Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
P.O. Box 98608
Las Vegas, NV 89193-8608

AUG 0 1 1995

Laurence S. Costin
Acting Technical Project Officer
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EVALUATION OF RESPONSE TO CORRECTIVE ACTION REQUEST (CAR) YM-95-014, REVISION 1, RESULTING FROM YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION'S (YMQAD) AUDIT YM-ARP-95-03 OF SANDIA NATIONAL LABORATORIES (SCPB: N/A)

The YMQAD staff has evaluated the response to CAR YM-95-014, Revision 1. The response has been determined to be programmatically satisfactory. However, technical concerns still exist and these concerns are described in further detail in the enclosed statement. Verification of completion of the corrective action will be performed after the effective date provided. Any extension to this date must be requested in writing, with appropriate justification, prior to the date. Please send a copy of extension requests to Deborah Sult, YMQAD/QATSS, 101 Convention Center Drive, Suite 640, Las Vegas, Nevada 89109.

If you have any questions, please contact either Robert B. Constable at (702) 794-7945 or William R. Sublette at (702) 794-7782.

Robert B Constable for

Richard E. Spence, Director
Yucca Mountain Quality Assurance Division

YMQAD:RBC-4088

Enclosures:
1. CAR YM-95-014, Revision 1
2. Statement

cc w/encls:
J. G. Spraul, NRC, Washington, DC
S. W. Zimmerman, NWPO, Carson City, NV
R. R. Richards, SNL, Albuquerque, NM, M/S 1333
M. C. Brady, SNL, Las Vegas, NV
S. B. Jones, YMSCO, NV

cc w/o encls:
W. L. Belke, NRC, Las Vegas, NV
D. G. Sult, YMQAD/QATSS, Las Vegas, NV

NH03
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YMP-5

9508070404 950801
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8 CAR NO.: YM-95-14, Rev1
PAGE: 1 OF 3
QA

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
QARD, QAIP 1-5	YM-ARP-95-03

3 Responsible Organization	4 Discussed With
SNL	M. Riggins/D.Kessel

5 Requirement:

QARD 2.2.4, "Planning Work," Planning shall be performed to ensure work is accomplished under suitably controlled conditions. Planning elements shall include, as appropriate:

A. Definition of the work scope, objectives, and a listing of the primary tasks involved.
B. Identification of scientific approach or technical methods used to collect, analyze, or study results of applicable work.
C. Identification of applicable standards and criteria.

QARD 2.2.9, "Document Review," Documents shall be reviewed to the following requirements and for any additional requirements specified by the applicable section of the QARD.

6 Adverse Condition:

Contrary to the requirements in QARD, Sections 2.2.4.A, B, and C, 2.2.9.A, 5.2.2.C, III.2.1.B, and QAIP 1-5, Sections 4.1.1.2.a and h, there was inadequate planning, implementation, and review of the SNL Work Agreement (WA)-0071, its subsequent work (partially implemented through Test Planning Package [TPP] 92-01) , and the resulting report (SLTR94-0001). Additionally, contrary to the requirements in QARD, Section 3.2.1.A and 4.2.1.B.2, WA-0071 failed to adequately incorporate or reference the ESF designer's input data needs or to maintain them up-to-date with the designer's data needs over time.

Examples:

1. The objectives of the study reported in SLTR94-0001 were to provide geoengineering characterization of the nonlithified tuffs that will be encountered by the North Ramp in the area of the Bow Ridge Fault. The purpose of this characterization is the following:

9 Does a Significant Condition Adverse to Quality exist?	10 Does a stop work condition exist?	13 Response Due Date:
Yes___ No X If Yes, Check One: ☐A ☐B ☐C ☐D ☐E	Yes___ No X ; If Yes - Attach copy of SWO If Yes, Check One: ☐A ☐B ☐C	20 Working Days From Issuance

11 Required Actions: ☒ Remedial ☒ Extent of Deficiency ☒ Preclude Recurrence ☒ Root Cause Determination

12 Recommended Actions:

Remedial Actions:

Evaluate and update WA-0071 to ensure it reflects ongoing work for which it is intended to implement.

7 Initiator William R. Sublette 4/12/95	14 Issuance Approved by: QADD for Date 4-14-95
15 Response Accepted QAR Date 7/26/95	16 Response Accepted QADD for Date 7-31-95
17 Amended Response Accepted QAR Date	18 Amended Response Accepted QADD Date
19 Corrective Actions Verified QAR Date	20 Closure Approved by: QADD Date

ENCLOSURE

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

5 Requirements (continued)

A Review criteria shall be established before performing the review. These criteria shall consider applicability, correctness, technical adequacy, completeness, accuracy, and compliance with established requirements.

QARD 5.2.2, "Content of Implementing Documents," Implementing documents shall include the following information as appropriate to the work to be performed:

C. A sequential description of the work to be performed including controls for altering the sequence of required inspections, tests, and other operations. The organization responsible for preparing the document shall determine the appropriate level of detail.

QARD III.2.1, "Planning Scientific Investigations"

B. Planning shall be coordinated with organizations providing input to or using the results of the investigation.

QAIP 1-5, "Establishing Work Agreements"

4.1 Preparing, Reviewing, and Approving a Work Agreement, Step (1), Procedure (2.)
If a Scientific Notebook (SN) is to be used without a governing TP, then the elements listed below shall be addressed, as applicable to the situation, in the WA, and the SN shall be prepared in accordance with Procedure 20-2.

a. Identification of scientific approach or technical methods used to collect, analyze, or study results of applicable work.
h. A sequential description of the work to be performed including controls for altering the sequence of required inspections, tests, and other operations. The organization responsible for preparing the document shall determine the appropriate level of detail.

QARD 3.2.1, "Design Input Control," Applicable design inputs (such as design bases, conceptual design reports, performance requirements, regulatory requirements, codes, and standards) shall be controlled by those responsible for the design according to the following requirements.

A. Design inputs shall be identified and documented, and their selection reviewed and approved by those responsible for the design.

QARD 4.2.1, "Procurement Document Preparation," Procurement documents issued by each affected organization shall include the following provisions, as applicable to the item or service being procured:

B. Technical requirements including:

2. Specific documents (such as drawings, codes, standards, regulations, procedures, or instructions) that describe the technical requirements of the items or services to be furnished shall be specified. The revision level or change status of these documents shall also be identified.

6 Adverse Condition (continued)

- Determine if the nonlithified tuffs have sufficient bearing capacity to allow the Tunnel Boring Machine (TBM) to maintain tunnel grade and alignment.
- Determine if the nonlithified tuffs have sufficient stand-up time and cohesion to prevent material from running through gaps in the TBM shield.

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

6 Adverse Condition (continued)

The objectives of this study were not satisfactorily completed due to inadequate planning, implementation, and review. The objective evidence of this finding is that the Bearing Capacity and Stand-up Time Tests were not performed under the representative saturated conditions that were identified in Unit 4 of the Pre-Ranier Mesa nonlithified tuff. Tables 5-1 and 5-2 of the SNL letter report (SLTR94-0001) show that portions of some stratigraphic units are saturated. The saturated test is a key test, the results of which contributed significantly in the decision process regarding how to proceed through the nonlithified tuffs in the area of the Bow Ridge Fault.

2. Contrary to a Technical Criteria Letter, dated 10/25/93, from Shephard to Dyer, no in-situ grouting injection tests were conducted under WA-0071 in the two NRG-2 boreholes nor was the in-situ grout testing noted or discussed in SLTR94-0001.

WRA 12
4/12/95 ~~15~~ Recommended Action(s) (continued)

Extent of Deficiency:

For WA-0071, evaluate the impact of not completing tests that were identified in Block 6 of the CAR and provide justification for not completing these tests. Consideration should be given to the fact that the second alcove will be constructed in the Bow Ridge Fault area and data that would have been gathered from tests not completed, may be important.

Sample other SNL WAs to ensure they accurately reflect the work they are intended to implement.

Preclude Recurrence:

Revise WA procedure to establish predetermined hold points that require the WA to be evaluated to ensure it is up to date and accurately reflects the work it is intended to implement. Revision to applicable upper-tier technical and procurement requirements documents are points in the process at which a review should be completed. Additionally, a mandatory annual review of each active WA may be necessary to ensure WAs are up-to-date.

Root Cause Determination:

Identify root cause for inadequate planning, implementation, and review of the SNL WA-0071, its subsequent work (partially implemented through TPP 92-01), and the resulting report (SLTR94-0001) and maintenance of the WA consistent with current designer needs. Also identify root cause for failing to adequately incorporate or reference the ESF designer's design input data needs or to maintain them up-to-date with the designer's data needs over time.

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CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

1. Corrective Action Response for CAR YM-95-014

A. REMEDIAL ACTIONS

Background
The attached time line for characterization activities in support of SLTR 940001 was prepared to document the planning process for this work. Work Agreement 0071 required that specific test criteria be incorporated in the Test Planning Package and Job Package that controlled the implementation of the work. In accordance with the WA, specific criteria for implementing the testing to characterize the Rainier Mesa nonlithified tuffs were documented in a criteria letter from SNL to DOE. The specific test strategy was developed jointly by the M&O Design Group, the constructor, the DOE WBS Manager and the testing community and is documented in meeting notes. The criteria letter provided the basis for implementing the work through Job Packages 94-02 and 94-03. Two additional Work Agreements were put in place for work that was not covered in the Test Planning Package and Job Packages. These were WA 0093, Seismic Research for Exile Hill and WA-0127, Exile Hill Soil Characterization involved the issue of groutability of the Rainier Mesa tuffs.

The progress of the test program was monitored by the M&O Design Group, the Constructor, the DOE and the testing community through a series of documented meetings that were held during the implementation of the test program. The scope of the initial test plan was modified in the course of these meetings as test results from trench NRT-1 indicated that ground conditions to be encountered by the TBM were not as unfavorable as initial drilling had indicated.

Remedial Actions
In order to improve the test planning process, three Work Agreements, WA 180, 188, and 193, have been issued for FY95 work. Work Agreements 0071, 0093, 0127 are being closed out. These new work agreements contain detailed and specific requirements for the work. As the scope of work changes these Work Agreements will be reissued in accordance with QAIP 1-5

The attached time line and the minutes of the meeting discussed above will be submitted as records packages to support the close out of WA 0071

Responsible individual: D.S. Kessel
Completion date 9/1/95

7/6/95 Costrich Spence

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CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

The detailed descriptions from the Test Planning Packages and Job Packages were not incorporated back into the Work Agreement. QAIP 1-5 designates the lower tier WA as the detailed planning document for technical work. The requirements for the contents of Work Agreement are stated in QAIP 1-5. The PI has been trained to QAIP 1-5 by reading the procedure and yet thought that the process of implementing testing requirements through the Test Coordination Office and Test Planning Packages and Job Packages was the appropriate method. The failure to incorporate the detailed test planning information in WA 0071 is attributed to a failure on the part of the PI to understand the requirements of QAIP 1-5 and an ineffective approach to training on this procedure.

D. CORRECTIVE ACTION TO PRECLUDE RECURRENCE

Specific training for the implementation of the requirements in QAIP 1-5 other than reading the procedure has not been implemented. Specific guidance and training will develop to assure sufficient detail is included in future Work Agreements. Since the level of detail required in Work Agreements is dependent on the specific activities involved and the requirements for Work Agreements are not consistently interpreted by PIs, several examples of effective Work Agreements will be included in the training.

Specific guidance for the development and technical review of Work Agreements will be developed implemented through classroom training. This training will emphasize proper scientific and engineering investigation practices and reproducibly of results.

Responsible individual: Ruby Cochrell
Completion Date: 9/30/95

QAIP 1-5 has been revised (Rev. 8 4/18/95) to include the requirements for Work Agreements to be technically reviewed in accordance with the requirements of QAIP 6-3.

Completed: 4/18/95

Michael C. Brady 7/6/95
Responsible Individual

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

B. EXTENT OF DEFICIENCY

Two work agreements in addition to WA 0071 were issued to support the Soil and Rock Properties characterization activities. These were WA 0093 Seismic Research for Exile Hill and WA 0127, Exile Hill Soil Characterization. These Work Agreements have been reviewed by the PI and deficiencies as noted for WA 0071 were not found. It is determined that the extent of deficiency is limited to WA 0071.

The CAR identified two examples which were stated to be indicative of inadequate planning regarding testing in saturated ground and in situ grout tests. Both have been determined to have no impact on the construction of the North Ramp because the ground conditions predicted in the SLTR were consistent with the conditions actually encountered in the North Ramp.

The potential impact on the ramp construction of ground saturation was recognized by SNL and communicated to the M&O Design Group and the Constructor and both determined that more detailed characterization was not necessary due to the limited extent of the potential saturated ground. This decision is documented in the meeting notes form April 28, 1994 (attached).

Grouting studies were initially planned in the Criteria Letter and in WA 0127. The decision to not perform in situ grout test was also made in the April 28th meeting.

Responsible individual: D.S. Kessel
Completed: 5/23/95

C. ROOT CAUSE

The PI thought that the criteria letter and the implementing TPP and JP, the documented planning meetings with the M&O, the constructor and the DOE, and the two additional work agreements for seismic and grout evaluations were adequate controls for this work. The work done under these controls was audited by both SNL QA Project QA with no deficiencies noted prior to the audit that generated this CAR. Work Agreement 0071 was intentionally written with a broad and general scope to implement the Soil and Rock Properties studies and to allow the flexibility to implement and exploration-type field test program.

SANDIA NATIONAL LABORATORIES

MAY 8, 1995

RAINIER MESA (PRE RAINIER MESA) TUFF CHARACTERIZATION ACTIVITIES

MO/YEAR	9/93	10/93	11/93	12/93	1/94	2/94	3/94	4/94	5/94	6/94	7/94	8/94	9/94
PLANNING MEETINGS	30 INITIAL SCOPE	18 FINAL PLAN	SITE TRIP		19,20 DISCUSSION, SITE VISIT			28 CLOSE OUT					
PLANNING* DOCUMENTS		25 CRITERIA LETTER		2 JP 94-02 TRENCHING	27 JP 94-03 DRILLING NRC 2C, 2D	28 WA127 GROUTING STUDY							
TESTS		27 NRC 2B				8 NRT-1		20 21 PLATE TEST RESULTS					
SOW								26 REV. 0	2026 REV. 1 REV. 2	7 REV. 3	28 REV. 4	6 REV. 5	9 REV. 6	1 REV. 7 (ISSUED)
REVIEWERS								RF	DE TS	JW	DK	MR	LS

REVIEWERS

RF RAY FINLEY
DE DALE ENGSTROM
TS TIM SULLIVAN
JW JOHN WESLING (GEOMATRIX)
DK DAVE KESSEL
MR MIKE RIGGINS
LS LES SHEPHARD

* WORK AGREEMENT 0071 ISSUED 4/93

D.J. WEAVER
LANL KESSEL.DWG

STATEMENT TO CAR YM-95-14, REV. 1

This attachment is included with the acceptance letter of CAR YM-95-14, Rev. 1 for the purpose of notify the affected project personnel that there is still an outstanding technical concern regarding this CAR. SNL's response to CAR-014 has been accepted from a programmatic perspective, however, there are still technical concerns regarding the issues identified in this CAR.

CAR-014 was written because it was apparent that SNL's geoengineering characterization of the nonlithified tuffs in the region west of the Bow Ridge Fault were not representative of the saturated conditions that were expected in Unit 4 of the Pre-Ranier Mesa nonlithified tuff. In summary SNL did not perform saturated bearing capacity and stand-up time tests on exposed Pre-Ranier Mesa outcrops, even though it was apparent from borehole data that Unit 4 of the Pre-Ranier Mesa was saturated.

An additional concern was identified when it was determined that SNL had actually performed one bearing capacity test in Trench NRT-1 under uncontrolled saturated conditions. However, SNL did not report the results of this test because they said the saturated soil failed in bearing capacity quickly and two of the three deformation gauges were lost almost immediately. Not only should SNL have reported these test results, but a they should have recognized the significance of this so called "failed test", and with this information plus the data from the boreholes, concluded that there was potentially a very bad ground condition in Unit 4 of the Pre-Ranier Mesa. Based on this information it should have been obvious that representative saturated bearing capacity and stand-up time tests should have been performed in Trench NRT-1.

SNL countered that the designers and constructors were aware of the potential saturated conditions in Unit 4 of the Pre-Ranier Mesa nonlithified tuff and did not expect it to be a significant problem. However, if the saturated testing had been performed in Trench NRT-1, then the collapsing and soft behavior of the soil under saturated conditions would have been blatantly obvious, and it is doubtful that these same responsible individuals (designers and constructors) would have had the same conclusion regarding the potential ground conditions of the saturated soil in the vicinity of the Bow Ridge Fault.

As expected a very bad ground condition was encountered when the TBM intersected the saturated zone of Unit 4 of the Pre-Ranier Mesa. The soil raveled so extensively that it formed a cavity that was approximately 18 ft. above the crown and about 40 to 45 ft. wide. The top of the raveled zone probably extended to the top of the capillary zone which extended upward from the saturated zone. Some project people have suggested that this was mostly a natural cavity due to the appearance of mineralization at the top. The mineralization at the top of the cavity would be expected at the top of the capillary zone due to evaporation. This is how many caliche layers are formed as a result of evaporation from the tops of capillaries extending upwards from perched water tables.

In retrospect the project was lucky the large raveling ground condition that occurred in the saturated zone of Unit 4 of the Pre-Ranier Mesa was not worse than what it was. Even though

the project lost a significant two and one half weeks of down time it could have been worse. To avoid similar problems in the future, it is recommended that SNL rewrite their procedures such that their characterization activities will be representative of the expected conditions. It is also recommended that the project rewrite the QARD such that it will clearly reflect this same requirement.

William R. Sublette, 7/21/95

cc: Susan B. Jones

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8 CAR NO.: YM-95-014
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CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
QAIP 1-5, Revision 07	YM-ARP-95-03

3 Responsible Organization	4 Discussed With
SNL	M. Riggins/D. Kessel

5 Requirement:

Section 4.1, Step 1 states, "Prepare a draft WA that includes or references, by number the following element. Enter "NA" for any element that is not applicable. Obtain the document indentifier for the document control staff."

Section 4.1, Step 1, 9) states, "Scope of work, objectives, and primary tasks."

Section 4.3, Step 2 states, "Prepare and issue revisions, initiated by either the customer or Supplier when necessary, in the same manner as the original WA (Section4.1 and 4.2)."

Section 4.1, Step 3, and Note states in part, "Review the draft WA.
"Note: Technical review criteria include technical adequacy;..."

6 Adverse Condition:
Contrary to the above requirements, Work Agreement (WA)-0071, did not adequately define the scope of work to meet the stated objectives.

Examples:

1) Tests to determine the bearing capacity and stand-up time were not identified or performed under saturated conditions. Saturated conditions represent the worst case ground conditions that could be encountered.

Discussion:

The objectives of this study were to provide geoengineering characterization of nonlithified tuffs that will be encountered by the North Ramp in the area of the Bow Ridge Fault. The purpose of the characterization is the following:

9 Does a Significant Condition Adverse to Quality exist?	10 Does a stop work condition exist?	13 Response Due Date:
Yes___ No X If Yes, Check One: ☐A ☐B ☐C ☐D ☐E	Yes___ No X ; If Yes - Attach copy of SWO If Yes, Check One: ☐A ☐B ☐C	20 Working Days From Issuance

11 Required Actions: ☒ Remedial ☒ Extent of Deficiency ☒ Preclude Recurrence ☒ Root Cause Determination

12 Recommended Actions:
Perform the referenced tests under saturated conditions and in a timely manner so the results can be used to help assess the bearing capacity and stand-up time of the nonlithified tuff in the area of the Bow Ridge Fault. Another option would be to contact the design group and constructors to determine whether the designers and constructors consider a saturated cohesionless soil condition a problem for the effective operation and advancement of the TBM. If they do

7 Initiator	14 Issuance Approved by:
William Sublette W R Sublette 12/13/94	QADD [signature] for Date 12.15.94
15 Response Accepted	16 Response Accepted
QAR Date	QADD Date
17 Amended Response Accepted	18 Amended Response Accepted
QAR Date	QADD Date
19 Corrective Actions Verified	20 Closure Approved by:
QAR Date	QADD Date

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

6 Adverse Condition (continued)

Determine if the nonlithified tuffs have sufficient bearing capacity to allow the TBM to maintain tunnel grade and alignment.

Determine if the nonlithified tuffs have sufficient stand-up time and cohesion to prevent material from running through gaps in the TBM shield.

It is apparent from Tabes 5-1 and 5-2 that portions of some stratigraphic units appear to be saturated. The in-situ unsaturated Bearing Capacity and Stand-up Time tests showed that the cohesionless soil exhibited some form of cohesion, however, it is not known if the cohesion is due to slight cementation or due to apparent cohesion (capillary suction in a partially saturated soil). This question could have been answered if both of these tests had been performed under saturated conditions. This is a key test and the results would have contributed to the decision process regarding how to proceed through the nonlithified tuffs in the area of the Bow Ridge Fault.

Additionally, Memorandum TWS-EES-13-LV-10-93-16, Kalia to Simecka, dated 10/29/94 (Page 3) identifed an action item to characterize "cohesionless materials" was not completed for saturated conditions.

2) Grouting tests were not identified or performed.

Discussion:

The October 25, 1993 Technical Criteria letter from Shephard to Dyer stated that "Grouting tests will be conducted by a grouting subcontractor to be identified (Procurement by SNL). Grouting injection tests will be conducted during a single mobilization of the subcontractor and will include tests in up to two of the NRG-2 holes. Site support requirements are described in the description of the drilling program." No in-situ grout testing was noted or discussed in SLTR94-0001.

Furthermore, WA-0071 was not revised to incorporate specific study objectives as identified in Technical Criteria letter, Shephard to Dyer, dated 10/25/93.

13 Recommended Action(s) (continued)

consider it a problem then the next question to ask them is whether they need to know the degree of apparent cohesion versus inherent cohesion within this partially saturated cohesionless silty sand that was studied in the NRT-1 trench. It must be clearly explained to them that if most of the cohesion in this soil is due to apparent cohesion, then the bearing capacity and stand-up time will be greatly reduced under saturated condition. If the designers and constructors do not think they need this information for saturated conditions, then it is suggested that this be clearly documented. It is also recommended that the review process be evaluated for adequacy and that the impacts that this adverse conditions has on design or other studies be evaluated.

Evaluate the impacts that will result due to the fact that no in-situ grout testing was performed.

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Corrective Action Response for CAR # YM-95-014

CAR YM-95-014 states that Work Agreement 071 did not completely define the scope of work and cites this as an adverse condition. It is SNL's position that this is incorrect and no violation of the requirements (as referenced in the CAR or otherwise) exists. WA-071 clearly defines the process by which test planning will be performed and results documented. This work agreement requires that satisfactory criteria for tests be incorporated into a Test Planning Package or Job Packages that are then used to direct specific testing activities in the field. This procedure was followed explicitly in the conduct of the work under audit, and documentation of this fact was provided to the audit team.

Two examples were cited as adverse conditions in the CAR. Discussion of these follows:

The first example states that tests to determine the bearing capacity and stand-up time were not identified or performed under saturated conditions. In fact an unsuccessful bearing capacity test was attempted under saturated conditions. This was discussed with the auditors. SNL subsequently determined that tests to evaluate strength parameters under saturated conditions would be performed in the laboratory which was also discussed with the auditors. SNL is currently implementing this plan through Work Agreement 0180 with the University of Nevada Reno. We do not consider it feasible to perform saturated standup tests in the field nor is there any established methodology to evaluate the results of such tests or their relationship to tunnel conditions that may be encountered.

Example 2 cites a failure to perform grouting tests discussed in a criteria letter from Shephard to Dyer. The criteria letter which was used to provide the input to the test planning process provided the option and planning basis to perform grouting tests. No requirement was violated by not performing additional grout tests. The decision to not perform additional grout tests was made by the SNL PI for this work and was supported by the M&O A&E team and the construction team.

Laboratory tests to evaluate the feasibility of grouting were performed and documented. The results of this work were presented to the M&O A&E and the construction team in meetings on January 19 and 20, 1994. These meetings are documented in a memo from H. N. Kalia, LANL to W. B. Simecka, DOE/YMPO dated February 24, 1994. This memo states that "No additional data needs were identified by the design or construction team" and that the "ESF design A&E should develop a contingency plan, required drawings and specifications, and procurement strategies to have readily available chemical grouting (from within the ramp) capabilities, should the mining conditions so require." This memo was made available to the audit team.

The subject CAR recommends that SNL contact the design group and the constructor to determine whether they consider a saturated cohesionless soil condition a problem for the effective operation and advancement of the TBM. Documented evidence was provided to the auditors that demonstrated that this very issue was discussed the with the M&O and

1/23/95 Shephard to Spence

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felt that there was a significant enough difference in these two loading conditions that would require separate plate load bearing capacity procedures.

It should also be noted that the ASTM subcommittee chairman responsible for these ASTM standard procedures was contacted, and he stated that ASTM D 1194 was the procedure that should have been used.

W R Sublette — 3/17/95

William R. Sublette — Date

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

ground conditions were encountered. It should also be noted that it will be difficult to obtain undisturbed samples from the Bow Ridge Fault for laboratory testing. Even if these undisturbed samples were obtained, their value would be marginal compared with the benefits obtained from plate load bearing tests under saturated conditions in the field.

SNL stated in their Technical Criteria letter from Shephard to Dyer (October 25, 1993) that grouting field tests would be performed and they also identified in Attachment 2 of Job Package 94-02, Rev. 0, that grouting field tests would be performed. However, the grouting field tests were never performed and their is no documentation stating that they would not be performed. SNL states in their CAR response that the February 24, 1994 letter from Kalia to Simecka that "no additional data needs were identified by the design or construction team". This quote is taken out of context. The complete quote states "No additional data needs were identified by the design or construction team. It was, however, agreed that the current plan, that is being implemented by Sandia National Laboratories, be completed including drilling two additional boreholes, deepening the trench, and selectively undermining the exposed material to obtain additional information on standup time." The only current plans that existed are those defined by the October 25, 1993 Technical Criteria letter, Job Package 94-02, and Test Planning Package 92-01. The field grouting tests are identified in the Technical Criteria letter and the Job Package. However, there is no reference to them in the Test Planning Package, which produces somewhat of a disconnect. In any case there is no documentation stating that the field grouting tests will not be performed and the corresponding justification as to why they will not be performed.

With regard to the recommendation, SNL stated that they adequately discussed with the M&O and constructor the potential problems that may be encountered with a saturated cohesionless soil condition. The concern the auditor had was that the PI stated during the audit that the one saturated test result was not reported in SLTR 94-0001 and also not discussed with either the designers or constructors. This is serious business. The significance of that test was that it failed in bearing capacity so quickly that two of the three gauges where lost almost immediately. This should have sent up a red flag and further saturated testing should have been performed immediately. In addition, the results of this test should have been presented in SLTR 94-0001 and the designers and constructor should have been informed of this result. This is why the recommendation was made in this CAR that the designers and constructors be completely informed of the behavior of the cohesionless soil under saturated conditions, including the results of the one and only plate load bearing test that was performed under saturated conditions. It should also be recognized that standard good geotechnical engineering practice would be to perform the field or laboratory tests under the worst expected conditions. Since it was evident that some areas were saturated, then it would be expected that there

should have been a representative number of saturated tests performed. It should also be noted that the appropriate procedure for the plate load bearing test, ASTM D 1194 (Standard Test Method for Bearing Capacity of Soil for Static Load and Spread Footings), requires that the soil be saturated if saturated conditions are expected.

YM-95-015 and YM-95-016

The adverse condition does not question whether the review process was performed but questions the effectiveness of the review process. Verification of correctness of data and calculations is an important part of the review process. The QARD (section 2.2.9) requires that review "criteria shall consider applicability, correctness, technical adequacy, completeness, accuracy, and compliance with established requirements."

The technical specialist evaluating SLTR94-0001 and the Scientific Notebook looked at a sample of the report and scientific notebook content and identified the errors described in these CARs. This evaluation was not comprehensive and therefore, a commitment should be made to determine if additional errors exist and if other information has been left out of the scientific notebook. Additionally, your response regarding SPT blow count data stated the following: "these data were reported as uncorrected and sufficient detail is provided both in the text and on the supporting Figure 5.1 (identified as deficient in the CAR)." This statement is incorrect, there is no detail on Figure 5.1 which states that the SPT blow count data is uncorrected for depth.

YM-95-017

As stated in the response to CARs 015 and 016, the adverse condition does not question whether the review process was performed but questions the effectiveness of the review process.

With regards to SNL's response to not using the most appropriate plate load bearing procedure, ASTM D 1196 "Standard Test Method for Nonrepetitive Static Plate Load Tests of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements", it is QA's position that this procedure was developed for a specific purpose (highways and airports) and if SNL wants to use this procedure for a purpose for which it is not intended (spread footings) then SNL needs to document their justification for using ASTM 1196 in place of the more applicable ASTM D 1194 "Standard Test Method for Bearing Capacity of Soil for Static Load and Spread Footings". ASTM would not have developed separate procedures for spread footings versus highways and airports unless they

CORRECTIVE ACTION REQUEST (CONTINUATION PAGE)

EVALUATION OF RESPONSES TO CARS YM-95-014, YM-95-015, YM-95-016 AND YM-95-017

Responses to CARs YM-95-014, YM-95-015, YM-95-016 and YM-95-017 are rejected. Responses to CARs YM-95-015, YM-95-016 and YM-95-017 shall address the extent of the deficiencies and describe what steps will be taken to preclude recurrence. The response to CAR YM-95-014 shall address the extent of the deficiency, describe what steps will be taken to preclude recurrence and determine root cause. An amended response shall be submitted to YMQAD by March 24, 1995.

Responses to CARs should follow a format that addresses each indicated "Required Action" in block 11 of the CAR form. It is unclear from your response which required actions you are addressing and which you feel no action is required. It is recommended that when you submit your amended response, each required action be addressed under separate title.

Specific technical and programmatic justification for rejection are provided below.

YM-95-014

WA-071 was not updated to specifically address technical criteria for investigations and modifications to the testing scope as described in the letter Shephard to Dyer, dated 10/25/94. As stated in the Block 6 of the CAR, specific tests were identified which were never added to the WA. The grouting test described in the CAR is one example of a change in the scope of the investigations that was never incorporated into the WA. Additionally, QAIP 1-5, Revision 07 requires that the scope of work, objectives and primary tasks be identified in the WA. The scope of work should be detailed enough to state that testing should be performed under representative conditions. This would have then provided the requirement to perform some tests under saturated conditions when it became evident that saturated conditions existed.

It is also strongly questioned as to why the saturated test was not noted in the SNL letter report (SLTR94-0001). SNL did one plate load bearing test under saturated conditions, however, they did not report it in the letter report, and more importantly why didn't the results of this one saturated test produce a red flag that would indicate the need for more of these types of tests to characterize the potential behavior of the soil conditions at the Bow Ridge Fault. SNL states that they are currently implementing a plan through Work Agreement 0180 that will perform saturated testing in the laboratory. It is a little late, the TBM has already passed through the Bow Ridge Fault and significant running or raveling

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constructor (see memo H. Kalia, LANL to Distribution, May 10, 1994, Rainier Mesa formation Past Bow Ridge Fault). In addition there is documented discussion of this subject in SNL's report SLTR 94-0001 Rev. 7 paragraph 2.2.1.

It is therefore our determination that no corrective action is necessary.

Michael C. Brady
1-28-95