

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

QUALITY ASSURANCE AUDIT PLAN

FOR AUDIT USGS-ARP-97-03

OF THE

U.S. GEOLOGICAL SURVEY

AT

THE YUCCA MOUNTAIN SITE, NEVADA
AND
DENVER, COLORADO
NOVEMBER 4 THROUGH NOVEMBER 14, 1996

Prepared by: *Kenneth T. McFall* Date: 9-25-96
Kenneth T. McFall
Audit Team Leader
Yucca Mountain Quality Assurance

Approved by: *Donald G. Horton* Date: 10/1/96
Donald G. Horton
Director
Office of Quality Assurance

Enclosure

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1.0 SCOPE

This performance-based audit of the U.S. Geological Survey (USGS) will be conducted by a team of auditors from Yucca Mountain Quality Assurance (YMQA). The audit will evaluate the effectiveness of implementation of the USGS Quality Assurance (QA) program requirements for the study identified in Section 4.0 of this plan.

In addition, a review of the status of open Office of Civilian Radioactive Waste Management deficiency documents identified during previous audits or surveillances of USGS, as applicable to this audit, will be included in the scope to determine the status of corrective actions.

2.0 AUDIT SCHEDULE

The audited activities will include work being performed at the Yucca Mountain Site, Nevada, and at the USGS office in Denver, Colorado. The audit will be performed at the Yucca Mountain Site, Nevada, November 4-8, 1996, and in Denver, Colorado, November 12-14, 1996.

YUCCA MOUNTAIN SITE, NEVADA

Preaudit Team/Observer Meeting	8:30 a.m., November 4, 1996 Yucca Mountain Site, Nevada
Preaudit Conference	9:15 a.m., November 4, 1996 Yucca Mountain Site, Nevada
Audit Activities	10:00 a.m. to 4:00 p.m. November 4, 1996 Yucca Mountain Site, Nevada
	8:00 a.m. to 4:00 p.m. November 5-7, 1996 Yucca Mountain Site, Nevada
	8:00 a.m. to 11:30 a.m. November 8, 1996 Yucca Mountain Site, Nevada

DENVER, COLORADO

Preaudit Conference 1:00 p.m., November 12, 1996
Denver, Colorado

Audit Activities 1:45 p.m. to 4:00 p.m.
November 12, 1996
Denver, Colorado

8:00 a.m. to 4:00 p.m.
November 12-13, 1996
Denver, Colorado

8:00 a.m. to 11:00 a.m.
November 14, 1996
Denver, Colorado

Postaudit Conference 11:30 a.m., November 14, 1996
Denver, Colorado

There will be a daily Audit Team/Observer meeting at 4:00 p.m. to review audit progress. Beginning on Tuesday, November 5, 1996, there will also be a daily Audit Team Leader/Observer/USGS management meeting at 8:15 a.m., to communicate audit progress, to discuss potential deficiencies, and establish needed liaison. Both daily meetings will be held at locations provided by USGS.

3.0 REQUIREMENTS TO BE AUDITED AND APPLICABLE REFERENCES

The requirements to be audited will be contained in performance-based and technical checklists. These checklists will be developed from the latest available revision of USGS's approved and issued QA program procedures, study plans, technical procedures, and the performance objectives established and agreed upon with USGS management.

The conduct of the audit will be guided by the documents (latest revision) listed below:

- Quality Assurance Procedure (QAP) 18.2. "Internal Audit Program"
- Administrative Procedure (AP)-16.1Q. "Performance/Deficiency Reporting"
- AP-16.2Q. "Corrective Action and Stop Work"

4.0 ACTIVITIES TO BE AUDITED

The audit team will evaluate implementation of QA program requirements with regard to the studies and products associated with the Work Breakdown Structure (WBS) number below:

1.2.3.2.2.1.2 - Structural Features within the Site Area (Exploratory Studies Facility Mapping Activity Deliverables and Processes)

The study for WBS 1.2.3.2.2.1.2, and its associated product, will be evaluated for the critical process steps listed below:

1. Data Gathering
2. Data Assembly
3. Data Checking
4. Data Analysis
5. Data Review
6. Sample Collection
7. Product Delivery

A performance-based audit evaluates products and associated processes to determine the degree to which they meet program requirements and management commitments and expectations. This evaluation of process effectiveness and product acceptability will be based upon:

- Satisfactory completion of the critical process steps;
- Acceptable results and quality of the end products;
- Documentation that substantiates quality of products;
- Performance of trained and qualified personnel; and
- Implementation of applicable QA Program Elements.

5.0 AUDIT TEAM MEMBERS

Kenneth T. McFall, YMQA, Las Vegas, Nevada, Audit Team Leader
Richard L. Weeks, YMQA, Las Vegas, Nevada, Auditor
Michael F. Fahy, USGS, Denver, Colorado, Technical Specialist

6.0 AUDIT CHECKLIST

The following checklists will be used during the audit:

USGS-ARP-97-03-01, Performance-Based Checklist
USGS-ARP-97-03-02, Technical Checklist

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QUALITY ASSURANCE CHECKLIST

ORGANIZATION EVALUATED U.S. Geological Survey		<input checked="" type="checkbox"/> EXTERNAL <input type="checkbox"/> INTERNAL	<input checked="" type="checkbox"/> AUDIT <input type="checkbox"/> SURVEILLANCE	PREPARED BY <u>K. T. McFall/R. L. Weeks</u> DATE _____
DATES OF EVALUATION November 4-14, 1996				
CONTROLLING DOCUMENT (Title, Number, Revision)			ACTIVITY EVALUATED	
ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted		RESULTS
1.1	<p>QARD SECTION 1, ORGANIZATION</p> <p>Examine objective evidence and verify that OCRM approved documents describe internal and external organizational interfaces, organizational structures, requirements, and responsibilities for this scope of work.</p> <p>(Section 1.2)</p>			

* INDICATE RESULTS: SATISFACTORY (SAT), UNSATISFACTORY (UNSAT), NOT APPLICABLE (N/A)

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ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
1.2	<p>QA/D SECTION 1, ORGANIZATION</p> <p>Personnel performing work are responsible for ensuring that quality is achieved and maintained; what objective evidence is available to demonstrate that quality is achieved and maintained for this scope of work?</p> <p>(Section 1.2.3)</p>		
1.3	<p>Verify that when differences of opinion involving QA program requirements occur, it is brought to the attention of appropriate management and progressively escalated as necessary.</p>		

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2.1	<p>SECTION 2, FEDERAL PERSONNEL QUALIFICATION OMP-2.02, REVISION 6</p> <p>Verify that all OMP-USGS quality affecting activities will be performed by personnel who have been assigned to these positions on the basis of their qualifications.</p> <p>(Paragraph 5.2)</p>		
2.2	<p>Verify that copies of position descriptions, which are retained officially by the Servicing Personnel Office, shall be included in the OMP-USGS files.</p> <p>(Paragraph 5.2)</p>		
2.3	<p>Verify that a resume containing education (school, degrees, and dates of degrees) and experience pertinent to OMP-USGS responsibilities shall be prepared and verified.</p> <p>(Section 5.3.1)</p>		

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2.4	Verify that the person verifying the information shall certify the verification on the document or other comparable document. (Section 5.3.1)		
2.5	Verify that the project-specific documentation for qualifications shall include a statement of attestation that serves as the documentation of the supervisor's evaluation of employee qualifications. (Paragraph 5.3.2)		

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ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
2.6	<p>Verify that upon a significant change in duties of the position, the information shall be updated on the documents described in Para. 5.2, 5.3.1, and 5.3.2 of this QMP and forwarded to the Chief, YMPB for inclusion in the employee's YMP-USGS Personnel Records Folder.</p> <p>(Section 5.3.3)</p>		

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2.7	<p>Verify that the following documents are retained as QA records:</p> <ul style="list-style-type: none">- Position Description - Personnel Resume (Verified) - Personnel Qualification Statement/Attestation letter - Approved Requests for Waivers, as appropriate (Section 6.2)		

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2.8	<p>YWP-USGS TRAINING QAP-2.07, REVISION 2</p> <p>Verify compliance to QARD requirements of the following: "Training to YWP-USGS procedures is waived for formally documented authors and reviewers, for approval signatories, and for instructors of specific classroom training." (Paragraph 2.2.5)</p>		
2.9	<p>Verify that when notified of a training assignment, the individual shall complete the instruction by the assigned due date and obtain any needed clarifications prior to signing any instruction form. (Section 5.2.2)</p>		

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2.10	<p>Verify that if training assignments are not completed by the due date, reminder notices will be issued, as information copies, to assist supervisors in ensuring completion of scheduled training.</p> <p>(Section 5.2.3)</p>		
2.11	<p>Verify compliance with this requirement. "The trainee and instructor signatures, or initials, designate completion of Attachment 6; be retained."</p> <p>(Section 5.6.2)</p>		

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2.12	<p>NON-FEDERAL CONTRACTOR PERSONNEL QUALIFICATION QMP-2.08, REVISION 2</p> <p>Verify that for YMP-USGS Documentation of Contractor Personnel Qualification: Personnel performing activities affecting quality for the YMP-USGS Project shall meet the minimum qualification requirements for the position as identified in the YMP-USGS Contractor Position Description.</p> <p>(Section 5.3)</p>		
2.13	<p>Verify that "For the purpose of YMP-USGS, the project-specific documentation for qualifications shall consist of a statement of attestation as described in this section. Attachment 3, Contractor Personnel Qualification Statement, or equivalent, shall be used.</p> <p>(Paragraph 5.3.1)</p>		

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2.14	<p>Verify that significant changes in position duties shall be incorporated in the documents described in Paragraphs 5.2, 5.3, and 5.3.1, which is then reviewed by the Contractor Project Manager and the applicable YMP-USGS manager, and submitted to Chief, YMPB.</p> <p>(Section 5.3.2)</p>		
2.15	<p>Verify that YMP-USGS Participant Personnel Qualification Documentation: Personnel qualification documentation to be maintained by the YMP-USGS for non-federal personnel employed with another YMP participant who are to conduct technical, managerial, and/or QA tasks for YMP-USGS quality-affecting activities which are within the scope of their current position description shall consist of a statement of attestation.</p> <p>(Paragraph 5.6)</p>		

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2.16	<p>Verify that records associated with this procedure shall be maintained by the Chief, YMPB as QA records/records package, and shall contain the following documents, as a minimum.</p> <p>(Section 6.2)</p> <ul style="list-style-type: none">- YMP-USGS Contractor Position Description- YMP-USGS Contractor Personnel Resume (verified)- YMP-USGS Contractor Personnel Qualification Statement/Attestation Letter- Waiver requests and approvals, as appropriate		

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3.1	<p>REVIEW AND APPROVAL OF YMP-USGS DATA, INTERPRETATIONS OF DATA AND MANUSCRIPTS QMP-3.04, REVISION 7</p> <p>Examine review documentation for reviews of data, interpretations of data and manuscripts to ensure specific procedural requirements were met.</p> <p>Verify that for data reviews: (Paragraph 5.1.3)</p> <ol style="list-style-type: none"> 1. The documentation shows evidence that the review criteria have been considered; 2. The responsible investigator responds to all mandatory comments; 3. All mandatory comments are resolved. 		
3.2	<p>Verify that documentation of data reviews is complete (Paragraph 6.2.1) and includes a table of contents.</p>		

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3.3	<p>SECTION 3, REVIEW AND APPROVAL OF YMF-USGS DATA, INTERPRETATIONS OF DATA AND MANUSCRIPTS (continued)</p> <p>Verify that for manuscripts and interpretations of data, at least two technical reviewers, that have not participated in the actual interpretation of the data or preparation of the manuscript, perform a technical review to predetermined criteria. (Paragraph 5.2)</p>		
3.4	<p>Verify that resolution of mandatory comments is documented. (Paragraph 5.2.3 & Paragraph 5.2.4)</p>		
3.5	<p>Verify that data submitted to the project, is submitted in accordance with appropriate process controls. (Paragraph 5.1.4)</p>		

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3.6	<p>YMP-USGS REVIEW PROCEDURE QMP-3.07, REVISION 5</p> <p>Verify that implementing documents and documents that specify technical or quality requirements are reviewed and that review criteria are established before performing the review. (2.2.10, A. & Paragraph 5.2.1)</p>		
3.7	<p>Verify that the review is performed by individuals other than the preparer and that each organization or technical discipline affected by the document reviews the document. (2.2.10, C. and E., 1. & Paragraph 5.1)</p>		
3.8	<p>Verify that the resolution of mandatory comments has been documented prior to approval of document. (.2.2.10, F. & Paragraph 5.3)</p>		

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5.1	<p>PREPARATION OF TECHNICAL PROCEDURES QMP-5.01, REVISION 6</p> <p>Verify that the content of technical procedures that implement work for this activity address the topics, as appropriate, identified in QMP-5.01, Section 5.1. (QMP-5.01, Paragraph 5.1)</p>		
5.2	<p>Verify that technical procedures have received an independent technical review which is documented in accordance with QMP-3.07. (Paragraph 5.2)</p>		
5.3	<p>Verify that quality assurance performs and documents a review of technical procedures and expedited changes. (Paragraph 5.3)</p>		

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5.4	<p>SCIENTIFIC NOTEBOOK QMP-5.05, REVISION 4</p> <p>Verify that when a scientific notebook is utilized appropriate initial and in-progress entries are made. (Sections 5.5 and 5.6)</p>		
5.5	<p>Verify that the final review of an SN is performed by a qualified individual that is independent of the original work. (QARD, Supp. III.2.2, C.)</p>		
5.6	<p>Verify that the final review considers the following criteria: (Paragraph 5.8.1)</p> <ul style="list-style-type: none"> a. Importance of data b. Complexity of the activity c. Reliability of the process d. Reproducibility of the results e. Uniqueness of the data f. Necessity for special controls 		

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6.1	<p>DOCUMENT CONTROL QMP-6.01, REVISION 6</p> <p>Verify that the Chief, YMPB, or delegate, with input from the YMP-USGS QA Manager, shall identify those persons required to have a controlled copy available for performing activities affecting quality.</p> <p>(Section 5.2.1)</p>		
6.2	<p>Verify that at a minimum, a configuration check shall be performed annually to confirm that the holder possesses the specific document(s) for which the holder is accountable. The recipient shall complete the configuration check documentation as instructed and return it to the Chief, YMPB, or delegate, within 30 calendar days.</p> <p>(Section 5.4)</p>		

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6.3	<p>Verify that the configuration check also shall query all controlled document holders as to 1) the continued need for the assigned controlled document(s), and 2) the need for replacement of missing controlled documents.</p> <p>(Section 5.4)</p>		
6.4	<p>Verify that for Alternate Control System (Sub-issues): The PI shall ensure that appropriate sub-issued controlled documents are accessible at appropriate work locations within the PI's work activities.</p> <p>(Section 5.5)</p>		

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ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
6.5	<p>Verify that controlled distribution (sub-issue) of technical procedures is performed as follows:</p> <ul style="list-style-type: none">- Technical procedures shall be "checked out" to the technical person via a check-out system (log, list or record). - At a minimum, the system shall indicate the procedure number, the person's name and/or location of assignment, and the date : sub-issue. - Each "sub-issue" copy shall be initialed by the PI on its cover page.		

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17.1	<p>YMP-USGS RECORDS MANAGEMENT FOR RECORD SOURCES YMP-USGS-QMP-17.01, REVISION 8</p> <p>Verify the following requirements' complian with 17.2A of the QARD, all corrections to records to ensure records are accurate require a correction acknowledgement. This may be accomplished by the date and initials or signature of the person authorized to make corrections in close proximity to the corrections (or bracketed corrections) on the document.</p> <p>(Section 5.3.1)</p>		
17.2	<p>* Verify that prior to termination of a responsible party from Project work, the Records Source shall ensure that working files are accounted for and appropriately transferred to the next responsible party.</p> <p>(Section 5.5)</p>		

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17.3	<p>* Verify that unless an extension is documented, QA records shall be submitted no later than 20 working days following the date of (1) completion of an individual record or the last generated record of a records package required by the governing procedure.</p> <p>(Section 5.6)</p>		
17.4	<p>Verify that in accordance with YMP-USGS-QMP-17.03, records received in the LRC shall receive a quality verification check. The LRC will attempt to correct discrepancies and the record will be either accepted or rejected.</p> <p>(Section 5.7)</p>		

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17.5	Verify that completed QA records shall be dual stored or retained in a container or facility with a fire rating of one-hour by an Underwriter's Laboratories label (or equivalent) or certified by a person competent in the technical field of fire protection. (Section 5.8.2)		

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17.6	<p>Verify that machine readable records shall include the following:</p> <ul style="list-style-type: none"> c. Dates of creation and coverage. d. Specifications for required playback software and for equipment. f. External label for each volume with the following: <ul style="list-style-type: none"> 1) Record length. 3) List of files with the application software and compiler used to create software. 5) Total number of bytes for each file. 6) Narrative description of subject matter of the executable software module; file layout; field names; field parameters; form of data, (numeric, alphabetic, alphanumeric, packaged, decimal, etc.). 		

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SI-1	<p>SOFTWARE SUPPLEMENT QMP-3.3, REVISION 6</p> <p>Identify software utilized for this activity and verify compliance to selected requirements of QMP-3.03, REVISION 6.</p> <p>Verify for software that can be verified by visual inspection and/or hand calculations, the following requirements have been implemented: (Paragraph 5.1)</p> <ul style="list-style-type: none"> a. baseline version and any subsequent changes to the software is listed and, b. documentation that the software provides correct results for a specified range of input parameters. 		
SI-2	<p>Verify that for developed or modified software, USGS has documented and approved a specific software life cycle for each software item prior to development or modification of the software. (Supp. I.2.1. A.)</p>		

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SI-3	<p>Verify that the Life Cycle Plan activities and documentation include the following:</p> <ul style="list-style-type: none"> a. Software Identification Form (SIF) b. Software Configuration Management (SCM) form c. Requirements Specification d. Validation Plan e. Design Description f. User Documentation g. Executable and source code h. Software Validation Report i. Review and verification documentation j. Documentation for Operations and Maintenance activities 		
SI-4	<p>Verify that software baseline documents are reviewed at the control point in accordance with QP-3.07 and documented on the SCM form. (Paragraph 5.2.1)</p>		

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SI-5	Verify that the review documents the extent to which the results of the Life Cycle activities agree with specified acceptance criteria as listed for each software baseline document. (Paragraph 5.2.1)		
SI-6	Verify that software verification and software validation is performed prior to release of software for use. (OARD, I.2.2, A.)		
SI-7	Verify that software verification and software validation activities are performed or reviewed by independent individuals or organizations. (OARD, I.2.2, B.)		

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SII-1	<p>IDENTIFICATION AND CONTROL OF SAMPLES YMP-USGS-QMP-8.01, REVISION 4</p> <p>Verify that methods and equipment for sample collection, handling, storage, cleaning, packaging, shipping and preservation, including container specifications shall be described in technical procedures or scientific notebooks.</p> <p>(Section 5.2.3)</p>		
SII-2	<p>Verify that these procedures shall identify specific measures to be taken for critical, sensitive, perishable, or high value samples, and shall identify any special environmental, safety, or handling considerations and will specify the special experience or training of the technician or operator.</p> <p>(Section 5.2.3)</p>		

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SII-3	Verify that technical procedures or scientific notebooks shall address, as necessary, methods such as marking or labeling, needed to ensure that samples are identified, maintained, and preserved during packaging, shipping, handling, and storage. (Section 5.2.4)		

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SII-4	<p>THE COLLECTION, SUBMISSION, AND DOCUMENTATION OF NON-CORE AND NON-CUTTINGS SAMPLES TO THE SAMPLE MANAGEMENT FACILITY FOR SITE CHARACTERIZATION YAP-SIII.4Q</p> <p>Verify that the collector obtains a) Sample Collection Report (Report) (Exhibit YAP-SII.4Q.1) and unique identification labels from the SMF for each sample to be collected, or uses their own collection report that contains, at a minimum, the following:</p> <ul style="list-style-type: none">1) date sample collected2) collector's name3) organization4) address and phone number		

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	<p>SII-4 (continued)</p> <p>5) name, organization, address and phone number of the recipient for whom the sample is collected</p> <p>6) type of sample and description</p> <p>7) site type and site description</p> <p>8) SMF sample identification number</p> <p>b) collects samples and completes Report;</p> <p>e) submits a copy of the Report to the SMF within 30 days after sample collecting activities are completed;</p>		

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SIII-1	<p>QARD SUPPLEMENT III SCIENTIFIC INVESTIGATION</p> <p>Verify that minimum planning of scientific activities as required by Section 2.0 of the QARD was completed prior to commencement of work. (III.2.1, A.) Specifically, verify that the following elements are addressed:</p> <p style="padding-left: 40px;">Identification of applicable standards and criteria.</p> <p style="padding-left: 40px;">Identification and selective application, or development, of appropriate implementing documents.</p> <p style="padding-left: 40px;">Identification of, or provisions for the identification of, required records and the recording of objective evidence of the work performed.</p> <p style="padding-left: 40px;">Identification of computer software.</p>		

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SIII-2	Verify that work was performed in accordance with scientific notebooks, implementing documents or a combination of both. (III.2.2, A.)		
SIII-3	Verify that organizations providing input or using results of this activity were involved in the planning. (III.2.1, B.) Examine objective evidence that documents this involvement.		
SIII-4	Verify that a process has been developed to document an independent review of acquired and developed data to confirm technical adequacy. (III.2.4) Examine objective evidence that documents implementation of this process for the activity being evaluated. (III.2.1, A.)		

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SIII-5	<p>PROCESSING OF TECHNICAL DATA ON THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT YAP-SIII.3Q, REVISION 1</p> <p>Determine if preliminary data has been provided to other YMP investigators. If provided, verify that a cover letter accompanies letter indicating its preliminary status and data sheets are properly marked. (Paragraphs 5.2.1, a. and b., Note)</p>		
SIII-6	<p>Verify that for RIB Data Item Development, a technical review of the RIB item is conducted and documented prior to submittal. (Paragraph 5.5.1, b.)</p>		
SIII-7	<p>Verify completeness of Data Submittal Package.</p>		

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ORGANIZATION EVALUATED U.S. Geological Survey (USGS)		<input checked="" type="checkbox"/> EXTERNAL <input type="checkbox"/> INTERNAL	<input checked="" type="checkbox"/> AUDIT <input type="checkbox"/> SURVEILLANCE	PREPARED BY <u>Michael F. Fahy</u> DATE <u>10/22/96</u>
DATES OF EVALUATION November 4-14, 1996				
CONTROLLING DOCUMENT (Title, Number, Revision) OARD DOE/RW-0333P, Revision 5			ACTIVITY EVALUATED Geology of the North Ramp-Stations 4+00 to 28+00	
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T-1	PROCESS 1. DATA GATHERING What are the objectives of the data gathering?			

* INDICATE RESULTS: SATISFACTORY (SAT), UNSATISFACTORY (UNSAT), NOT APPLICABLE (N/A)

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T-2	<p>Technical Procedures (TP) used</p> <ul style="list-style-type: none"> a. What TP controls the data collection? b. What Scientific Notebooks (SN) are used? c. What are the acceptance criteria for the data (Section 13.0)? d. Are there industry techniques to collect these data...ASTM, ISRM? <ul style="list-style-type: none"> d1. If so, what are the reasons for not using these? e. What is not covered by the TP with respect to the data collected? <ul style="list-style-type: none"> e1. If any, how are these procedures controlled? <p>Review of controls</p> <ul style="list-style-type: none"> f. Have there been any quality assurance issues raised previously with regard to the TP or SNs? <ul style="list-style-type: none"> f1. What were the issues? f2. How were they resolved? 		

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I-3	<p>Review of alternatives to the process</p> <ul style="list-style-type: none">a. What alterations to the TP are used?b. What documentation is there of changes?c. Are these changes noted<ul style="list-style-type: none">c1. in notebook?c2. on drawings?c3. in summary letters?		

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T-4	Review of training a. What training is required? b. Is there refresher training?		

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T-5	<p>The data itself</p> <ul style="list-style-type: none"> a. What do the "records" look like? <ul style="list-style-type: none"> a1. Are the "Maps at 1:125" the record? a2. Are the data files for the DLS the record? b. What are the checks for the data quality and accuracy? <ul style="list-style-type: none"> b1. ...as "records." b2. What are the scientific checks? c. How is the stratigraphy defined in the tunnel? d. Who identifies the stratigraphy? e. What are the training requirements? f. Is there procedural control? <p>Fractures</p> <ul style="list-style-type: none"> g. Are all fractures measured? <p>Parameters measured? General questions for several of the parameters.</p> <ul style="list-style-type: none"> h. How measured? i. Accuracy? j. Why needed? 		

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T-5 (cont.)	<p>Specific questions for..</p> <ul style="list-style-type: none"> k. Orientation <ul style="list-style-type: none"> k1. Strike ...p. 16 goniometer was used for azimuth (controlled by SW? and where?) k2. Is there a change in accuracy as a result? l. Type .. What are the definition or criteria for types? m. Fracture Termination Angle....less than 45, greater than 45...Definition? (Is this in GP-32?) p. 17 in text? n. Roughness... on page 17, 18, R1 to R6, used instead of Nick Barton's...Is this a change in GP-32? If so, where documented? o. Mineral infilling (e.g., p. 22) <ul style="list-style-type: none"> o1. How was this done?...using Barbara Carlos' classification? o2. Are mineral infillings appearance, hardness, reaction to HCl, fluorescence in UV light measured for all infillings? 		

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T-6	<p>Faults, Foliation</p> <ul style="list-style-type: none">a. Are all faults measured?b. What parameters are measured?<ul style="list-style-type: none">bl. How are the data preserved?c. How is offset determined?<ul style="list-style-type: none">cl. How is this information presented?d. For foliation or partings what parameters are measured?		

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T-7	<p>Errors</p> <ul style="list-style-type: none">a. Were any errors found in the technical review of the data before release?<ul style="list-style-type: none">al. If so, how are these handled?b. Are there any pre-releases of data?<ul style="list-style-type: none">bl. If errors, how are the original records (annotated) or changed?		

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T-8	a. Of the equipment used to collect the data, are any calibrations required? a1. For an example, how are the Brunlon's handled?		

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T-9	<p>PROCESS 2. DATA ASSEMBLY</p> <p>Compilation and summary 4+00 to 28+00</p> <p>a. What is the purpose of the data assembly?</p> <p>b. DLS data and FPGM data....what are the differences and similarities?</p> <p>c. What do the records look like for DLS and FPGM?</p> <p> c1. What is physically submitted?</p> <p> c2. Is this user friendly?</p> <p>d. What about the data submittal for DLS 26+00 to 28+00?</p> <p>Stereo plots</p> <p>e. How are the plots constructed? (Data control and checking important. Number of data points should change the contour interval and count circle.)</p> <p>Tabulated data sets</p> <p>f. Available for DLS are they available for FPGM?</p> <p> f1. If not, why not?</p> <p>g. Who are the clients?</p> <p> g1. What client requirements are being met?</p>		

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T-10	<p>PROCESS 3. DATA CHECKING</p> <p>Data sufficiency</p> <p>a. Are the data sufficient?</p> <p> a1. Who decides how much and what data?</p> <p> a2. Can you get by with less?</p> <p>Data reviewers</p> <p>c. Who reviewed the product?</p> <p>Data check of tabulations</p> <p>d. Who checks the data and tabulations?</p> <p> d1. Comment on text versus number of data points in Alcoves 3 and 4.</p>		

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T-10	<p>PROCESS 3. DATA CHECKING</p> <p>Data sufficiency</p> <p>a. Are the data sufficient?</p> <p> a1. Who decides how much and what data?</p> <p> a2. Can you get by with less?</p> <p>Data reviewers</p> <p>c. Who reviewed the product?</p> <p>Data check of tabulations</p> <p>d. Who checks the data and tabulations?</p> <p> d1. Comment on text versus number of data points in Alcoves 3 and 4.</p>		

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T-11	PROCESS 4. DATA ANALYSIS Fracture Analysis a. What are the objectives of the analysis? What is the purpose?		

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T-12	<p>Set identification. Three sets identified Lumpers vs. splitters.</p> <p>a. What software was used?</p> <p> a1. How is its use controlled? (Professional use only? Robustness?)</p> <p>b. You assigned a genetic context for each of the sets: cooling, tectonic and foliation...What is the basis?</p> <p>c. Cooling joints (Orientation 254-258/88)</p> <p> c1. How are the cooling fractures identified</p> <p> c2. Group 1 and 2 in text: What are these?</p> <p>d. Dominant tectonic joints (Orientation 215-219/81-82 with wide scatter 132-230/50-90)</p> <p> d1. Group 1 and 2, again what are these?</p> <p> d2. "All of the continuous faults with offset fall in this class"...do we have access to data to document this statement in the report?</p>		

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T-12 (cont.)	<ul style="list-style-type: none"> e. VPPs (Orientation 016-25/15-50) <ul style="list-style-type: none"> e1. Group 1 and 2 (again?) f. Is the data adequate for the purpose? g. Who are the clients? h. Number of data points <ul style="list-style-type: none"> h1. How are the data separated for analysis? i. Sampling bias <ul style="list-style-type: none"> i1. What are the factors that contribute to "bias"? j. Areal <ul style="list-style-type: none"> j1. What are the effects on length distribution k. Greater than...and less than...values? <ul style="list-style-type: none"> k1. How are these handled in the classification? l. Orientation <ul style="list-style-type: none"> l1. What are the errors or variation within a single reading (+/- 5 degrees) l2. How was this assigned (Declaration? Empirically?) l3. Does this have an effect on set identification? 		

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T-13	<p>Representative of mountain</p> <p>a. How far away from the tunnel can we take the data and the analysis/conclusions?</p> <p>Leads to comment on Alcove data...</p> <p>b. Are the alcove data equivalent to a certain length segment of the main tunnel (North ramp)?</p> <p>Distribution with respect to</p> <p>c. How are the data related to the tectonics?</p> <p>d. How are the data related to the stratigraphy?</p>		

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T-14	<p>Stereo plots</p> <p>a. How are the plots constructed? (Data control and checking important. Number of data points should change the contour interval and count circle.)</p> <p>Cluster analysis Cluster analysis is a classification technique for placing similar entities or objects into groups or "clusters."</p> <p>b. How is the cluster analysis performed? (Data control and checking is important).</p> <p>c. What are the key parameters for cluster membership? Report says length and aperture are the most significant from the 0-mode analysis perspective)</p> <p>d. What are the "dense points"? (See Clustran manual for details)</p> <p>e. Did you see what happens if you took Set 1 and ran the cluster analysis on it? (Did they check the individual cluster for further segmentation?)</p>		

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T-14 (cont.)	<p>Statistical treatment of data - Table 3 and 4</p> <p>f. What are the numbers in parentheses once we are in Table 3?</p> <p>f1. Median values of orientation?</p> <p>f2. How is median defined from the data? (Should the median or the mode be used?)</p> <p>f3. Does this imply "significance"? why or why not?</p> <p>f4. Amin and Amax are based on how many observations?</p> <p>f5. What does a median of 0.00 for Amin or Amax mean?</p> <p>f6. Are there values less than 0.00?</p> <p>f7. What is the standard deviation of strike mean? (Assumption of normal distributions?) Is this warranted based on data?</p> <p>...by stratigraphic unit</p> <p>g. Was this looked for?</p> <p>...selected interval?</p> <p>h. Was this looked for?</p>		

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T-14 (cont.)	<p>Q-mode analysis</p> <p>Q-mode resemblance functions measure the similarity or dissimilarity between SUs in terms of their set composition. This makes sense when we are comparing how similar or dissimilar independent samples are.</p> <p>Purpose of these questions: to explore the process to do the Q-mode analysis.</p> <ul style="list-style-type: none"> i. What are the parameters that are used to start the Q-mode analysis? j. What are the ranges of each parameter? (Parameters should be normalized: Range={0,1}) k. Are any of these parameters correlated? (Parameters should be linearly independent) l. How are the Factors constructed? (Representation of Factors should be such that composite Factors are generated to maximize the variance) m. What is Factor 1, 2, and 3 in the current milestone report? (Functional relation between measured parameters and Factors) 		

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T-15	<p>PROCESS 5. DATA REVIEW</p> <p>GP-32, R0</p> <p>a. Location, how is this used?</p> <p> a1. How accurate does this need to be?</p> <p> a2. CADD drawings: are they adequate as records? (I think that there are no other records for the PFGO)</p> <p>b. Paragraph 9.1.4: measurement of strike...technique</p> <p>c. Paragraph 9.2.5: By question, ascertain that this is met.</p> <p>d. paragraph 13.0: Acceptance criteria</p> <p>e. Paragraph 14.0: QA records</p>		

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ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
T-16	<p>a. There are no techniques for Q and R, are there?</p> <p>...leads to SW 83/84</p> <p>b. Are there significant enough changes to the techniques to have warranted a change in procedure?</p> <p>c. Were there any minor revisions?</p> <p>d. Are there supportive checks?</p> <p>d1. Quantitative?</p> <p>d2. Qualitative? (Plots of the individual sets identified by clustering should be used)</p>		

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QUALITY ASSURANCE CHECKLIST (continuation sheet)

ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
T-17	<p>PROCESS 6. SAMPLE COLLECTION</p> <p>Samples collected</p> <p>a. What are the procedural controls?</p> <p>b. Have any samples been taken?</p> <p>c. What job package controls this?</p>		

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ITEM NO.	CHARACTERISTICS TO BE EVALUATED	REMARKS Record objective evidence reviewed, method of verification, personnel contacted	RESULTS
T-18	<p>PROCESS 7. PRODUCT DELIVERY</p> <p>Tabulated data sets</p> <p>a. What was delivered?</p> <p>b. Who are the clients?</p> <p>c. Did they get what they need d? (Answer: John Pye, M&O)</p> <p>d. Purpose is?</p>		