



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

WBS 1.2.9.3
 QA

AUG 23 1991

Larry R. Hayes
 Technical Project Officer
 for Yucca Mountain
 Site Characterization Project
 U.S. Geological Survey
 101 Convention Center Drive
 Suite 860
 Las Vegas, NV 89109

**EVALUATION OF RESPONSE AND CLOSURE OF CORRECTIVE ACTION REQUEST (CAR)
 YM-91-051 RESULTING FROM YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION (YMQAD)
 AUDIT YMP-91-05 OF U.S. GEOLOGICAL SURVEY**

The YMQAD staff has evaluated the response to CAR YM-91-051 and found it to be satisfactory. The completion of corrective action was verified and determined to be satisfactory. As a result, the CAR is considered closed.

If you have any questions, please contact Catherine E. Hampton at 794-7973 or Richard L. Maudlin at 794-7290.

Catherine Hampton
 Donald G. Horton, Director
 Yucca Mountain Quality Assurance Division

YMQAD:CEH-5334

Enclosure:
 CAR YM-91-051

cc w/encl:
 K. R. Hooks, NRC, Washington, DC
 S. W. Zimmerman, NWPO, Carson City, NV
 T. H. Chaney, USGS, Denver, CO

cc w/o encl:
 J. W. Gilray, NRC, Las Vegas, NV
 N. J. Brogan, SAIC, Las Vegas, NV, 517/T-08
 D. D. Porter, SAIC, Golden, CO

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 ADD: Ken Hooks Ltr. Encl. NH03 1/1

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

14CAR NO.: YM-91-51
 DATE: 5/30/91
 SHEET: 1 OF 2
 QA
 WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document YMP-USGS-QMP-3.03, R2	2 Related Report No. Audit No. YMP 91-05
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3 Responsible Organization USGS	4 Discussed With T. E. Chaney
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10 Response Due 6/28/91	11 Responsibility for Corrective Action L. R. Hayes, USGS TPC	12 Stop Work Order Y or N N
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5 Requirement:
 YMP-USGS-QMP 3.03, R2, Section 5.3.2.1, requires that all phases of the Software Lifecycle Methodology shall apply to all critical and ancillary Software products developed by or under direction of USGS personnel. Section 5.3.2.2 makes the same requirements for the modification of all Ancillary or Critical Software. Section 5.3.3 states that each phase of the Lifecycle Methodology shall be documented by preparing a specified SQA document for that phase.

6 Adverse Condition:
 Contrary to the above requirements, USGS has baselined and released USGS-developed and modified Software products that are classified as Critical and Ancillary and for which less than the procedurally required minimum set of SQA documents have been written.

7 Recommended Action(s):
 Identify the remedial action(s) to be taken to correct the deficiencies noted in Block 6. Investigate the program process, activities or documentation to determine the extent and depth of similar deficient conditions to the CAR. Identify these deficiencies and provide

8 Initiator T. J. Higgins C.C. Warner for	Date: 5/30/91	9 Severity Level - 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/>	13 Approved By: OOA <i>Catharine Hampton</i>	Date: 5-30-91
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15 Verification of Corrective Action:
 Based on your initial response dated 07-11-91, USGS surveillance Ymp-52-091-023 performed on 08/05-07/91, and your amended response dated 8/14/91 this CAR should be closed. All actions in your responses have been completed and satisfactorily resolve the above condition. See USGS surveillance report Ymp-52-91-023 for details of surveillance.

16 Corrective Action Completed and Accepted: OAR <i>[Signature]</i> Date <u>08-16-91</u>	17 Closure Approved By: OOA <i>Catharine Hampton</i> <u>08-16-91</u>
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WASHINGTON, D.C.

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DATE: _____
SHEET: _____ OF _____

CAR NO.: YM-91-51
DATE: 5/30/91
SHEET: 2 OF 2

CORRECTIVE ACTION REQUEST
(continuation sheet)

WASTE ACTION RESPONSE: (Amended 8/14/91)

CORRECTIVE ACTION FOR DEFICIENT CONDITION CAR No. YM-91-51

Corrective Action to Prevent Recurrence: QMP-3.03, R2 has been modified as described on the attached in order to clarify the interface between QMP-3.03 and QMP-3.14 with regard to the role of the Configuration Control Committee (CCC) in determining specific documentation requirements for modified software. In addition, this modification clarifies the requirements for non-complex, developed software with regard to the Module Unit Test Report (MUTR).

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Response Accepted *Richard A. Maull* 08-16-91
QAR Date

Response Accepted *Catherine Hampton* 08-16-91
OQA Date

tr dtd 8/14/91 - Cheney to Hester

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CAR NO. YM-91-51
DATE: _____
SHEET: _____ OF _____

CORRECTIVE ACTION REQUEST
(continuation sheet)

CORRECTIVE ACTION RESPONSE:

1. CORRECTIVE ACTION FOR DEFICIENT CONDITION (CAR YM-91-51)

- A. **Extent of Deficiency:** For all software products documented, baselined, and released, under QMP-3.03, R2, the Configuration Control Committee (CCC) has determined and documented the appropriate documentation requirements based on the requirements set forth in QMP-3.03 and QMP-3.14. The latitude exercised by the CCC in the application of Section 5.3 of QMP-3.03 is allowed by Sections 5.2.6 of QMP-3.03 and Section 5.4.3.2.4 of QMP-3.14. In this way the Technical Contact (TC) and the Configuration Control Committee (CCC) can provide relative emphasis for the lifecycle phases on a case-by-case basis based upon the nature, complexity, and importance of the software, as stated in YMP-USGS-SQAP-01, R0 Sections 4.1, 4.2, and 5 and in YMP-USGS-QAPP-01, R5 Sections 3.3.1 and Appendix H 4.1.

The documentation requirements have been examined for all Developed or Modified Software which are Critical or Ancillary and which were baselined and released by the YMP-USGS Software Configuration Management System. The specific results of the examination are as follows:

DEVELOPED SOFTWARE: For all Developed Software, the only documentation in question consists of the Module/Unit Test Report (MUTR, Attachment 4 of QMP-3.03). QMP-3.03, R2, Section 5.3.3.4 describes the use of the MUTR for documenting individual tests of modules and units when the software is complex enough to have multiple modules or units which require individual testing. The CCC has interpreted paragraphs 5.3.1.4 and 5.3.3.4 to mean that if Software is not complex enough to require individual tests of modules or units, then no MUTRs are required. In such cases the Software Verification Report provides adequate documentation of testing of the entire software product.

MODIFIED SOFTWARE: The CAR states that the requirements are the same for Modified Software as for Developed Software (paragraphs 5.3.2.1 and 5.3.2.2). This statement is not accurate. For Modified Software the Software Methodology is required, but all phases of the Software Lifecycle are not required. In practice, when the CCC reviews a Software Change Request, they evaluate what SCM Baselines would be impacted by the change and determines documentation requirements accordingly. For example, if the modification does not impact the software requirements phase, then no additional software requirements documentation is required. However, if the design phase is impacted, then a revised Software Design Description is required. The Software Lifecycle Methodology is then applied in sequence beginning with that phase.

She Hyl 7/11/91 - Cheney to Norton

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CORRECTIVE ACTION REQUEST
(continuation sheet)

All Modified Software products have received the above mentioned evaluation prior to approval of the modifications. In each case the CCC determined appropriate documentation requirements and the Software Lifecycle Methodology was applied.

- B. Root Cause: Section 5.3 of QMP-3.03, R2 is inconsistent when taken outside of the context of the full YMP-USGS SQA Program.
- C. Remedial Action: Investigative actions have been completed to determine the extent of the documented deficiency. This review has confirmed that documentation requirements for the software to which this CAR refers have been reviewed and approved by the YMP-USGS CCC. With this approval, the requirements are deemed to be adequate and appropriate based on the nature, importance and complexity of the software. The procedural inconsistencies have not adversely affected the implementation of QMP-3.03 and no remedial actions are necessary for the software products.
- D. Corrective Action to Prevent Recurrence: The YMP-USGS TPO and the QA Manager will assure that the revised QMP corrects the procedural inconsistency noted above. The next revision for QMP-3.03 is dependent upon the issuance of the OCRWM QARD. Therefore, QMP-3.03, R3, will be issued within 45 days of the issuance of QARD R5.

RESPONSE APPROVED BY: _____

DATE: 7/11/91

Response Accepted: _____

QAR

08-16-91
Date

Response Accepted: _____

OQA

08-16-91
Date

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U.S. DEPARTMENT OF ENERGY
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CORRECTIVE ACTION REQUEST
(continuation sheet)

CORRECTIVE ACTION RESPONSE: (Amended 8/14/91)

1. CORRECTIVE ACTION FOR DEFICIENT CONDITION CAR No. YM-91-51

- D. Corrective Action to Prevent Recurrence: QMP-3.03, R2 has been modified as described on the attached in order to clarify the interface between QMP-3.03 and QMP-3.14 with regard to the role of the Configuration Control Committee (CCC) in determining specific documentation requirements for modified software. In addition, this modification clarifies the requirements for non-complex, developed software with regard to the Module Unit Test Report (MUTR).

Response Accepted

QAR

Catherine L. Maull

08-16-91

Date

Response Accepted

OQA

Catherine L. Hampton

08-16-91

Date

Ltr dtd 8/14/91 - Cheney to Hester

WBS: 1.2.9.3
QA:QA
QA File: 3.5.03
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YMP-USGS MODIFICATION TO YMP-USGS QUALITY MANAGEMENT PROCEDURE

Modification Number: QMP-3.03,R2-M2 Applies to YMP-USGS-QMP-3.03, Rev. 2

QMP Title: Software Quality Assurance

REQUIRED MODIFICATIONS:

Para. Changed to

5.2.6 Add after first sentence: "The documentation requirements identified on Part IV of the CIRF are intended to adjust the general requirements listed in Section 5.3.3 of this QMP to fit the specific software characteristics. After a case by case evaluation based on the nature, importance, and complexity of the software, certain documentation requirements may be augmented or diminished in accordance with Section 5.4.3.2.4 of QMP-3.14."

5.3.3.4 Add after first sentence: "The MUTR is intended to satisfy all previous requirements for the Software Testing Summary (STS) as described the YMP-USGS SQAP-01."

5.3.3.5 Add note following paragraph b: "NOTE: For software which does not contain modules, testing - including design validation and software verification - may be adequately documented by the SVR."

Attachment 2 Replace Software Requirements Specification (SRS) form with the attached SRS form.

Attachment 3 Replace Software Design Description (SDD) form with the attached SDD form.

Effective Date: 8/16/91

Supersedes Modification No. N/A

NOTE: Approval by QA Manager and TPO only are required unless Sections 1, 2, or 4 of the QMP are affected by this modification.

[Signature]
YMP-USGS Quality Assurance
Manager Date

[Signature] For 8/13/91
Technical Project Officer Date

N/A

Chief, Office of Regional Geology Date

N/A

Assistant Chief Hydrologist for Program Coordination and Technical Support Date

N/A

Assistant Director for Engineering Geology Date

SOFTWARE REQUIREMENTS SPECIFICATION (SRS)

CID: YMP-USGS/

Page ___ of ___

To be prepared by the responsible Technical Contact and submitted to the SCM Coordinator. The SRS should be completed with a level of detail appropriate to the nature, complexity, importance, and intended application of the software product. *Instructions: Use black ink (no white out). See Para. 5.4 of this QMP for a detailed explanation. Use additional sheets, as applicable, labeled with CID and paged in numerical sequence.*

A. Software Product Name/Version: _____

B. Requirements Specification - Describe the software requirements making sure that the requirements are testable. The following should be addressed:

- Functional Requirements - what the software is intended to do,
 - Performance Requirements or Constraints - any limitations of the expected inputs or outputs,
 - Interfaces with hardware, other software, or external data,
 - Software Engineering Standards, if applicable, and
 - Operation Issues - any applicable requirements concerning portability, maintainability, reliability, and efficiency.
-

C. Software Validation Test Plan - Briefly describe how the requirements listed above will be validated in the finished software product:

SOFTWARE DESIGN DESCRIPTION (SDD)

CID: YMP-USGS/

Page ___ of ___

To be prepared by the responsible Technical Contact and submitted to the SCM Coordinator. The SDD should be completed with a level of detail appropriate to the nature, complexity, importance, and intended application of the software product. *Instructions: Use black ink (no white out). See Para. 5.4 of this QMP for a detailed explanation. Use additional sheets, as applicable, labeled with CID and paged in numerical sequence.*

A. Software Product Name/Version: _____

B. Design Description

Provide a description of the software design that is easily traceable to the requirements described in the SRS. The description shall address the following:

- An overall description of the design (such as a flowchart, a narrative, data flow diagram, etc.),
 - The programming language and version,
 - Major variables,
 - Descriptions of files,
 - Data structures (including restrictions and limitations),
 - Hardware and operating system,
 - Special and peripheral hardware, and
 - Internal and external interfaces.
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