodically visit the Sample Management Facility and coring locations and observe these practices to determine whether these practices can provide the necessary scientific information for site characterization. Overall, the ORs have found these practices to be acceptably conducted with no major problems. However, due to limited resources, the ORs have not been able to evaluate these practices in-depth as DOE audits and surveillances do. The ORs recommended to DOE that they revaluate the coring process and related procedural controls to assure this is an isolated instance and not widespread. This matter was briefly discussed with the OCRWM QA Director and he indicated that this matter was being looked into.

5.0 EXPLORATORY STUDIES FACILITY AND NRC KEY TECHNICAL ISSUES

Exploratory Studies Facility Testing:

As of July 31, 1996, the TBM advanced to station 60+92 meters (19,988 feet). Geologic mapping and sampling were

completed to station 60+33 meters. Investigators believe that the Ghost Dance Fault is the small NE-SW trending fault which cuts the left and right wall of the ESF at stations 57+02 and 57+30 meters respectively. The vertical offset on this steeply dipping fault is approximately 2 meters (down to the northwest). The Topopah Spring crystal-poor, lower lithophysal zone is present in the lower half of the tunnel from stations 57+02 to approximately 59+80 meters. The location of alcoves and preliminary tunnel stratigraphy is summarized in Enclosure 4.

Alcove 1 (Upper Tiva Canyon Alcove)
This alcove was constructed to conduct radial borehole and hydrochemistry testing in the Tiva Canyon Tuff. All testing in this alcove has been completed.

Alcove 2 (Bow Ridge Fault Alcove)
The purpose of this alcove is to investigate the hydrochemistry and hydrologic properties of the Bow Ridge Fault. Over the past month investigators completed the cross-hole air permeability testing between the two radial boreholes in this alcove.

Alcove 3 (Upper Paintbrush Tuff [non-welded] Contact Alcove)
Testing in this alcove is designed to investigate the pneumatic and hydrologic properties of the lithologic contact between the Tiva Canyon welded units and the Paintbrush bedded units. Over this reporting period investigators downloaded data from temperature, humidity, and radon monitoring equipment.

Alcove 4 (Lower Paintbrush Tuff [non-welded] Contact Alcove)
Alcove 4 is designed to investigate the hydrochemical properties between the Upper Paintbrush nonwelded tuff and the Topopah Spring welded tuff. Over this reporting period investigators downloaded data from temperature, humidity, and radon monitoring equipment in the vicinity of this alcove.

Alcove 5 (Thermal Testing Facility)
The Thermal Testing Facility is being constructed to investigate the thermomechanical properties of the potential repository horizon. It consists of the 1) Access Observation Drift, 2) Thermomechanical Alcove and 3) the Heated Drift. Full periphery mapping and photography have been completed in this alcove. Investigators continue to install instrumentation and connect cables to the data collection system in preparation for the start of the single-element heater test. This test is expected to start August 26, 1996.

The excavation of the Access Observation Drift (AOD) has advanced 136 meters from the centerline of the ESF. A borehole drilled into the crown of the AOD, at approximately 129 meters into the drift, cut the TSw1/TSw2 (Topopah Spring welded, lithophysae-rich/Topopah Spring welded, lithophysae-poor) stratigraphic contact at a depth of 9.1 meters. Geologic mapping and photography in this drift is complete. This includes full periphery mapping supplemented by detailed geologic mapping along a 60 centimeter wide strip down the right rib of the drift. Constructors have started coring the first two of the planned 22 instrumentation boreholes from the AOD to the Heater Drift Test area. The excavation of the cross-over drift, connecting the AOD to the Heater Drift, is expected to start in September 1996.

Alcove 6 and 7 (Northern and Southern Ghost Dance Fault Alcoves)
These alcoves are being constructed to investigate the hydrochemistry and hydrologic properties of the Ghost Dance Fault. Constructors excavated the first 22 meters of Alcove 6 using the Drill and Blast method. On July 1, 1996, the Alpine Miner proceeded with this excavation and construction of this alcove advanced 51 meters by the end of the month. The first phase of testing in this alcove will begin when the excavation has advanced approximately 90 meters from the ESF centerline. Alcove 7 will be located at station 50+60 meters. Excavation of Alcove 7 is expected to start in FY 1997.

SURFACE-BASED TESTING

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

C-Hole Tracer Test
Investigators continued with the third in a series of six tracer tests at the C-Hole Complex. The C-Holes tracer testing is designed to assist in establishing flow and transport properties in the saturated zone. This testing is being conducted in the Bullfrog member of the Crater Flat Tuff. A total of 15 kilograms of sodium iodide, a conservative (non-sorbing) tracer, was injected into C#1 on June 18, 1996. Since the start of this tracer test, groundwater has been pumped from C#3 at a rate of approximately 153 gallons per minute (gpm) and discharged to Fortymile Wash. At the same time water from C#3 is also reinjected into C#1 at a rate of 5 gpm. Investigators continue to monitor pumped effluent from C#3 for the presence of iodide above background concentrations. At the end of this reporting period, investigators detected a slight rise in iodide concentrations possibly representing

the initial breakthrough of this tracer. To date, tests conducted at the C-Holes suggests that the axis of greatest permeability and transmissivity lies between C#2 and C#3. Enclosure 6 displays the layout of the C-Holes, the location of the water table, the identity and depth of lithostratigraphic units penetrated, and the test zone. An accompanying table (Enclosure 6A) correlates equivalent geologic, hydrogeologic, and thermal/mechanical units.

The next tracer test will involve the simultaneous injection of lithium bromide (reactive or sorbing tracer), pentaflurorobenzoic (conservative or non-sorbing tracer), and polystyrene microspheres (to simulate transport of colloid size particles) into C#2. C#3 will continue to serve as the production well. This test is expected to initiate in August 1996.

G-2 Testing

Automatic recording of water-level recovery data from the pump test conducted in April 1996 continues. On July 30, 1996, the fluid level in this borehole had risen to within a meter of the pre-test level.

Gas Sampling and Pneumatic Testing in Boreholes

Pneumatic data recording and or gas sampling continues at boreholes UZ-4, UZ-5, NRG-6, UZ-7a, SD-7, SD-9, SD-12, UZ-6s, and NRG-7a. Nye County is recording data in NRG-4 and ONC-1 as well as collecting temperature, pressure and humidity data from instrumentation installed on the TBM. Investigators conducted gas sampling and analysis at SD-12 from July 10-19, 1996. These samples were drawn from pneumatic testing ports located at various depths in this borehole.

OTHER ACTIVITIES

Several documents have been issued over this reporting period that may have a bearing on NRC Key Technical Issues.

Probabilistic Volcanic Hazard Analysis

In early July 1996, DOE released the Probabilistic Volcanic Hazard Analysis (PVHA) for Yucca Mountain. This report assesses the probability of disruption by a volcanic event at Yucca Mountain and quantifies the uncertainty associated with this assessment. The stated goals of this study include: 1) to capture uncertainties involved in assessment of volcanic hazard; 2) to assign weights to models for cumulative probability distribution; 3) to evaluate variability of models and quantify uncertainty associated with each parameter value. This study was conducted over an 18 month period involving 4 workshops and 2 field trips. An important part of this PVHA report is the inclusion of

written elicitations of 10 experts. DOE intends to use the results of this report as input to its ongoing performance assessment work for the Yucca Mountain site.

DOE Response to Peer Review Recommendations on Thermohydrologic Modeling

In FY 1995, DOE requested a team of experts to evaluate the Yucca Mountain Project thermohydrologic testing and modeling program. This Peer Review Team (PRT) completed their evaluation and proposed 23 recommendations in a report entitled "Thermohydrologic Modeling and Testing Program Peer Review Report". In early July 1996, DOE issued a report responding to each of these recommendations. In the report, DOE agreed with 22 of the 23 recommendations. The report clearly outlines DOE's position with respect to each PRT recommendation and cites specific work and deliverables that address each recommendation. On July 30, 1996, the PRT commented on DOE's response document. In its response, the PRT acknowledged its satisfaction that DOE accepted 22 of its 23 recommendations. However, the PRT also felt a need to reiterate its position in several areas: 1) infiltration; 2) fracture-matrix interactions; and 3) DOE's in-situ thermal testing program. This PRT response represents the final step in this peer review process.

New Report on Hydrogeologic Controls on Ground-Water Flow

The U.S. Geological Survey recently issued a report entitled "Summary of Hydrogeologic Controls on Ground-Water Flow at the Nevada Test Site, Nye County, Nevada". This report documents the results of a study conducted in cooperation with DOE's Office of Environmental Restoration and Waste Management to better understand the hydrogeologic controls affecting ground-water flow at the Nevada Test Site (NTS). This study was conducted to support an assessment of health risks, from test-generated contaminants, that is based on an understanding of the ground-water flow system.

This report summarizes what is known and inferred about ground-water flow beneath the NTS and vicinity. It provides basic hydrologic and geologic information and describes subsurface conditions affecting ground-water flow. This report incorporates data on ground-water levels from 120 boreholes supporting underground tests conducted over the past 40 years. It describes the principal stratigraphic and associated hydrogeologic units from Quaternary valley-fill deposits to Precambrian carbonate rocks represented in this study area. In addition, the report includes a description of the three ground-water subbasins that make up the ground-water flow system of the NTS. Maps accompanying this report outline recharge and discharge areas, ground-water subbasin boundaries, and ground-water level contours across the site.

Geologic and hydrologic cross-sections of this area are also illustrated in this report.

Although this report was developed to support environmental restoration activities that are not related to the Yucca Mountain Project, the information contained in this report is relevant to hydrogeologic investigations at Yucca Mountain. Based on discussions with DOE Yucca Mountain Project staff, saturated zone modelers from DOE's Nevada Operations Office and Yucca Mountain Project Office are working together and exchanging information to better understand the ground-water flow system across the NTS. This information exchange may be particularly helpful in providing clues that help explain the nature of the large hydraulic gradient north of the potential repository block.

6.0 GENERAL

1. Meetings and/or Site Visits

NRC/CNWRA Site Visit to Yucca Mountain Area:
Over the period July 22-26, 1996, NRC/CNWRA conducted confirmatory characterization work related to several buried volcanic deposits in Crater Flat and Amargosa Valley. This work included the completion of a ground magnetic survey in the vicinity of Northern Cone, Little Cone, and an area just south of Lathrop Wells. The results of these surveys will be shared with DOE staff later this year.

2. Appendix 7 Interactions

DOE-NRC Appendix 7 Interaction on Thermal Testing:
On July 24, 1996, NRC and DOE staff and contractors met at the Yucca Mountain ESF to exchange information on thermal testing. Participants visited the Thermal Test Facility and discussed thermal test design, representativeness of test location, adequacy of thermal test data for Viability Assessment/License Application, and interference among tests and between tests and construction. In the morning, participants viewed a highly fractured section of ESF between stations 42+20 and 46+00 meters. In the afternoon, participants had an opportunity to ask questions and exchange information on various aspects related to thermal testing. In the ORs view, the objectives of this meeting were met. Finally, since it appears evident that there will be more Appendix 7 interactions in the future, the ORs recommend that a procedure be established to provide consistent guidelines on how these interactions should be conducted.

7.0 REPORTS

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

U.S. GEOLOGICAL SURVEY

Open-File Report 94-111 WATER LEVELS IN THE YUCCA MOUNTAIN AREA, NV, 1990-91, P. Tucci, G. O'Brien, D. Burkhardt, 1996

Open-File Report 95-159 WATER LEVELS IN THE YUCCA MOUNTAIN AREA, NEVADA, 1993, P. Tucci, G. Goemaat, D. Burkhardt, 1996

Open-File Report 95-289 ORIGINS OF SECONDARY SILICA WITHIN YUCCA MOUNTAIN, NYE COUNTY, SOUTHWESTERN NEVADA, R. Moscati, J. Whelan, 1996

Open File Report 95-325 GEOCHEMISTRY OF CORE SAMPLES OF THE TIVA CANYON TUFF FROM DRILL HOLE UE-25 NRG#3, YUCCA MOUNTAIN, NEVADA, Z. Peterman, Kiyoto Futa, 1996

Open-File Report 95-709 SELECTED HYDROLOGIC DATA FROM FORTYMILE WASH IN THE YUCCA MOUNTAIN AREA, NEVADA, WATER YEARS 1993-94, C. Savard, 1996

NUREG

CR-5229 FIELD LYSIMETER INVESTIGATIONS: LOW-LEVEL WASTE DATA BASE DEVELOPMENT PROGRAM FOR FISCAL YEAR 1995, ANNUAL REPORT, J. McConnell, Jr., R. Rogers, J. Jastrow, W. Sanford, I. Larsen, T. Sullivan, 6/96

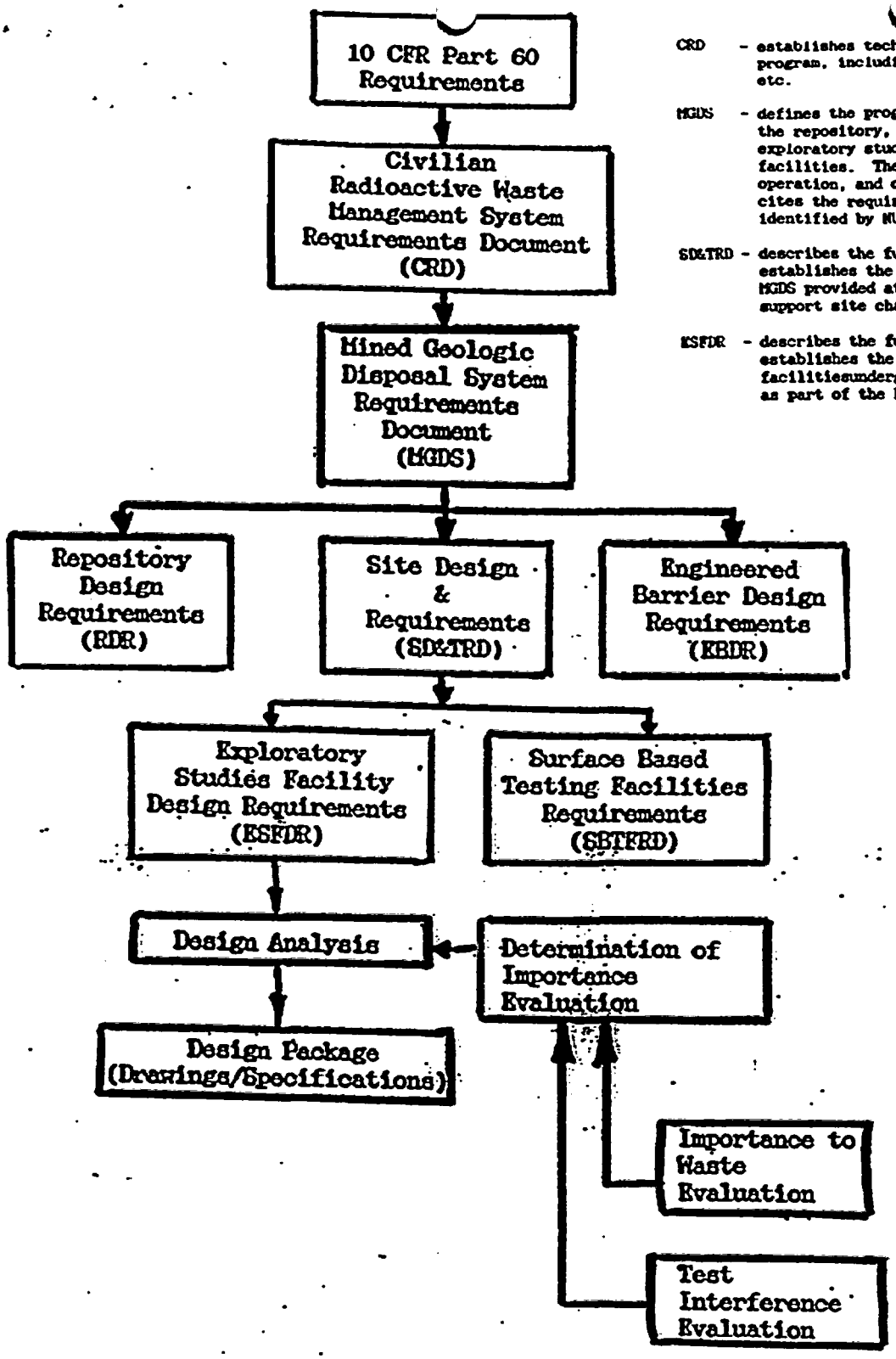
CR-6256 FIELD LYSIMETER INVESTIGATIONS--TEST RESULTS, Low-Level Waste Data Base Development Program: Test Results for Fiscal Years 1994 and 1995, J. McConnell, Jr., R. Rogers, J. Jastrow, W. Sanford, T. Sullivan, R. Neilson, Jr., L. Hilton

CR6341 MICROBIAL DEGRADATION OF LOW-LEVEL RADIOACTIVE WASTE, Final Report, R. Rogers, M. Hamilton, R. Veeh, J. McConnell, Jr., 6/96

LAWRENCE LIVERMORE

UCRL-ID-122899 EFFECT OF RADIATION ON THE MECHANICAL PROPERTIES OF TOPOPAH SPRING TUFF, S. Blair, J. Kelly, O. Pine, R. Pletcher, P. Berge, 6/96

MONTHLY REPORTS - LANL Monthly Management Analysis, (July). USGS June Progress Report.



CRD - establishes technical requirements for the entire program, including Federal regulations, DOE directives, etc.

MGDS - defines the program-level requirements for the design of the repository, engineered barrier system, the exploratory studies facility, and surface-based testing facilities. These requirements include design, operation, and decommissioning. The MGDS specifically cites the requirements from 10 CFR Part 60 that are identified by NUREG 1439.

SD&TRD - describes the functions to be performed by and establishes the requirements for facilities of the MGDS provided at the potential repository site to support site characterization.

ESFDR - describes the functions to be performed by and establishes the requirements for the design of facilitiesunderground openings, utilities, and services as part of the ESF.

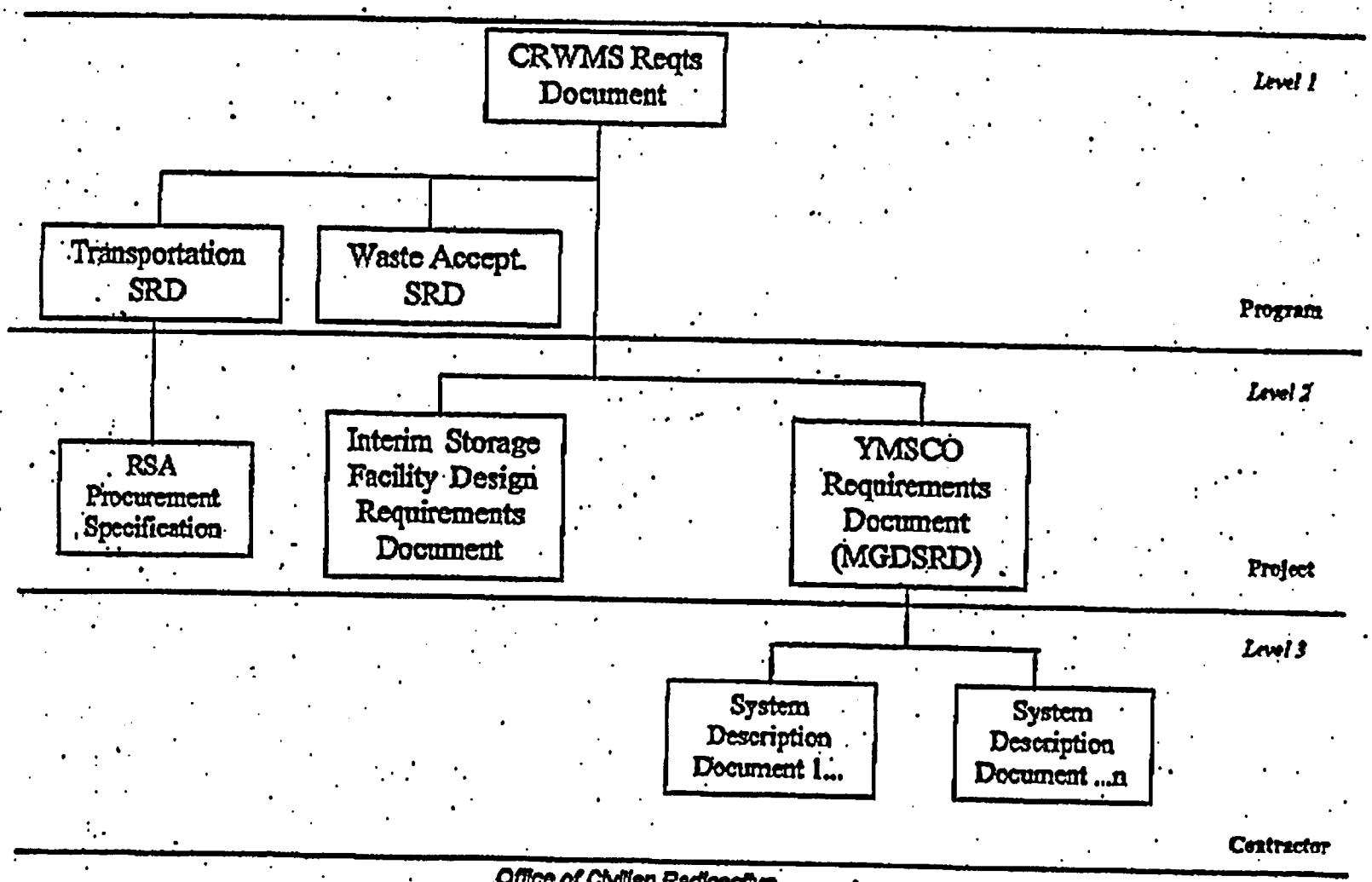
ESF TECHNICAL REQUIREMENTS

DOCUMENT HIERARCHY

ENCLOSURE 1

Preliminary Draft

Interim Technical Baseline



Office of Civilian Radioactive Waste Management

ENCLOSURE 2

ORIGINAL
THIS IS A RED STAMP

OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8 ☐ Performance Report
☒ Deficiency Report

NO. YM-96-D-065

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QA: L

PERFORMANCE/DEFICIENCY REPORT

1 Controlling Document:	2 Related Report No.
QARD, DOE/RW-0333P, Revision 5	YMP-SR-96-016

3 Responsible Organization:	4 Discussed With:
Yucca Mountain Site Characterization Office	S. Jones / K. Skipper

5 Requirement/Measurement Criteria:

QARD, Section 2.0, Paragraph 2.2.5, states in part: "Planning shall be documented to ensure work is accomplished under suitably controlled conditions. Planning elements shall include, as appropriate:
B. Identification of scientific approach or technical methods used to collect, analyze, or study results of applicable work."

QARD, Section 5.0, Paragraph 5.2.2 states: "Implementing documents shall include the following information appropriate to the work to be accomplished." Subparagraph 5.2.2B stipulates: "Technical and regulatory requirements."

6 Description of Condition:

Contrary to the above requirements, the appropriate technical requirements for the collection of core have not been specified and/or established in implementing documents. In discussion with U.S. Department of Energy Assistant Manager for Scientific Programs personnel it was determined that core orientation, photography, and geologic logging are considered standard industry practices that need to be accomplished for all core. However, in review of site procedures these technical requirements are not always mandated.

Examples of this deficiency are represented by:
1) Los Alamos National Laboratory (LANL) procedure LANL-EES-13-DP-612, Revision 0, fails to contain specifics on orientating core, core photography, and creation of a geologic log containing structural and lithologic features.
2) Civilian Radioactive Waste Management System Management and Operating Contractor procedure NWI-DS-0001Q, Revision 2, fails to identify core photograph and creation of a geologic log for non-assigned, non-allocated drill hole core.

Basically, the Project has failed to identify and document minimum set of technical requirements needed for the collection of all core when there is no special instructions identified by the Principal Investigators.

7 Initiator	9 QA Review
John S. Martin Date 7/2/96	QAR Date 7/10/96
10 Response Due Date:	11 QA Issuance Approval
20 Working Days From Issuance	QAR (PR)/AOQAM (DR) Date 7/19/96

12 Remedial Actions:

13 Remedial Actions Response By:	14 Remedial Action Due Date
Date	Date
15 Remedial Action Response Acceptance	16 PR Verification /Closure
QAR Date	QAR Date

Exhibit AP-16.1Q.1 Rev. 07/03/95

ENCLOSURE 3

ESF TUNNEL STRATIGRAPHY*

STATION	
0+00 to 0+99.5m	Tiva Canyon crystal poor upper lithophysal zone.
	Alcove #1 (centerline station intersection): 0+42.5
0+99.5 to 1+90m	Tiva Canyon crystal poor middle nonlithophysal zone
	Alcove #2 (centerline station intersection): 1+68.2
1+90 to 1+99.5m	Tiva Canyon crystal poor lower lithophysal zone.
1+99.5 to 2+02m	Bow Ridge fault zone (placing Pre-Ranier Mesa Tuff against Tiva Canyon Tuff)
2+02 to 2+20m	Pre-Ranier Mesa Tuff
2+20	Fault (4.3m offset)***
2+20 to 2+63.5m	Pre-Ranier Mesa Tuff
2+63.5 to 3+37m	Tuff "X"
3+37 to 3+49.5m	Pre-Tuff "X"
3+49.5 to 3+59.5m	Tiva Canyon vitric zone
3+59.5 to 4+30m	Tiva Canyon crystal rich nonlithopysal zone
4+30m	Fault (~10m offset)***
4+30 to 4+34	Tiva Canyon crystal rich nonlithopysal zone
4+34 to 4+39m	Tiva Canyon crystal rich lithopysal zone
4+39 to 5+50m	Tiva Canyon crystal poor upper lithophysal zone
5+50m	Fault (~5m offset)***
5+50 to 5+53	Tiva Canyon crystal poor upper lithophysal zone
5+53 to 5+87m	Tiva Canyon crystal poor middle nonlithophysal zone

ESF TUNNEL STRATIGRAPHY CONTINUED*

5+87 to 6+19m	Tiva Canyon crystal poor lower lithophysal zone
6+19 to 7+00m	Tiva Canyon crystal poor lower nonlithophysal zone
7+00m	Fault (~20m? offset)***
7+00 to 7+77m	Tiva Canyon crystal poor lower nonlithophysal zone.
	Alcove #3 (centerline station intersection): 7+54.
7+77 to 8+69m	Tiva Canyon crystal poor vitric zone
8+69 to 9+12m	Bedded tuffs (including thin Yucca Mountain member)
9+12 to 10+20m	Pah Canyon Member.
10+20 to 10+51.5m	Pre-Pah Canyon tuffs
	Alcove #4 (centerline station intersection): 10+27.8
10+51.5 to 11+93m	Topopah Spring crystal rich vitric zone
11+93 to 17+17m	Topopah Spring crystal rich nonlithophysal zone
17+17 to 17+97m	Topopah Spring crystal rich lithophysal zone
17+97 to 27+20m	Topopah Spring crystal poor upper lithophysal zone
27+20 to 35+93m	Topopah Spring crystal poor middle nonlithophysal zone
	Alcove #5 (centerline station intersection): 28+27
35+93m	Sundance fault (most prominent fault plane, minor fracturing reported between Stations 35+85 and 36+40)
35+93 to face	Topopah Spring crystal poor middle nonlithophysal zone

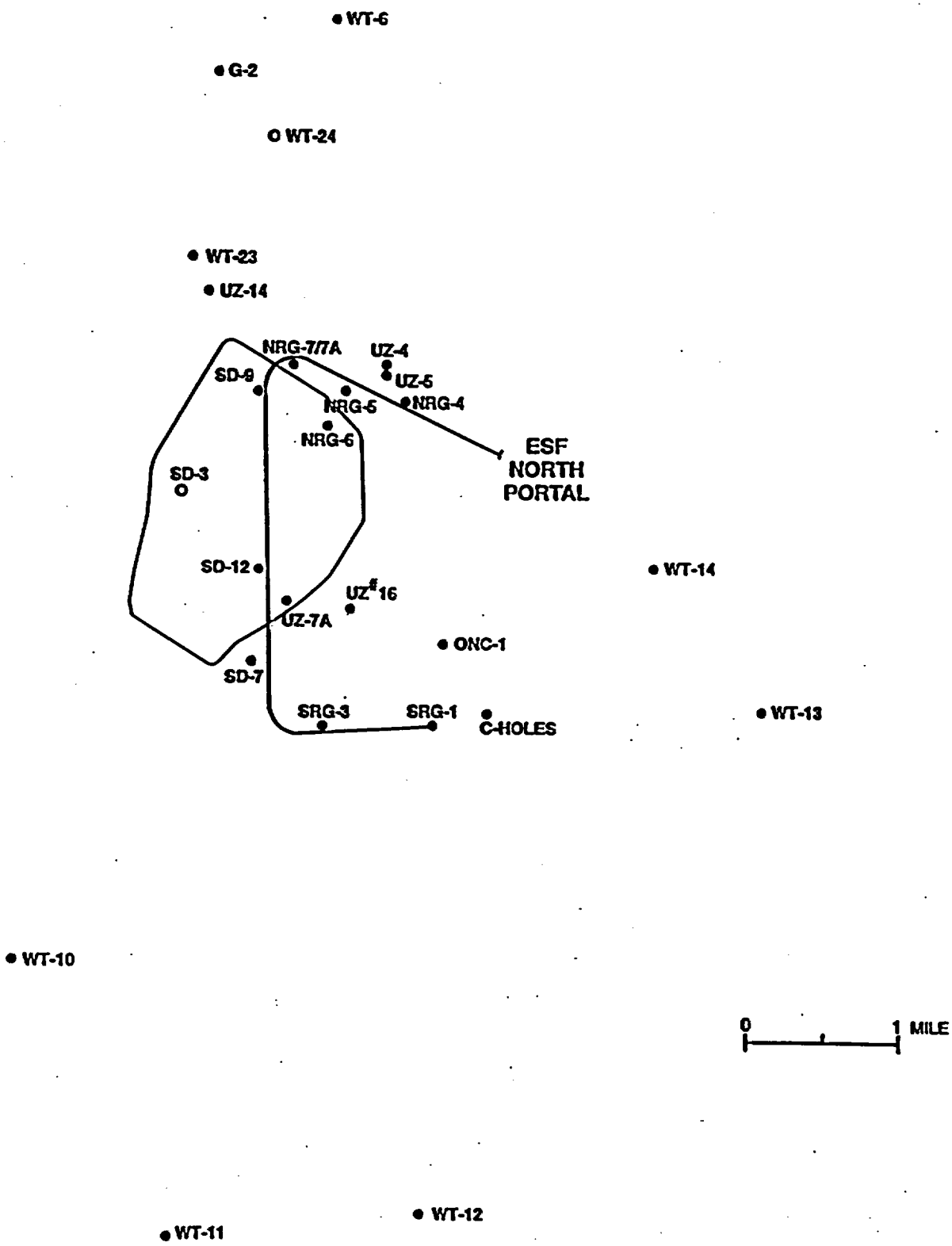
Note: Starting at station 57+02 and ending at about 59+80, the crystal poor lower lithophysal zone is exposed in the lower portion of the tunnel (below springline).

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

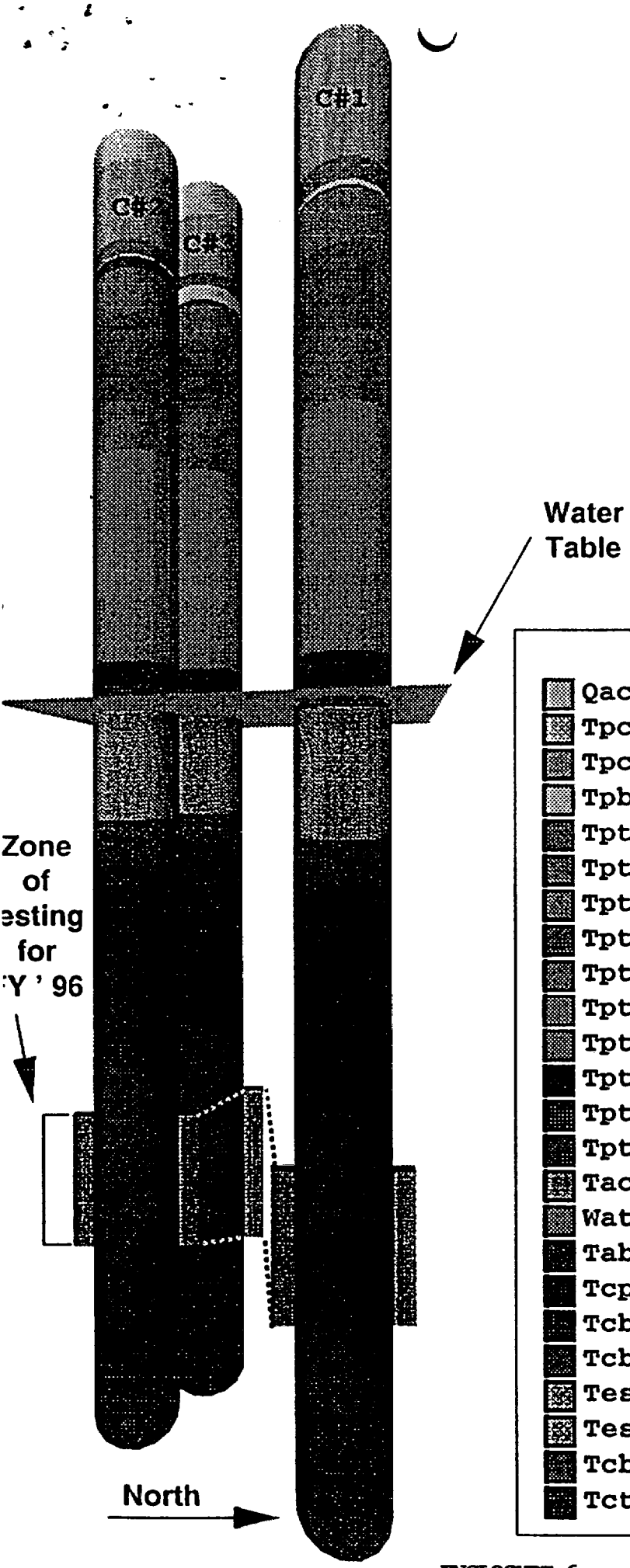
** Indicates that contact is preliminary and has not been verified.

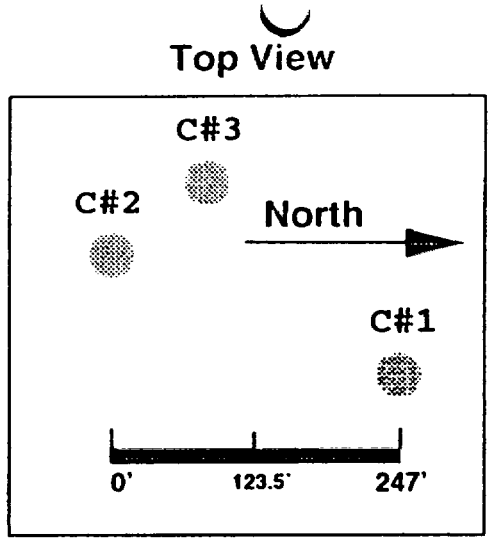
*** Only faults with greater than 4 meters offset are noted on the table.

Selected Borehole Locations



ENCLOSURE 5





Legend

	C#1	C#2	C#3
Qac	–	0.00	0.00
Tpcpln	0.00	69.88	80.05
Tpcpv1	259.84	250.00	225.10
Tpbt4	305.12	285.10	254.92
Tptrv3	314.96	290.03	290.03
Tptrv1	–	–	294.95
Tptrn	322.83	316.93	305.12
Tptpul	430.12	423.88	399.93
Tptpmn	595.14	617.12	559.97
Tptpll	735.89	726.05	709.97
Tptpln	1066.93	1057.08	1029.85
Tptpv3	1222.11	1206.03	1200.13
Tptpv2	1287.07	1259.84	1250.00
Tptpv1	1308.07	1289.04	1270.01
Tac	1332.02	1315.94	1299.87
Water Tbl	1313.65	1319.55	1319.78
Tabt1	1593.17	1569.88	1560.04
Tcp	1691.93	1671.91	1629.92
Tcbt3	2119.09	2109.58	2084.97
Tcb	2152.88	2138.12	2109.90
Test Top	2294.00	2287.00	2283.00
Test Bot	2618.00	2601.00	2669.00
Tcbt2	2694.88	2674.86	2649.93
Tct	2715.87	2729.00	2669.94

All measurements are depths from ground surface to tops of lithostratigraphic units in feet

Correla..on Table

Formal Geologic Stratigraphy		Lithostratigraphy Buesch et al. 1995	Hydrogeologic Units Wittwer et al. 1992	Thermal/Mechanical Units Ortiz et al. 1985/Buesch et al. 1995
Qac		Qac	Alluvium	UO
Paintbrush Tuff	Tiva Canyon Member	Tpc Tpcrv3 Tpcrv2 Tpcrv1 Tpcrn Tpcpul Tpcpmn Tpcpll Tpcpln Tpcpv3	Tiva Canyon TCw	TCw
		Tpcpv2 Tpcpv1 Tpcbt(Tpbt4)	Paintbrush PTn	PTn
	Yucca Mountain Member	Tpy Tpybt (Tpbt3)		
	Pah Canyon Member	Tpp Tppbt (Tpbt2)		
	Topopah Spring Member	Tpt Tptrv3 Tptrv2		
		Tptrv1 Tptrn Tptpun Tptrl Tptpul Tptpmn Tptpll Tptpln Tptpv3	Topopah Spring TSw	TSw1 TSw2 TSw3
		Tptpv2 Tptpv1 Tptbt (Tpbt1)	Calico Hills CHn	CHn1v CHn1z CHn2z CHn3z PPw
Calico Hills	Calico Hills	Tac Tacbt		
Crater Flat Tuff	Prow Pass Member	Tcp Tcpbt		
	Bullfrog Member	Tcb Tcbbt	Crater Flat Unit CFM	CFUn BFw CFMn1 CFMn2 CFMn3
	Tram Member	Tct Tctbt		TRw

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ENCLOSURE 6A