YUCCA MOUNTAIN QUALITY ASSURANCE DIVISION

QUALITY ASSURANCE SURVEILLANCE REPORT

OF

UNITED STATES GEOLOGICAL SURVEY

SURVEILLANCE REPORT NUMBER YMP-SR-91-023

CONDUCTED AUGUST 5 THROUGH AUGUST 7, 1991

ACTIVITY SURVEILLED:

SOFTWARE QUALITY ASSURANCE

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ENCLOSURE

1.0 INTRODUCTION

This report contains the results of a Yucca Mountain Quality Assurance Division (YMQAD) Surveillance No. YMP-SR-91-023 of the United States Geological Survey (USGS) conducted at Denver, Colorado, from August 5 through August 7, 1991.

2.0 PURPOSE AND SCOPE

The purpose of this surveillance was to determine the effectiveness of implementation of USGS procedures for the control of Software Quality Assurance. The scope of the surveillance covered the review of software documentation packages.

During this surveillance, implementation of the following procedures were verified for compliance:

1. YMP-USGS-SQAP-01, Rev 0, "Software Quality Assurance Plan"

2. YMP-USGS-QMP-3.03, Rev 2, "Software Quality Assurance"

3. YMP-USGS-QMP-3.14, Rev 3, "Software Configuration Management System"

In addition, the surveillance team was tasked to evaluate implementation of the corrective actions identified in Corrective Action Request (CAR) YM-91-053. Also a re-evaluation of those software packages reviewed and referenced in YM-91-051 was to be completed.

3.0 SURVEILLANCE PERSONNEL

This surveillance was conducted by the following personnel:

Richard L. Maudlin, Quality Assurance Specialist,
MAC Technical Services Co./YMQAD (Surveillance Team Leader)

John R. Matras, Quality Assurance Engineer,
Science Applications International Corporation/YMQAD (Team Member)

4.0 SUMMARY OF SURVEILLANCE RESULTS

The implementing procedures listed in Section 2.0 of this report were the source of questions used to conduct this surveillance. Checklists generated from these documents were used to determine compliance. The following results were obtained during this surveillance:

YMP-USGS-SQAP-01, R0 "Software Quality Assurance Plan"

Originally, the Software Quality Assurance Plan (SQAP) was not intended to be part of the scope; however, during the course of the surveillance, it was found that requirements from the SQAP had not been filtered down

into the implementing Quality Management Procedures (QMPs). Specifically, the SQAP, Section 4.2.5 requires that the life-cycle verification phase demonstrate that the software satisfies the intended requirements specified in such documents as the Software Requirements Specification. Also, testing and verification are to be done by the developer and an independent verifier. QMP 3.03 was found not to address these requirements. CAR YM-91-075 and YM-91-076 were issued to document this condition. Also, it was found that the Software Test Summary (STS) as referenced in the SQAP is no longer used. QMP 3.03 now applies a Module Unit Test Report in its place. The SQAP has not been revised to reflect this change. CAR YM-91-074 was issued to address this condition.

YMP-USGS-QMP-3.03, R2 "Software Quality Assurance"

Developed, acquired and existing modified software packages were reviewed for compliance to procedural requirements. Software packages selected were based on those reviewed during USGS Audit YMP-91-05. The following software application packages were reviewed:

4 Developed	Name	Importance	Application
NHP0031.01	CALDATA/1.00	ANCILLARY	DBMS
NHP0076.01	MMONITOR/1.0	SUPPLEMENTARY	DAS/DRS/SES
NHP0077.01	MDISPLAY/1.0	SUPPLEMENTARY	OTHER
NHP0079.01	RADSOL.F77/1	ANCILLARY	OTHER
5 Modified (Existing)			
GDD0001.01 & 02	HYP071.FOR	ANCILLARY	MODEL BASED SES
GDD0012.01 & 02	PING.C	CRITICAL	DRS
NHP0030.01 & 02	GDISPLAY	ANCILLARY	SES
NHP0029.01 & 02	THMREG	ANCILLARY	DRS/SES
NHP0038.01 & 02	PTSETMA	ANCILLARY	DRS
4 Acquired			
NHP0078.01	HYTEQ/1.0	ANCILLARY	MODEL BASED SES
NHP0088.01	ANNIE/02/09	ANCILLARY	OTHER
GDD0088.01	GEOCOMPS	ANCILLARY	DRS
NHP0090.01	IOWDM/02/09	ANCILLARY	OTHER

All software products were reviewed, and the developed and acquired packages appeared to be satisfactory. Supplementary software was not reviewed in detail in that its intended use will not be quality affecting.

Additional Critical software documentation listed below was also reviewed and appeared to be satisfactory:

GDD0004.01	SEISMIC.CMD	CRITICAL	DAS
GDD0010.01	LUDMUX.C	CRITICAL	DRS
GDD0011.01	LPTPLOT.C	CRITICAL	DRS
GDD0037.01	SQUASH.C	CRITICAL	OTHER
NHP0036.01	PTCAL/1.007	CRITICAL	DAS
NHP0044.01	TCPCAL/1.008	CRITICAL	DAS/SES
NHP0045.01	THMCAL/1.006	CRITICAL	DAS/SES

Only the Configuration Identification Request Form, Software Verification Report, Users Manual, and Software Summary Form were reviewed for the above Critical packages. In all the above packages, the documentation development was traceable and easy to find except for modified existing software. The documentation was usually in the modified existing package but appeared in different locations. One package (NHP0029.02/E01) was found to be missing a Software Verification Report. This was documented on CAR YM-91-077.

YMP-USGS-QMP-3.14, R "Software Configuration Management System"

The Configuration Management System was reviewed for compliance to procedural requirements. All documentation was clearly labeled and there were no problems finding any requested documentation packages. All software packages reviewed appeared to be well organized except for Existing Modified Ancillary software packages where the documentation was difficult to identify and document development was not easily traceable. For example, the requirements or code was either in the Users Manual attached to the Verification Report or attached to the Software Summary Form. Also, the Configuration Control Committee (CCC) did not document how the documentation received with the existing and acquired software met the requirements of QMP-3.03, Section 5.3.3.

MISCELLANEOUS

All corrective actions for CAR YM-91-053 have been implemented. It is recommended that this CAR be closed.

In regards to CAR YM-91-051, it was determined based on discussions with USGS management, members of the CCC, and a review of the status of other packages for which the CAR was based upon, that the response provided by USGS be accepted contingent on a timely revision to QMP 3.03. The software packages for which this CAR was generated were classified as Existing Ancillary (3 packages) and Existing Critical (1 package). Based on the requirements in QMP 3.03 which indicates that EXISTING software enters the life-cycle at the Installation and Checkout Phase, the documentation found appeared to be acceptable and met the requirements of the procedure. Also, two of the packages appeared to be inappropriately classified (see Recommendations Section).

5.0 PERSONNEL CONTACTED DURING THE SURVEILLANCE

T. Chaney, Quality Assurance Manager, USGS
M. Mustard, Quality Assurance Specialist, USGS
D. Gockel, Software Quality Assurance Specialist, USGS
M. Wallendorf, Software Librarian, SAIC/USGS
M. Kurzmack, Technical Contact, USGS

6.0 SYNOPSIS OF DEFICIENCY DOCUMENTS/OBSERVATIONS

CAR No. YM-91-074	Contrary to the requirements of the SQAP, QMP 3.03 has deleted the use of the STS without revising the SQAP.
CAR No. YM-91-075	QMP 3.03 does not require traceability of documentation as required by the SQAP.
CAR No. YM-91-076	QMP 3.03 does not address independence of personnel performing software testing for verification as required by the SQAP.
CAR No. YM-91-077	Software package NHP0029.02/E01 was found to have been released without an SVR or Technical/Peer Review having been performed.

7.0 RECOMMENDATIONS

The CARs identified during this surveillance are not considered significant, but will in two (2) instances, require actions to determine the cause and identify measures to prevent recurrence.

During the course of the surveillance, it was observed that software is being placed in the SQA System under an inappropriately classification. Two software packages, NHP0030/.01 (Screen Graphics) and NHP0038/.A01 (Determines Optimal Excitation Current for Druck Pressure Transducers) were placed into the SQA System as Existing Ancillary software. In discussions with the developer, it was learned that the Graphics Software does not produce any output and is not quality affecting. The software that determine optimal current, if found in error, does not have any affect on the acceptance of the results produced from the transducer taking measurements. Based on these discussions, it was pointed out to members of the CCC that stronger controls should be placed on the evaluation and classification of software. It was recommended that this software be reclassified to Supplemental Software which does not require such stringent software documentation requirements as does Ancillary.

The second recommendation relates to the decision making process regarding the determination of what life-cycle documentation is needed for each software application. It is understood that the CCC plays a major role in this process. The concern raised by the surveillance team

was that when the Configuration Identification Request Form (CIRF), Part IV is completed where NO is checked, there should be an explanation as to the bases for not requiring that particular document. Since this justification is not documented, dependency for the justification is based upon a verbal response from a member of the CCC. This places the focus for the decisions of the CCC on those members remembering what at been decided and why. The documentation is not always self sufficient. Also, it was found in certain instances that the documentation, especially the Software Verification Report, did not always identify the basis for the tests that were performed, such as Software Requirements Specification or Users Manual. The documentation assumed that the reviewer or auditor would automatically take into account certain documents.

8.0 REQUIRED ACTIONS

USGS is requested to provide responses to CARs YM-91-074 through YM-91-077 within 20 working days of transmittal of the CARs. For CARs YM-91-076 and 077, provide in your response, the cause of the condition and the action(s) to be taken to prevent recurrence. Attached to this report are copies of the CARs issued.

ORIGINAL
THIS IS A RED STAMP

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

14CAR NO.: YM-91-074
DATE: 08-07-91
SHEET: 1 OF 1
QA
WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
YMP-USGS-SQAP-01, Rev. 0	YMP-SR-91-023

3 Responsible Organization	4 Discussed With
USGS	D. Gockel/M. Wallendorf/T. Chaney

10 Response Due	11 Responsibility for Corrective Action	12 Stop Work Order Y or N
20 days from issue	T. Chaney	No

5 Requirement:

SQAP, Rev. 0, Section 5.0, makes reference to the application of a Software Test Summary (STS).

6 Adverse Condition:

Contrary to the above, QMP 3.03, Rev. 2, has deleted the use of the STS without revising the SQAP. The STS has been replaced with the Module/Unit Test Report.

7 Recommended Action(s):

Revise SQAP to be consistent with present practice of Module/Unit Test Report.

8 Initiator Date:	9 Severity Level -	13 Approved By: Date:
R. Maudlin/J. Matras 08/14/91	1☐ 2☐ 3☒	OQA Catherine Hampton 8-14-91

15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted:	17 Closure Approved By:
QAR _____ Date _____	OQA _____

ORIGINAL
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14CAR NO.: YM-91-075
DATE: 08-07-91
SHEET: 1 OF 2
QA
WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
YMP-USGS-SQAP-01, Rev. 0	YMP-SR-91-023

3 Responsible Organization	4 Discussed With
USGS	D. Gockel/M. Wallendorf/M. Mustard

10 Response Due	11 Responsibility for Corrective Action	12 Stop Work Order Y or N
20 days from issue	T. Chaney	No

5 Requirement:

YMP-USGS-SQAP-01, Rev. 0, Section 4.2.5 states:

A. Lifecycle verification demonstrates that the product resulting from any lifecycle phase satisfies the specifications and requirements of the preceding lifecycle phase.

B. Design validation demonstrates that the final software product correctly implements all of the functional requirements specified during the Requirements phase.

C. Software Verification demonstrates that the software product as embodied in code written for a specified hardware configuration performs all logical and mathematical operations correctly and does not perform any unintended functions that could degrade the performance of the software product.

6 Adverse Condition:

QMP-3.03 requires that a Software Verification Report, Model Validation Report and/or Software Technical/Peer Review Report forms to be completed but does not require that the above requirements be documented in the reports.

7 Recommended Action(s):

Bring the requirements form Section 4.2.5 of the SQAP into QMP-3.03.

8 Initiator / Date:	9 Severity Level -	13 Approved By: / Date:
J. Matras/R. Maudlin 08/14/91	1☐ 2☐ 3☒	OQA 8-14-91

15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted:	17 Closure Approved By:
QAR _____ Date _____	OQA _____

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

CAR NO.: YM-91-075
DATE: 08-07-91
SHEET: 2 OF 2

CORRECTIVE ACTION REQUEST
(continuation sheet)

5 Requirements (continued)

D. Model Validation demonstrates that the physical and mathematical models embodies in model-based SES are appropriate and adequate for the intended application of the software product.

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14CAR NO.: YM-91-076
DATE: 08-07-91
SHEET: 1 OF 1
QA
WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
YMP-USGS-SQAP-01, Rev. 0	YMP-SR-91-023

3 Responsible Organization	4 Discussed With
USGS	D. Gockel/M. Wallendorf/T. Chaney

10 Response Due	11 Responsibility for Corrective Action	12 Stop Work Order Y or N
20 days from issue	T. Chaney	No

5 Requirement:

SQAP, Rev. 0, Section 4.2.5 (Testing Phase) states in part: "During this phase, the software product is subjected to lifecycle-verification and design validating testing by both the developer and by technically qualified personnel independent of the development of the software product."

6 Adverse Condition:

Contrary to the above: (1) QMP 3.03, Rev. 2, does not address independence of personnel during the software testing phase (i.e., Software Verification), and (2) one example was noted during the review of software packages where the only person performing the software verification was also the one who made the modification.

Example: Software Package YMP-USGS/GDD012/E01.02. The SVR was completed by S.C. Harmsen who was also the person who modified the program.

7 Recommended Action(s):

(1) Revise QMP 3.03 to address requirements for independency of person performing software verification, and (2) evaluate software which has completed verifications to determine if independently verified.

8 Initiator	Date:	9 Severity Level -	13 Approved By:	Date:
R. Maudlin/J. Matras		1☐ 2☒ 3☐	OQA Catherine J Hampton	8-14-91
R. Maudlin	08/14/91			

15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted:	17 Closure Approved By:
QAR _____ Date _____	OQA _____

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14CAR NO.: YM-91-077
DATE: 08-07-91
SHEET: 1 OF 1
QA
WBS No.: 1.2.9.3

CORRECTIVE ACTION REQUEST

1 Controlling Document	2 Related Report No.
YMP-USGS-QMP 3.3, Rev. 2	YMP-SR-91-023

3 Responsible Organization	4 Discussed With
USGS	D. Gockel/M. Wallendorf/T. Chaney

10 Response Due	11 Responsibility for Corrective Action	12 Stop Work Order Y or N
20 days from issue	T. Chaney	No

5 Requirement:

QMP-3.03, Rev. 2, Section 5.4 (c) and (d) require that before the Software Summary Form (SSF) is submitted to the SCM librarian, a Software Verification Report (SVR) or Technical/Peer Review must be performed before the software is released for operation (Section 5.3.3.6a).

6 Adverse Condition:

Contrary to the above, Software Package NHP0029.02/E01 was found to have the SSF completed and in the SCM Library. The software package has been released for use without any evidence that an SVR or a Technical/Peer Review has been completed.

7 Recommended Action(s):

Take immediate action to withraw software from use. Perform testing and verification on software. If results are unacceptable, determine what activities software has been used on and tag as nonconforming. Determine if any other similar condition exists.

8 Initiator Date:	9 Severity Level -	13 Approved By: Date:
J. Matras/R. Maudlin Maudlin for 08/14/91	1☐ 2☒ 3☐	QQA Catherine Hooper 8-14-91

15 Verification of Corrective Action:

16 Corrective Action Completed and Accepted:	17 Closure Approved By:
QAR _____ Date _____	QQA _____