



Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
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QA: L

SEP 12 1994

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EVALUATION OF RESPONSE TO AND CLOSURE OF CORRECTIVE ACTION
REQUEST (CAR) YM-94-074 RESULTING FROM YUCCA MOUNTAIN QUALITY
ASSURANCE DIVISION (YMQAD) AUDIT YMP-94-01 OF THE CIVILIAN
RADIOACTIVE WASTE MANAGEMENT SYSTEM MANAGEMENT AND OPERATING
CONTRACTOR (SCPB: N/A)

The YMQAD staff has evaluated the response to CAR YM-94-074 and
the following was determined:

1. CAR YM-94-074, Parts 1 and 2 will be closed by the issuance
of CAR YM-94-100 to the Yucca Mountain Site Characterization
Office.
2. CAR YM-94-074, Part 3 response is acceptable.

In conclusion, the CAR is considered closed.

If you have any questions, please contact either Robert B.
Constable at 794-7945 or Richard E. Powe at 794-7749.

Richard E. Spence, Acting Director
Yucca Mountain Quality Assurance Division

YMQAD:RBC-5007

Enclosure:
CAR YM-94-074

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YMP-5

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PDR WASTE
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L. Dale Foust

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cc w/encl:

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W. L. Belke, NRC, Las Vegas, NV

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CORRECTIVE ACTION REQUEST

1 Controlling Document OCRW QARD, DOE/RW-0333P, Revision 01	2 Related Report No. YMP-94-01
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3 Responsible Organization M&O	4 Discussed With J. Pye/S. Bonabien / S. Rindskopf
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5 Requirement:
QARD, Sections 5.2.2.B, 5.2.2.D, and 5.2.2.E. "Implementing documents shall include the following information as appropriate to the work to be performed:

B. Technical and regulatory requirements.
(Continued on next page)

6 Adverse Condition:
There is a lack of adequate flowdown and traceability of 10CFR60 requirements to the ESFDR.

Discussion:

Examples are:

- Quantitative criteria not provided through ESFDR to Specifications for 10CFR60 requirements. Examples of this are: maximum allowable convergence for opening; maximum rate of convergence for openings; maximum allowable tonnage of rock falls.

- 10CFR60.141 has not been adequately addressed in the ESFDR. This especially applies to 10CFR60.141(d).

- Traceability of ESFDR requirements back to 10CFR60 are inconsistent with actual requirements in 10CFR60. Approximately twenty ESFDR criteria were sampled and four were found to reference a 10CFR60 requirement that were not applicable e.g.,

ESFDR 3.2.2.4.T.2 not consistent with 10CFR60 133.e.2
ESFDR B.2.35.3.E not consistent with 10CFR60 133.e.2
(Continued on next page)

9 Does a Significant Condition Adverse to Quality exist? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes, Check One: <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E	10 Does a stop work condition exist? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> ; If Yes - Attach copy of SWO If Yes, Check One: <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	3 Response Due Date: 20 Working Days From Issuance
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11 Required Actions: Remedial Extent of Deficiency Preclude Recurrence Root Cause Determination

12 Recommended Actions:
Quantify the design criteria (performance criteria) in the ESFDR or any subsequent lower-tiered documents such that the requirements in 10CFR60 are adequately addressed with specific criteria for design activities. A more specific quantified design criteria will also be required to satisfactorily
(Continued on next page)

7 Initiator William R. Sublette <i>WR Sublette</i>	14 Issuance Approved by: QADD <i>AC Spence</i> Date <i>8/5/94</i>
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15 Response Accepted QAR <i>RE Powe</i> Date <i>9/9/94</i>	16 Response Accepted QADD Date
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17 Amended Response Accepted QAR Date	18 Amended Response Accepted QADD Date
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19 Corrective Actions Verified QAR <i>NOT REQUIRED</i> <i>RE Powe</i> Date <i>9/9/94</i>	20 Closure Approved by: QADD <i>AC Spence</i> Date <i>9/9/95</i>
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5 Requirements (continued)

- D. Quantitative or qualitative acceptance criteria sufficient for determining that activities were satisfactorily accomplished.
- E. Prerequisites, limits, precautions, process parameters, and environmental conditions."

6 Adverse Condition (continued)

ESFDR B.2.35.3.F not consistent with 10CFR60 133.e.2
ESFDR 3.2.2.4.U.2.(a) not consistent with reference it cites in the
ESFDR, Appendix I, Analysis 5 (Recommendation 2).

13 Recommended Action(s) (continued)

determine if the engineered item is performing as intended. This will be part of the design validation process which in turn is part of the performance confirmation process.

The criteria described in ESFDR 3.2.2.4.U.6 is going in the right direction but needs further quantification. There should at least be a criteria quantifying the maximum allowable closure, and possible maximum rockfall tonnage.

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Analysis of CAR YM-94-074

The CAR has three distinct parts, and all are included under "lack of adequate flowdown and traceability of 10 CFR 60 requirements in the ESFDR" designation.

Part 1

"Quantitative criteria not provided through ESFDR to Specifications for 10CFR60 requirements. Examples of this are: maximum allowable convergence for opening; maximum rate of convergence for openings; maximum allowable tonnage of rock falls."

The suggested quantitative criteria concerning opening convergence, rate of convergence, and rock fall tonnage are not 10 CFR 60 requirements, as implied by the CAR. Minimum measurements required by 10 CFR 60 are found in 10 CFR 60.141(c). Nonetheless, the suggested criteria have been evaluated by the design organization to determine the impact or applicability to package 2C. M&O design has determined there is no impact on the 2C design. The following is offered in response to the first portion of CAR YM-94-074:

The examples for quantitative criteria cited on the CAR are not criteria, but "tentative goals" identified in the Drift Design Methodology and Preliminary Application for the Yucca Mountain Site Characterization Project. See Tables 3.1 and 4.1 of Sandia Report 89-0837, December 1991. These tables were developed for the SCP conceptual design which anticipated the repository to be excavated by drill and blast methods. (Please note that the ESF (including package 2C) will be constructed with a tunnel boring machine, which disturbs less surrounding rock mass than drill and blast methods.)

These tables relate performance measures, tentative goals and design criteria for the repository. In general, these criteria have been effectively incorporated into the ground support design for design package 2C. Criteria were developed for package 2C, and are documented in several of the analyses in package 2C. The design criteria developed by the M&O Subsurface Design Organization are consistent with the criteria in Tables 3.1 and 4.1 of Sandia Report 89-0837, with the exception of providing a "full lining of drift". An application of a full and complete lining immediately after excavation would prevent site characterization and performance testing. Therefore, a phased approach to ground support is necessary to facilitate testing. Where it has been necessary to defer meeting full repository design criteria in order to facilitate site characterization and performance testing, the 2C design has provisions for upgrading to repository (e.g., the incorporation of a full lining). Details of this approach are discussed in TS North Ramp Ground Support Scoping Analysis BABEA0000-01717-0200-00008, Rev. 00, Section 10.11.1, "Requirements, Criteria and Constraints".

The TS North Ramp ground support design is based on qualitative criteria which require the design to provide a stable opening. If necessary, the opening is to be maintained to ensure stability without risking personnel safety or incurring deleterious rock movement. Until repository design criteria can be developed based upon performance confirmation activities in the ESF, the A/E concludes that qualitative criteria identified in the ESFDR concerning opening stability are both adequate and sufficient to produce an appropriate and effective design.

8/25/94 LV.SJR.KJA.8/94-162

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The use of "goals" or "quantitative criteria" which are subjectively imposed upon the design without any analytical basis serves no useful purpose. Quantitative criteria should only be developed for the repository design on the basis of observations and experience in the ESF and from design analyses completed as part of the development of baseline data to be used for performance confirmation.

SCP 8.3.1.15.1.5, Excavation Investigations, as identified in SD&TRD 3.2.1.15.A.5, is intended to study the behavior of underground excavations. One of the activities associated with this study is SCP 8.3.1.15.1.5.1, Access Convergence, in which rock-mass deformation and in situ stresses will be studied. Another study planned is SCP 8.3.1.15.1.8, In Situ Design Verification, as identified in SD&TRD 3.2.1.15.A.8. An activity associated with this study is SCP 8.3.1.15.1.8.3, Monitoring Drift Stability.

Testing of the rock mass deformation has and will occur during ESF excavation. The data gathered from this testing has and will be used in the ESF design process. The interaction of the test community (Sandia and Los Alamos) with the design organization, as evidenced in letter LV.ESFB.JHP.6/94-674, from the M&O to the TCO, dated 17 June 1994, entitled Ground Support Design Verification Data Needs, has and will provide the necessary feedback to allow test data to be considered in the design. Data from Package 1A (starter tunnel) has been considered in the 2C design package, as evidenced by references made to starter tunnel geotechnical information contained on page 54 of the TS North Ramp Ground Support Scoping Analysis BABEA0000-01717-0200-00008, Rev. 00. Construction monitoring, including the use of instrumentation and facility inspections, will provide an effective warning of potential deleterious displacements. These conditions can be addressed through planned ground support maintenance or remedial measures.

Based on the above discussion, an impact on the 2C design package from CAR YM-94-074 is not recognized. Appropriate design criteria have been developed for the design and a process is in place that allows the consideration of testing results in the design.

Part 2

"10CFR60.141 has not been adequately addressed in the ESFDR. This especially applies to 10CFR60.141(d)."

The second portion of the CAR regarding the applicability and traceability for 10 CFR 60.141 requirements in the ESFDR has been evaluated. An actual impact upon package 2C is not realized. This becomes a question of when and where performance confirmation monitoring shall take place. The ESFDR contains requirements (3.2.1.J.9 and 3.2.9.4.D.3) that guide the design of the North Ramp (2C) to not preclude the ability to provide performance confirmation monitoring.

Regarding the requirements of 10 CFR 60.141, the following discussion is offered, and is based on SCP 8.3.5.16:

As stated in SCP 8.3.5.16, "A performance confirmation plan will be available in the same time frame as the license application to guide the development and implementation program." The DOE has established a performance confirmation program consisting of two phases: (1) a baseline phase ending with the submittal of the license application for construction authorization, and (2) a confirmation phase that begins with the submittal of license application and ends with the approval of the license amendment for permanent closure. The SCP does not address a specific start period for performance

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confirmation. However, per 10 CFR 60.140(b), the performance confirmation program is to be started during site characterization.

The DOE believes that the performance confirmation activities are a subset of the site characterization activities already planned (see above for representative examples). If site characterization information indicates that additional baseline information is needed, than the baseline phase of the performance confirmation plan will be appropriately modified.

Based on the above discussion, it is unrealistic to expect performance confirmation plan details related to 10 CFR 60.141 in the ESFDR. The ESFDR is a facility design requirements document, and it is not intended to be a study plan. The requirements to build the ESF in a manner that will not preclude the establishment of a performance confirmation program are sufficient in addressing the 10 CFR 60.141 requirements. Additionally, the ESFDR has considered all 10 CFR 60 requirements in the NRC Staff Technical Position on Regulatory Considerations in the Design and Construction of the Exploratory Studies Facility (NUREG-1439). The consideration for these requirements is documented in Appendix F of the ESFDR.

However, as noted above in the discussion on the first part of the CAR, baseline geotechnical information is being collected and incorporated into the design process. These data will be carried forth into the performance confirmation program once it is defined and established. In this regard, the ESFDR (and the ESF design) does adequately respond to the performance confirmation requirements included in 10 CFR 60.141, as the ESF has and will support the collection and consideration of geotechnical test data.

Part 3

"Traceability of ESFDR requirements back to 10CFR60 are inconsistent with actual requirements in 10 10CFR60. Approximately twenty ESFDR criteria were sampled and four were found to reference a 10CFR60 requirement that were not applicable e.g.,

ESFDR 3.2.2.4.T.2 not consistent with 10CFR60 133.e.2
ESFDR B.2.35.3.E not consistent with 10CFR60 133.e.2
ESFDR B.2.35.3.F not consistent with 10CFR60 133.e.2
ESFDR 3.2.2.4.U.2.(a) not consistent with reference it cites in the ESFDR, Appendix I, Analysis 5 (Recommendation 2)."

Regarding the third portion of the CAR, the following is offered:

ESFDR 3.2.2.4.T.2 is not consistent with 10 CFR 60.133.e.2

The tie between 3.2.2.4.T.2 and 10 CFR 60.133(e)(2) is not intended to represent a stand-alone response to the 10 CFR 60 requirement. The referenced ESFDR requirement is a sub-requirement to 3.2.2.4.T (which is 10 CFR 60.133(e)(2)), and it represents a partial satisfaction of the 10 CFR 60 requirement. 3.2.2.4.T.2 is concerned with ground control, which plays a role in reducing the potential for deleterious rock movement (the intent of the 10 CFR 60 requirement and ESFDR 3.2.2.4.T). Therefore, the tie is valid.

ESFDR B.2.35.3.E and F are not consistent with 10 CFR 60.133.e.2

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B.2.35.3.E and F are requirements that are in support of the test identified in B.2.35. This test, and its ESF requirements, have been developed in response to SD&TRD 3.2.1.15.A.8.c. Table 6-1 of the SD&TRD (the parent hierarchical document to the ESFDR) clearly indicates the tie between 3.2.1.15.A.8.c and 10 CFR 60.133(e)(2). The ESFDR B.2.35.3.E and F requirements appropriately reference the parent requirement 3.2.1.15.A.8.c, and, additionally, the higher source trace to 10 CFR 60.133(e)(2). This represents a duplication of the information contained in Table 6-1 of the SD&TRD, but, by association, is a valid tie. A more appropriate and easily discernable tie may be needed and can be explored.

ESFDR 3.2.2.4.U.2.a and reference in ESFDR Appendix I, Analysis 5

The recommendation in Appendix I is suggesting guidance to assist in limiting the changes in rock permeability due to blast-induced effects. As stated in 3.2.2.4.U.2, the recommended change in permeability of less than 1 order of magnitude of maximum opening size is a goal, and the recommendation to constrain fractures to less than 1 meter has been made in Appendix I to assist in meeting this goal. The measurement of rock fractures is more readily accessible than the measurement of permeability changes.

The CAR cites examples as stand-alone requirements, when, in fact, the requirements are consistent with higher tier requirements. The examples represent decomposition of requirements that can, indeed, be traced to 10 CFR 60 requirements. No discrepancies exist within the context of complete requirement flowdown and traceability. Secondly, it must be pointed out that no requirements were identified as incorrect, invalid, missing as a design input for package 2C, or inappropriately applied to package 2C.

The ESFDR requirements and corresponding traces have been influenced by the result of the merge between established and accepted requirements from the superseded ESFDR (and its hierarchy) and the present OCRWM requirements document hierarchy and ESFDR. The current requirements traces represent the most logical ties to accommodate the transition from old to new hierarchy, and they reflect the guidance received from the DOE with respect to the hierarchy transition. This has resulted in some tenuous ties, although all requirements are valid and have been applied to all designs where applicable. The approach and logic of the requirements traceability will continue to be improved with each successive iteration of the ESFDR.

In summary, the explanation provided for the first two parts of the CAR demonstrates the proper identification of requirements and an impact on 2C is not realized. The third part of the CAR has some merit, but does not identify any invalid requirements. Therefore, no potential detrimental impact on Package 2C is recognized.

It does not appear that there are any 10 CFR 60/ESFDR discrepancies that may impact package 2C, nor is there an impact to future design activities.

Root Cause Determination

The ESFDR requirements and corresponding traces have been influenced by the result of the merge between

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established and accepted requirements from the superseded ESFDR (and its hierarchy) and the present OCRWM requirements document hierarchy and ESFDR. The current requirements traces represent the most logical ties to accommodate the transition from old to new hierarchy. This has resulted in some tenuous ties, although all requirements are valid and have been applied to all designs where applicable. The approach and logic of the requirements traceability will be continue to be improved with each successive iteration of the ESFDR. The approach includes the current ESFDR Revision 1 effort which responds to CARs YM-94-002 and YM-94-003. These CARs also address requirements justification and traceability.

Remedial and Corrective Action

None required.

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EVALUATION OF RESPONSE TO CAR YM-94-074

The overall adverse condition described in this CAR is "There is a lack of adequate flowdown and traceability of 10CFR60 requirements to the ESFDR". Three sets of examples are provided.

After careful review of the response, which attempts to provide rationale as to why no action is required for each example given, OQA has concluded that the following actions are necessary:

1. CAR YM-94-074, Parts 1 & 2 will be closed by issuance of a new CAR to YMSCO.
2. CAR YM-94-074, Part 3 response is acceptable.

In conclusion, because no verification is necessary CAR YM-94-074 is considered closed.



Richard E. Powe, QAR

9/9/94

Date