YUCCA MOUNTAIN PROJECT OFFICE

QUALITY ASSURANCE SURVEILLANCE REPORT

SURVEILLANCE YMP-SR-90-019

CONDUCTED FEBRUARY 20 THROUGH FEBRUARY 23, 1990

ACTIVITIES SURVEILLED:

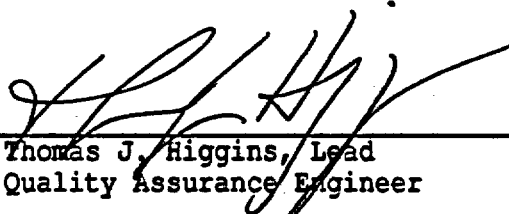IMPLEMENTATION OF PROCEDURES

YMP-USGS-QMP-3.03, REVISION 1

AND

YMP-USGS-QMP-3.14, REVISION 2

BY THE

UNITED STATES GEOLOGICAL SURVEY

Prepared By: _____ Date: 3·22·90
Thomas J. Higgins, Lead
Quality Assurance Engineer

Approved By: _____ Date: 3/22/90
Donald G. Horton, Director
Quality Assurance Division

1.0 <u>EXECUTIVE SUMMARY</u>

The purpose of this surveillance was to verify the implementation by the
United States Geological Survey (USGS) of its procedures YMP-USGS-
QMP-3.03, "Software Quality Assurance," and YMP-USGS-QMP-3.14, "Software
Configuration Management System." The implementation of both procedures
was judged to be adequate. Five observations were issued, but no standard
deficiency reports (SDRs) resulted from the surveillance.

2.0 <u>INTRODUCTION</u>

The Yucca Mountain Project Office (Project Office) Quality Assurance (QA)
staff conducted this surveillance at the USGS facility in Denver,
Colorado, February 20 through 23, 1990. The surveillance was conducted in
accordance with the Project Office Quality Management Procedure QMP-18-02,
"Surveillance," Revision 1.

John Gilray and Tilak Verma of the U.S. Nuclear Regulatory Commission
(NRC) and Susan Zimmerman of the State of Nevada were present as
observers.

3.0 <u>BACKGROUND, PURPOSE, AND SCOPE</u>

3.1 <u>BACKGROUND</u>

The Project Office approved the USGS Software Quality Assurance Plan
(SQAP) for implementation on August 8, 1989. The procedures that
implement the SQAP are YMP-USGS-QMP-3.03, "Software Quality Assurance,"
and YMP-USGS-QMP-3.14, "Software Configuration Management System." In
June 1989, the Project Office performed Surveillance YMP-SR-89-110, which
evaluated YMP-USGS-QMP-3.03, Revision 1, and YMP-USGS-QMP-3.14,
Revision 0, "against the requirements of the Project Office QA Plan, NNWSI
QAP/88-9, Revision 2, and the quality related Administrative Procedures as
applicable." At the conclusion of that surveillance, the single
identified deficiency had been corrected.

3.2 <u>PURPOSE</u>

This surveillance evaluated the implementation of YMP-USGS-QMP-3.03,
Revision 1, and YMP-USGS-QMP-3.14, Revision 2, by the USGS.

3.3 SCOPE

The USGS Software Configuration Status Accounting (CSA) Log lists 75 computer codes in the Software Configuration Management (SCM) System. Of these 75, 9 have a complete set of lifecycle documentation, although document reviews are not complete; 10 have one or more baselined lifecycle documents, and the remaining 56 are merely registered with the SCM System. These have no baselined documentation beyond the Configuration Identification Request Form that registers the software with the SCM System. The surveillance team selected four of the nine software products for which a complete set of lifecycle documentation was available. (Two of the remaining five had been previously examined in Audit 89-4.) The surveillance team also selected five of the ten software products that have some portion of the lifecycle process completed for verification of procedural implementation.

4.0 SURVEILLANCE PERSONNEL

T. J. Higgins, QA Engineer, Project Office QA, Las Vegas, Nevada
S. D. Harris, QA Engineer, Project Office QA, Las Vegas, Nevada
R. L. Maudlin, QA Specialist, Project Office QA, Las Vegas, Nevada
N. D. Cox, QA Engineer, Project Office QA, Las Vegas, Nevada

5.0 SUMMARY OF SURVEILLANCE RESULTS

The surveillance team examined the existing records, logs, and meeting minutes of the SCM Management System to assess compliance with procedural steps and requirements. Interviews were held with Mr. D. T. Hoxie, Software QA Specialist, and Mr. M. A. Wallendorf, SCM Librarian, as an integral part of this process. The training and qualifications of these two individuals was also reviewed. Finally, two technical contacts who are responsible for the development of lifecycle documentation for their assigned software products were also interviewed to determine their understanding of the SCM System and its procedures.

The surveillance team examined the entire CSA Log and then requested that a random selection of individual baselined documents be retrieved from the SCM Library, which is maintained within the USGS Local Records Center (LRC). The surveillance team also requested complete records packages for four software products having a complete set of documentation and the record packages of five products for which the preparation of lifecycle documentation is in progress.

The selected software products with complete lifecycle documentation were:

Configuration
Identification No.   Code Name

        GDD0004   SEISMIC.CMD
        GDD0014   FORUV.FOR
        GDD0027   TARVAX.FOR
        GDD0034   LOTUS 123

The selected software products with more than one baselined lifecycle document were:

Configuration
Identification No.   Code Name

        GDD0023   EVENTDATABASE
        GDD0026   UTILITIESDATABASE
        NHP0009   RTM
        NHP0010   RTRC
        NHP0011   WAVSEP

The surveillance team concluded that the implementation of both procedures is adequate. Specific results for each of the individual procedures are provided in the following sections.

5.1 IMPLEMENTATION OF SOFTWARE CONFIGURATION MANAGEMENT SYSTEM

The surveillance team determined that implementation of YMP-USGS-QMP-3.14, Revision 2, "Software Configuration Management System," is adequate. The areas assessed were:

o Configuration identification
o Submission of software configuration items
o Changes and revisions
o Configuration Control Committee
o Configuration status accounting
o SCM System Library

The following facts and conditions were noted:

1. Of the 198 SQA Document Acknowledgment Forms examined in the CSA Log, 15 had incomplete sections, but were filed in the CSA Log as complete nonetheless. These are mostly among the earlier entries in the CSA Log.

2.   The term "software user" as employed by the USGS is significantly different from that which the Surveillance Team would expect. Neither the SQAP, nor its implementing procedures, provides an adequate definition that reflects USGS usage. Consequently, a directory of "users" which the surveillance team requested to examine based on their reading of procedural requirements, did not exist because users refers to individuals other than the the technical contact, actual developers of the software, and possibly the principal investigator.

     NOTE: The USGS is currently revising QMP-3.03 and will address this concern.

3.   A software requirements specification (CID:YMP-USGS/NHP0010/ B01.01.02), received by the SCM Librarian on December 22, 1989, was amended and the changes were initialed and dated by the original author on the same day as the January 26, 1990, Configuration Control Committee (CCC) meeting. The changes occurred in Section 15, "Intended Application," Part A., Attributes 2) and 4). The changes were from "yes" to "no" in both cases and indicate that the intended application of the software will probably not be "critical," as defined by the USGS SQAP. This change is in the non-conservative direction. No justification for this change was provided as part of the identified record, nor was it included in the meeting minutes for the January 1990 CCC meeting.

5.2   IMPLEMENTATION OF SOFTWARE QUALITY ASSURANCE

The surveillance team examined the complete record packages obtained from the LRC for each of the nine codes identified in Section 5.0 of this report. It also interviewed two technical contacts to determine their knowledge and familiarity with the procedure. From this review, the Team determined that the implementation of procedure YMP-USGS-QMP-3.03, "Software Quality Assurance," Revision 1, is adequate. The following conditions and facts were noted:

1.   The procedure provides no instructions for the completion of the many forms that it requires. While some forms are self-explanatory, others do need explicit instructions or a statement of criteria by which satisfactory completion may be judged. Among the latter are Software Verification Report, and Software Technical/Peer Review Plan.

2.   Certain details related to the production of acceptable records require attention and emphasis. Among those observed were two entries in pencil, illegible handwriting, no table of contents for record packages, and incomplete pagination.

3.   Software (CID: GDD0026) identified by the technical contact as "critical" was carried into the testing phase before the completion of all reviews of the submitted lifecycle documentation from the preceding design phase.

4.   The point at which acquired software will enter the lifecycle is not well defined.

5.   The procedure delays the determination of the software attribute "importance" until the Installation and Check-out Phase.

5.3 SOFTWARE IN USE IN SEISMIC MONITORING

The ongoing Seismic Monitoring Program makes use of software for which the reviews of all lifecycle documentation is not complete. The identified code is SEISMIC.CMD (GDD0004), which is used for data digitization and manipulation. This condition has been formally identified by the USGS and is affected by one of several corrective action requests issued by the USGS to promulgate a self-imposed stop work order. The surveillance team has interpreted this as a documented data verification hold-point per NNWSI/88-9, Section III, Paragraph 1.9.2, and concluded that the activity does not constitute a condition adverse to quality.

It is understood that the stop work order will be lifted in the near future, upon completion of corrective actions. The USGS should address the possibility that the need to continue control of the existing affected data might be overlooked when the stop work order is lifted. One or more of the following measures is suggested:

1.   Institute specific formally documented hold-points for the usage of seismic data processed with unqualified software until such time as both the software and the software products are qualified. (NNWSI/88-9, Section III, Paragraph 1.9.2)

2.   Complete the qualification of the software and software product at the earliest time possible. (NNWSI/88-9, Section III, Paragraph 3.1.6)

3.   Place hold tags or other devices on every magnetic tape containing processed seismic data until such time as the software and software product are qualified. (NNWSI/88-9, Section XV, Paragraph 1.1.1)

6.0 PERSONNEL CONTACTED

L. R. Hayes, Technical Project Officer, USGS
Thomas Chaney, Acting QA Manager, USGS
D. T. Hoxie, Software QA Specialist, USGS
M. A. Wallendorf, SCM Librarian, SAIC (Golden)
P. A. Covington, Geologic Division QA, SAIC (Golden)
T. M. Mendez-Viga, Nuclear Hydrology Program QA, SAIC (Golden)
J. S. Gomberg, Technical Contact, USGS
S. C. Harmsen, Technical Contact, USGS

7.0 SYNOPSIS OF NCRs/SDRs/OBSERVATIONS

No SDRs were written as a result of this surveillance. The following five
Observations were issued:

YMP-SR-90-019-01   States that YMP-USGS-QMP-3.03, Revison 1, lacks
                    adequate direction for the completion of some of the
                    forms completed during use of the procedure.

YMP-SR-90-019-02   States that YMP-USGS-QMP-3.03, Revision 1, requires
                    that lifecycle documentation of one phase be submitted
                    before the next phase is initiated, while the SQAP
                    requires that it will also be approved. The procedure
                    is less restrictive than the requirement which it
                    implements.

YMP-SR-90-019-03   States that YMP-USGS-QMP-3.03, Revision 1,
                    inadequately implements the SQAP requirement to
                    provide stringent software lifecycle control of
                    critical software because it does not determine a
                    software's "importance" (i.e., whether it will be
                    critical) until near the end of the lifecycle.

YMP-SR-90-019-04   States that YMP-USGS-QMP-3.14, Revision 2, does not
                    require that the User's List for a software product
                    contain all developers and users, in particular the
                    primary users.

YMP-SR-90-019-05   States that YMP-USGS-QMP-3.14, Revision 2, does not
                    address revisions to documents submitted to the SCM
                    System in the interval between acceptance by the SCM
                    Librarian and baselining.

8.0 REQUIRED ACTIONS

Response to an Observation is required within 20 days from the date of its
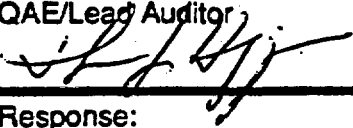transmittal to the recipient.

9.0 RECOMMENDATIONS

The following recommendations are to improve the implementation of the USGS program:

1. The USGS should distribute both the knowledge of, and the responsibility for, the SQAP over a number of individuals. Currently, both knowledge and responsibility are concentrated in D. T. Hoxie.

2. The USGS should emphasize the requirements for the completion of QA records and record packages.

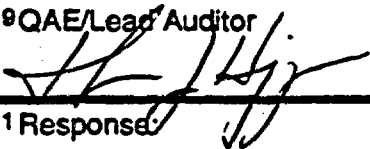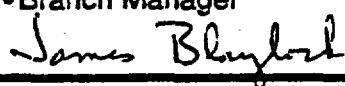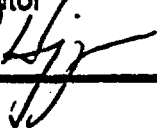3. The USGS should review the CSA Log and provide any missing historical information.

YUCCA MOUNTAIN PROJECT OFFICE
1 YMPO OBSERVATION NO. YMP-SR-90-019-01

N-QA-012
4/89

Completed by Originating Organization

2 Noted During: Surveillance YMP-SR-90-019	3 Identified By: T. J. Higgins	4 Date: 3-14-90
5 Organization: USGS	6 Person(s) Contacted: L. R. Hayes, D. T. Hoxie	7 Response Due Date is 20 Days from Date of Transmittal

8 Discussion:

Procedure YMP-USGS-3.03, Rev. 1, "Software Quality Assurance", provides very few instructions for the completion of the 16 separate forms that may be required during the use of the procedure. Although some of the forms are self-explanatory, others are not and do require either explicit instructions or a statement of criteria by which their satisifactory completion may be determined. Among these are the Software Verification Report, Software Technical/Peer Review Plan etc.

9 QAE/Lead Auditor	Date 3-22-90	10 Branch Manager James Blayford	Date 3/22/90

Completed by Respondee

11 Response:

12 Signature: **Date:**

Completed by QA Org.

13 Response Receipt Acceptable ☐

Initiator	Date	QA/Lead Auditor	Date

14 Remarks:

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YUCCA MOUNTAIN PROJECT OFFICE
1 YMPO OBSERVATION NO. YMP-SR-019-02

N-QA-012
4/89

Completed by Originating Organization

2 Noted During: Surveillance YMP-SR-90-019	3 Identified By: S. D. Harris
	4 Date: 3/14/90

5 Organization: USGS	6 Person(s) Contacted: L. R. Hayes, D. T. Hoxie	7 Response Due Date is 20 Days from Date of Transmittal

8 Discussion:

The U. S. Geological Survey Software Quality Assurance Plan For The Yucca Mountain Project, YMP-USGS-SQAP-01, R0, requires that "... each document or set of documents produced at each software lifecycle development and testing phase will be reviewed for technical content and SQA adherence prior to proceeding to the next ... phase. These reviews will be performed as a part of the SCM function ..." (Section 6.2). However, procedure YMP-USGS-3.03, Rev. 1, "Software Quality Assurance", section 5.4.1 (a), Developed Software, states in part "... the responsible TC shall prepare ... documentation at the completion

9 QAE/Lead Auditor	Date 3-22-90	10 Branch Manager James Blaylock	Date 3/22/90

Completed by Respondee

11 Response:

12 Signature: **Date:**

Completed by QA Org.

13 Response Receipt Acceptable ☐

Initiator	Date	QA/Lead Auditor	Date

14 Remarks:
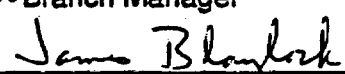
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8 Discussion: (continued)

of each lifecycle phase and shall submit this documentation to the QA Office
for technical and SQA review prior to proceeding to the next lifecycle phase."
The procedural statement is less restrictive than that of the SQAP.

One example that illustrates the negative potential of the above condition is
the initiation of the Testing phase for the code UTILITIESDATABASE
(CID: GDD0026) before the completion of the review(s) associted with the Design
phase. This code was described as "critical" by the Technical Contact.

YUCCA MOUNTAIN PROJECT OFFICE
¹YMPO OBSERVATION NO. YMP-SR-90-019-03

N-QA-012
4/89

²Noted During:	³Identified By:	⁴Date:
Surveillance YMP-SR-90-019	T. J. Higgins	3/14/90

⁵Organization: USGS	⁶Person(s) Contacted:	⁷Response Due Date is 20 Days from Date of Transmittal
	L. R. Hayes, D. T. Hoxie	

⁸Discussion:

Procedure YMP-USGS-QMP-3.03, Rev. 1, "Software Quality Assurance", requires that the software attribute "importance" be determined during the approval process for the Software Summary Form (Attachment 6 to the procedure) which documents completion of the Installation and Checkout Phase (Section 5.3.1.6). This is near the end of the software lifecycle process and therefore does not effectively support the requirement that "Critical Software will be subject to stringent software lifecycle control to the extent both feasible and practical." as specified in section 6.2 of the U. S. Geological Survey Software

⁹QAE/Lead Auditor	Date 3-22-90	¹⁰Branch Manager James Blaylock	Date 3/22/90

¹¹Response:

¹²Signature: | **Date:**

¹³Response Receipt Acceptable ☐

Initiator	Date	QA/Lead Auditor	Date

¹⁴Remarks:

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Completed by Originating Organization

Completed by Respondee

Completed by QA Org.

8 Discussion: (continued)

   Quality Assurance Program For The Yucca Mountain Project, YMP-USGS-SQAP-01, R0.

YUCCA MOUNTAIN PROJECT OFFICE

N-QA-012
4/89

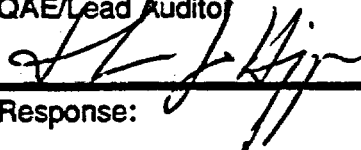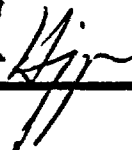**¹YMPO OBSERVATION NO.** YMP-SR-90-019-04

²Noted During: Surveillance YMP-SR-90-019	**³Identified By:** S. D. Harris

⁴Date: 3/19/90

⁵Organization: USGS	**⁶Person(s) Contacted:** L. R. Hayes, D. T. Hoxie

⁷Response Due Date is 20 Days from Date of Transmittal

Completed by Originating Organization

⁸Discussion:

In the implementation of procedures YMP-USGS-QMP-3.14, Rev.2, "Software Configuration Management System", section 5.5.2, and of YMP-USGS-QMP-3.03, Rev. 1, "Software Quality Assurance", section 5.3.1.7.1(a), the SCM Librarian and SQA Specialist do not list the Technical Contact, primary users, and developers of a software product in the directory of users. Rather, they list only individuals outside of this circle who must acquire the software product through a Software Transfer Request. (CONTINUED on next page.)

⁹QAE/Lead Auditor	**Date** 3-22-90	**¹⁰Branch Manager** James Blaylock	**Date** 3/22/90

Completed by Respondee

¹¹Response:

¹²Signature: | **Date:**

Completed by QA Org.

¹³Response Receipt Acceptable ☐

Initiator	Date	QA/Lead Auditor	Date

¹⁴Remarks:

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8 Discussion: (continued)

This condition is in part due to the fact that there is no definition of "software user" in the USGS Software Quality Assurance Plan For The Yucca Mountain Project, YMP-USGS-SQAP-01, Rev. 0, or in its implementing procedures YMP-USGS-QMP-3.03, Rev. 1, , and YMP-USGS-QMP-3.14, Rev. 2. However QMP-3.03, section 4.8, does specify the responsibilities of software users which it states may include the Technical Contact, Principal Investigator or other YMP-USGS personnel. The lack of a definition of "user" coupled with the practice of the Librarian and Specialist is a programmatic defect. It should be corrected.

YUCCA MOUNTAIN PROJECT OFFICE
¹YMPO OBSERVATION NO. YMP-SR-90-019-05

N-QA-012
4/89

²Noted During: Surveillance YMP-SR-90-019	³Identified By: T. J. Higgins	⁴Date: 3/20/90
⁵Organization: USGS	⁶Person(s) Contacted: L. R. Hayes, D. T. Hoxie	⁷Response Due Date is 20 Days from Date of Transmittal

⁸Discussion:

Procedures YMP-USGS-QMP-3.03, Rev. 1, and YMP-USGS-QMP-3.14, Rev. 2., which implement the USGS Software Quality Assurance Program, do not address the question of document amendment in the interval between the document's registry in the SCM System by the SCM Librarian, and the baselining of that document as a Software Configuration Item.

This Observation is prompted by dated and initialled changes to a Software Specification Summary (CID: YMP-USGS-NHP0010/BO1.01.02) in section 15 of that

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⁹QAE/Lead Auditor	Date 3-22-90	¹⁰Branch Manager James Blaylock	Date 3/22/90

¹¹Response:

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¹²Signature: **Date:**

¹³Response Receipt Acceptable ☐

Initiator	Date	QA/Lead Auditor	Date

¹⁴Remarks:

(left margin, rotated: Completed by QA Org.)

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1 of 2

8 Discussion: (continued)

form. The document was received by the SCM Librarian on December 22, 1989, and was altered on January 26, 1990. No explanation was attached to the document nor was there any found in the meeting minutes of the January 26, 1990, Configuration Control Committee.

cc w/encls:
Ralph Stein, HQ (RW-30) FORS
D. E. Shelor, HQ (RW-3) FORS
R. L. Maudlin, MACTEC, Las Vegas, NV
N. J. Brogan, SAIC, Las Vegas, NV, 517/T-08
N. D. Cox, SAIC, Las Vegas, NV, 517/T-06
S. D. Harris, SAIC, Las Vegas, NV, 517/T-08
T. J. Higgins, SAIC, Las Vegas, NV, 517/T-06
C. H. Prater, SAIC, Las Vegas, NV, 517/T-06
T. H. Chaney, USGS, Denver, CO
J. W. Gilray, NRC, Las Vegas, NV
Tilak Verma, NRC, Washington, DC
S. W. Zimmerman, NWPO, Carson City, NV

cc w/o encls:
K. G. Sommer, HQ (RW-3) FORS
D. O. Porter, SAIC, Golden, CO
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