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U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE
AUDIT REPORT OF
SANDIA NATIONAL LABORATORIES
ALBUQUERQUE, NEW MEXICO
AUDIT NO. YMP-92-22
AUGUST 24 THROUGH 28, 1992

PROGRAM ELEMENTS EVALUATED:

- 3.0 Design Control
- 5.0 Instructions, Procedures, Plans, and Drawings
- 6.0 Document Control
- 17.0 Quality Assurance Records
- 19.0 Computer Software
- 20.0 Scientific Investigation

Prepared by: Frank J. Kratzinger
Frank J. Kratzinger
Audit Team Leader
Yucca Mountain Quality Assurance Division

Date: 9/25/92

Approved by: Donald G. Horton
Donald G. Horton
Director
Office of Quality Assurance

Date: 9/30/92

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EXECUTIVE SUMMARY

This report contains the results of the U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM) Audit No. YMP-92-22 of Sandia National Laboratories (SNL) that was conducted in Albuquerque, New Mexico, on August 24 through 28, 1992. This external audit was performed by a team of auditors from the Yucca Mountain Quality Assurance Division (YMQAD) of the Office of Quality Assurance (OQA) and evaluated the implementation of six Quality Assurance (QA) Program Elements described in the SNL Quality Assurance Program Plan (QAPP), Revision 00. This was done by verifying implementation and effectiveness of the system in place, as well as verifying compliance with requirements.

Overall, for the QA program elements audited, SNL is satisfactorily implementing an effective QA program in accordance with the SNL QAPP and implementing procedures. Five of six QA program elements audited (QA Program Elements 5.0, 6.0, 17.0, 19.0, and 20.0) are being implemented satisfactorily. There has been no implementation of Program Element 3.0 since the Exploratory Studies Facility Alternative Studies.

The audit team identified three deficiencies during the course of the audit that required the issuance of OCRWM Corrective Action Reports (CARs). One was for not having Document Review Comment (DRC) forms for Interim Change Notices (ICNs) to Technical Procedures (TPs). Another was for not identifying the QA level of the resultant data in the SAND91-0607 report. The last one was for not retaining marked-up pages for a document review of the report SAND92-0450.

In addition, four deficiencies were identified and corrected by SNL during the course of the audit. Details of issued OCRWM CARs and corrected deficient conditions are found in Section 6.1 and 6.2 of this audit report.

The YMQAD audit team appreciated the cooperation and professional attitude exhibited by the SNL staff during the conduct of this audit.

1.0 INTRODUCTION

This report contains the results of the DOE OCRWM OQA QA Audit No. YMP-92-22 of SNL conducted at Albuquerque, New Mexico, on August 24 through 28, 1992. This audit was performed in accordance with the approved audit plan (Reference: Correspondence OQA:MRD-4649, dated July 29, 1992).

2.0 AUDIT SCOPE

This audit evaluated the effectiveness of the SNL QA Program in meeting the requirements and commitments imposed by OCRWM. This was done by verifying implementation of QA requirements delineated in the SNL QAPP and implementing procedures.

SNL activities associated with the following QA Program Elements and Technical areas were audited:

Program Elements

- 3.0 Design Control
- 5.0 Instructions, Procedures, Plans, and Drawings
- 6.0 Document Control
- 17.0 Quality Assurance Records
- 19.0 Computer Software
- 20.0 Scientific Investigation

Technical Areas

WBS Number	Title
1.2.1.3.1	Site and Engineering Data Base
1.2.1.4.7	Supporting Calculations for Post Closure Performance Analyses
1.2.4.2.1.2	Rock Mass Analyses
1.2.4.2.3.2	Far Field Thermal and Structural Analyses

3.0 AUDIT TEAM AND OBSERVERS

The list of audit team members, the program elements or technical activity they evaluated, and observers can be found in Enclosure 1.

4.0 AUDIT MEETINGS AND PERSONNEL CONTACTED

The pre-audit conference was held at SNL facilities in Albuquerque, New Mexico, on August 24, 1992. Daily coordination meetings were held with SNL management and staff, and daily audit team/observer meetings were held to discuss issues and potential deficiencies. The audit was concluded with a post-audit conference at the SNL facilities in Albuquerque, New Mexico, on August 28, 1992. A list of auditors, observers, and personnel contacted during the audit is included in Enclosure 2. The list includes an indication of those who attended the pre- and post-audit conferences.

5.0 SUMMARY OF AUDIT RESULTS

5.1 Program Effectiveness

Overall, for the QA Program Elements audited, SNL is satisfactorily implementing an effective QA program in accordance with the SNL QAPP and implementing procedures. Five of six QA Program Elements audited, QA Program Elements; 5.0, "Instructions, Procedures, Plans, and Drawings", 6.0, "Document Control", 17.0, "Quality Assurance Records", 19.0, "Computer Software", and 20.0, "Scientific Investigation", are being satisfactorily implemented. The adequacy of implementation of QA Program Element 3.0, "Design Control", could not be determined due to a lack of activity in this Program Element since the Exploratory Studies Facility Alternative Studies.

5.2 Programmatic and Technical Audit Activities

Details of programmatic and technical audit activities are included in Enclosure 3.

5.3 Summary of Deficiencies

The audit team identified a total of seven deficient conditions during the course of the audit. Four of these conditions were considered isolated in nature requiring only remedial actions and were corrected by SNL as a result of the audit. Three deficiencies resulted in the issuance of CARs. A synopsis of the issued CARs and the deficiencies corrected during the audit are included in Sections 6.1 and 6.2 of this audit report.

6.0 SYNOPSIS OF DEFICIENCIES

6.1 Corrective Action Request

The OCRWM CARs listed below were issued as a result of this audit. An information copy of the CARs are provided as Enclosure 5.

- YM-92-070 There was no documented evidence that DRC forms were completed for ICNs to technical procedures.
- YM-92-071 The quality assurance level of the resultant data of report SAND91-0607 is not identified.
- YM-92-072 The marked-up pages for a document review of the report SAND92-0450 could not be located.

6.2 Deficiencies Corrected During the Audit

Conditions adverse to quality that are considered isolated in nature and requiring only remedial action can be corrected during the audit without issuance of a CAR. The following conditions adverse to quality were identified and corrected during the audit:

1. Section 6 of the QARD, Revision 4, paragraph 6.1, states in part that "In addition to the elements identified in NQA-1 Supplement 6S-1, Section 2, the control system for document preparation, review, approval, and issuance shall include:
 - a. Resolution of review comments for which the resolutions are considered mandatory by the reviewing organization prior to approval and issuance of the document.
 - b. Documentation and maintenance of review comments and resolutions".

Contrary to the above requirements, Section 7.0, "Records", of QAIP 5-1, Revision 01, which is the implementing procedure for writing QAIP's, states that "Non-processed records generated by this procedure may be retained...Procedure review comment and resolution documentation including DRC forms". The DRC forms were being held in an uncontrolled historical file in QA.

The problem was corrected during the audit by the issuance of ICN No. 2 to procedure QAIP 5-1, changing may be retained to shall be retained.

2. DOP 2-4, Revision 4, paragraph 6.1.5, requires that when an analysis is performed by SNL supporting organizations outside the NWRT Department or by contractors or consultants, the PI and the chairperson of the analysis-review committee will specify that all analysis related documents be cross-referenced in the Contractors Records in the NWRT Department RMS.

Contrary to the above requirements, three memos were missing from the Contractor Records.

The problem was corrected when copies of the memos were placed in the Contractor Records prior to the conclusion of the audit.

3. Procedure DOP 03-07, paragraph 4.2.1, states in part, "The submittal must provide the quality assurance level assigned to the activity that produced the individual data values".

The SEPDB had indicated that the quality level of all data within the database was identified as TBD or QA Level III, not QA or QA/NA.

The database was corrected to show the proper identifications of quality level prior to the conclusion of the audit.

4. Procedure DOP 03-17, paragraph 5.1.1 states in part, "These documents will contain...specified reference to the origins of the data...". There were two aspects to this problem.
 - (a) Reference 1 and Reference 2 list the minimum and maximum values for different stratigraphic units as coming from the RIB, but they do not indicate which version of the RIB. For example: reference 1 lists minimum and maximum values for PTN of 1196 and 1234 meters, while the RIB, version 4, revision 0 (the most recent version) list 1195 and 1234. In looking into how these numbers are used, the slight discrepancy has no impact.
 - (b) Reference 1 and reference 2 list the same values for fracture Van Genuchten parameters for each stratigraphic unit and state that these values come from reference 3. These values actually come from reference 4, which, in turn states that the values come from reference 3. These values could not be found anywhere in reference 3.

Reference 1: SAND91-0791
Reference 2: SAND91-0790
Reference 3: SAND84-1471
Reference 4: SAND84-2642

This problem was corrected during the audit by writing a memo to the appropriate files citing the correct source of the data.

7.0 RECOMMENDATIONS

During the audit, several areas were identified within the SNL QA Program where there were opportunities for improvement. The following recommendations are offered for SNL management consideration:

1. Section 4.1 of procedure DOP 3-3 be revised to include the following:
 - Identification of any assumed values, data, or problem and model conditions, including a justification for the assumptions.
 - Reference the source of all values, data, and problem and model conditions.

It was noted during the auditing of PDM 75-25 (page 5), that the sources for the input load descriptions of decay curve characteristics, areal power density, average age, emplacement drift spacing, and standoff distance from mains, were not adequately identified. It was also noted that the assumed values, such as average age, were not identified as being an assumed value nor was a justification given for the assumed value used.

2. Section 4.1.6 of procedure DOP 3-10 should be revised to delete the phrase "as appropriate." This type of phrasing can allow for inadequate documentation of calculations. Examples of this are as follows:
 - DIM 261 calculation notebook, pages 168, 169, and 172. A table of a strength data (confinement stress and compressive strength) with no column headings or units.
 - DIM 261 calculation notebook, pages 180, 182, 186, 190, 194, and 196. Titles to the second page of rock mass strength tables are missing.
 - DIM 261 calculation notebook, pages 323, 378, and 406. Bottom of the pages are very hard to read and are probably not reproducible.
 - DIM 261 calculation notebook, pages 328 to 377. The rock mass strength plots did not have an adequate title description of what the plot is and from what data group the failure envelopes represent.
 - DIM 261 calculation notebook, pages 384 to 388. There is not enough of an explanation defining the columns and their units.
3. A brief description should be included in the PDM 75-25 reference section to explain how the decay curve characteristics are accomplished. This would include the Oak Ridge National Laboratory data pedigree and the RIB calculation assumptions.
4. Units and/or parameters should be identified more frequently, (ie: once at the top of each page or once at the top of the first page of a long multiple page list of numbers.)
5. SNL should require that J.F.T. Agapito and other SNL contractors to be more clear in their notebooks and to adhere to the records submittal requirements when filling out their notebooks. Calculation notebooks for DIMs 260 and 261, even though they were

accepted by the Central Records Facility, contain many instances of violations of record submittal requirements. (This condition was accepted by the closure of CAR YM-91-065 and the issuance of a Guidance Letter on the Requirements for Legibility and Completeness of Records by C.P. Gertz letter YMP:CLC-5911, dated October 11, 1991).

8.0 LIST OF ENCLOSURES

- Enclosure 1: Audit Team Members and Observers
- Enclosure 2: Personnel Contacted During the Audit
- Enclosure 3: Audit Details
- Enclosure 4: Objective Evidence Reviewed During the Audit
- Enclosure 5: Information Copies of Corrective Action Requests

ENCLOSURE 1

AUDIT TEAM MEMBERS AND OBSERVERS

AUDIT TEAM:

<u>Name</u>	<u>Title/Organization</u>	<u>QA Program/Area Assignment</u>
Frank J. Kratzinger	Audit Team Leader/YMQAD	
Neil D. Cox	Auditor/YMQAD	19.0
Gerard Heaney	Auditor/YMQAD	3.0 and 20.0
Cindy H. Prater	Auditor/YMQAD	5.0, 6.0, and 17.0
Kenneth T. McFall	Lead Tech. Spec./YMQAD	3.0 and 20.0
Keith M. Kersch	Tech. Spec./SAIC	WBS 1.2.1.3.1 WBS 1.2.1.4.7
William R. Sublette	Tech. Spec./SAIC	WBS 1.2.4.2.1.2 WBS 1.2.4.2.3.2

OBSERVERS

Bruce Mabrito, Nuclear Regulatory Commission/Southwest Research Institute

Ken Hooks, U.S. Nuclear Regulatory Commission

Susan Zimmerman, State of Nevada

Englebrecht Tiesenhausen, Clark County, Nevada

Mario R. Diaz, YMQAD

Donald G. Horton, DOE, Director, Office of Quality Assurance

ENCLOSURE 2

PERSONNEL CONTACTED DURING THE AUDIT

NAME	ORGANIZATION	TITLE	PRE-AUDIT	DURING AUDIT	POST-AUDIT
Adams, Paula F.	SNL	SEPDB Staff	X	X	
Askew, Steven D.	SNL	SW Coordinator	X	X	X
Bingham, Felton	SNL	Dept. Manager	X	X	
Blejwas, Thomas	SNL	TPO	X	X	
Check-Martin F.	SNL	Training	X		
Costin, Lawrence	SNL	PA Manager	X	X	
Dockery, Holly A.	SNL	PI/TL	X	X	
Edmund, Stanley	SNL	CDS	X		
Fewell, Merton	SNL	Task Leader	X	X	X
Friend, John	MACTEC	QA Staff	X	X	X
Garcia, Magdalena	SNL	Records Tech.	X		X
Hawkinson, David	MACTEC	QA Staff	X	X	X
Holmes, John T.	SNL	Deputy TPO	X		X
Jung, Joseph	SNL	Task Leader	X	X	X
Lewis, Barbara A.	SNL	QA	X		X
Maier, Robert J.	SNL	Tech. Librarian	X		
Miller, Warren	SNL	Software QA Mgr.		X	
Orzel, Richard J.	SNL	Task Leader	X		
Richards, Robert	SNL	QA Manager	X	X	X
Sharpton, Sarah E.	SNL	Dept. Manager	X		X
Sobolik, Steven R.	SNL	PI	X	X	
Taylor, Corrine F.	LATA	Admin. Support	X		X
Thomas, Jessica	SNL	Data Base Tech.	X		X
Voigt, James V.	SNL	QA Staff	X	X	X
Warner, Peggy J.	SNL	Records Coord.	X		X
Walck, Marianne	SNL	Acting Manager		X	
Wash, Debra	SNL	Records Tech.	X		X
Werning, Michael	SNL	Tech. Reviewer			X

ENCLOSURE 3

AUDIT DETAILS

This enclosure contains the details of the evaluation performed by the programmatic auditors and technical specialists. A list of objective evidence reviewed is contained in Enclosure 4 including the full document identification number, revision number, and title for Plans and Procedures identified below.

Program Element 3.0, Design Control

There has been no implementation of this Program Element since the Exploratory Studies Facility Alternative Studies. This Program Element is considered no implementation.

Program Element 5.0, Instructions, Procedures, Plans, and Drawings

The following QAIPs and their associated ICNs were reviewed against the requirements of QAIP 05-01, Revision 01, and DOP 03-13, Revision C: 05-01, Revision 01; 05-02, Revision 00; 17-01, Revision 00; and 17-03, Revision 00. Work plans 1.2.9.1.5 and 1.2.1.4.6 were reviewed in accordance with DOP 02-03, Revision A. The following TPs and their associated ICNs were evaluated in accordance with the requirements of QAIPs 05-01, 05-02, and DOP 03-13: -090, Revision 0; -91, Revision A; -092, Revision 0; -093, Revision 0; -094, Revision 00; -095, Revision 0; -096, Revision 0; -201, Revision 00; -202, Revision 00; and -207, Revision 00.

A total of 12 ICNs had been written which addressed changes to nine of the 10 TPs evaluated. Evidence of document comment and review could only be found for four of the ICNs. CAR YM-92-070 was issued against this deficiency.

The QA supervisor and QA staff assessed the four latest YMPO Administrative Procedure/Quality documents (AP-1.10Q, Revision 4; AP-5.2Q, Revision 3; AP-5.27Q, Revision 0; and AP-6.1Q, Revision 2) for impact and documented the evaluations.

Overall, this Program Element appears to be satisfactorily implemented.

Program Element 6.0, Document Control

The generation, handling, and distribution of controlled documents was verified against the requirements of DOP 06-01, Revision D, ICNs 01 through 03. Implementation was satisfactory.

The following three technical documents were reviewed in accordance with QAIP 06-02, Revision 00: SAND91-0790, SAND91-0791, and SAND91-0792. Implementation was considered satisfactory.

Overall, this Program Element appears to be satisfactorily implemented.

Program Element 17.0, Quality Assurance Records

Checklist questions were prepared using the requirements of QAIPs 17-01, Revision 00; 17-02, Revision 00, ICN 01; and 17-03, Revision 00.

A Total of 29 record packages were examined for compliance with QAIPs 17-01 and 17-03. No deficiencies were found.

Based on the completeness of the examined records, it is evident that SNL record sources and Local Records Center personnel are conscientiously implementing records requirements.

A total of three Document Records Management System (DRMS) record packages were examined and found to meet the procedural requirements of QAIP 17-02. Implementation is, therefore, considered adequate. The record packages reviewed were: 51/L02-03/01/80, Mechanical Properties; 51/L02-07/11/90, Linear Cutting Tests; and 55/F13-05/15/87, Prototype Thermal Stress Testing.

Overall, this Program Element appears to be satisfactorily implemented.

Program Element 19.0, Computer Software

The software configuration master log, dated 8/21/92, was obtained. A total of 63 software configuration items are listed, all with unique identifiers. All software items are listed as either commercial or existing software. By item categories, there are 11 Scientific and Engineering (SES) items, 29 calculational non-SES items, 8 non-calculational items, 14 Auxiliary items, and one Peripheral item.

Storage of QA Records in the Records Center (LRC) was observed as was storage of magnetic media.

Nine analyses has been performed using software items PPICKNTS (110.124, versions 1.0 and 1.1), TOSPAC (110.127, version 1.0), NORIA-SP (110.128, version 0.0), STRES3D (110.126, version 4.0), EXCEL (110.100, version 2.2), and SAS (110.159, version 5.00). All secondary or auxiliary codes used for the analyses are listed on the Analysis-Specific Software Certification forms.

The modification-or-discrepancy system had been exercised five times (PPICKNTS, STRES3D, and NORIA_SP). These actions were in accordance with QAIP 3-2. Impact statements were prepared, where appropriate, for the changes to NORIA-SP and STRES3D.

No case was observed where appropriate technical review of lifecycle documentation was not performed. Lifecycle documentation was found to begin, as required, with the Software Classification Form (SCF). Lifecycle documentation was still incomplete for many of the items. Analysis, verification, and validation activities are permitted once the Software Qualification Form

(SQF) is entered. The SQFs were in the documentation for the software used for the nine analyses mentioned previously.

Efforts had been made to obtain all available documentation from the suppliers of acquired software. A Software Evaluation Report (SER) and a Software Check-out Report (SCR) were prepared for each item with an SQF in effect.

As evidenced by the presently existing Statements of Analysis-Specific Software Certification, no efforts for application verification nor for model validation have been made as yet.

Technical Specialists discovered that a software item, named SIMPLEX, was being used for calculations governed by DIM 261. An investigation revealed that the software was simple, was performing routine calculations, and was controlled by DOP 3-10. Although this software was not listed as software controlled by the Software QA Program, it met the requirements of SNL's QAIP-3.2, paragraph 6.5.2 for Computational NON-SES which indicates that NUREG-0856 does not require documentation because such software is easily and exactly verified or performs a simple function such as conversions of units.

In the SNL progress report for July, 1992, software identified by the name SHAFT_SEAL was said to be in development. An investigation was made, wherein it was found that efforts were being undertaken to place the software under QAIP 3-2 controls.

Overall, this Program Element appears to be satisfactorily implemented.

Program Element 20.0, Scientific Investigations

The following is a summary of the Programmatic and Technical Activities examined during the audit for Scientific Investigations being conducted by SNL in support of the YMP Project.

Activities and documentation resulting from the following Work Breakdown Structure (WBS) Elements were examined during the audit:

WBS 1.2.1.3.1	Site and Engineering Data Base
WBS 1.2.1.4.7	Supporting Calculations for Post Closure Performance Analyses
WBS 1.2.4.2.1.2	Rock Mass Analyses
WBS 1.2.4.2.3.2	Far Field Thermal and Structural Analyses

1.0 Problem Definition Memo (PDM) 75-25, Revision 0 (WBS 1.2.4.2.3.2)

STRES 3D, Version 4.10, is the applicable code for use with this PDM. STRES 3D was certified by the Software Coordinator and the appropriate Task Leader on 8/21/92. In their report on this activity, J.F.T. Agapito mistakenly referred to STRES 3D, Version 4.01 as the code used to generate data. A verification is currently underway to confirm that version 4.10 was in fact the code that was used. No CAR was issued, since the work is still in process.

The drawings used by SNL in the PDM were supplied by Raytheon Services of Nevada and were intended to provide an "intended geometry only" for future needs. The drawings were all in the conceptual stage and marked "For Information Only".

No deficiencies were encountered during the review of the implementation of this PDM and it is determined to be satisfactorily implemented.

2.0 DOP 02-03, Revision A, Work Plans (WBS 1.2.1.4.7)

The following work plans were reviewed for compliance to procedural requirements:

1. Supporting Calculations for Post Closure Performance Analysis
2. Development and Validation of Flow and Transport Models
3. Development and Verification of Flow and Transport Codes

There were no deficiencies resulting from a review of this procedure and it is determined to be satisfactorily implemented.

3.0 DOP 2-4, Revision 4, Analysis Control and Verification (WBS 1.2.4.2.3.2; WBS 1.2.1.4.7)

PDM 75-25 was examined for compliance to this procedure. Grading Package QAGR S124232A was examined as was its flow-down to PDM 75-25. The QA requirements and non QA areas were carried through accurately.

One instance of the use of parameter values not obtained from the Reference Information Base (RIB) was encountered. A value for Young's Modules was used that was taken from a Hardy and Bauer report. The report and the values were properly referenced and traceable.

SAND92-0589, "Yucca Mountain Site Characterization Project New Three Dimensional Far-Field Repository Thermomechanical Calculations", is the report resulting from PDM 75-25. A review of SAND92-0589 during the audit found that the input values used in this report and taken from the RIB and the Hardy and Bauer report were appropriate for the intended purposes of the analysis performed.

The analysis review report conducted by SNL personnel contained the following:

- The purpose of the report,
- Identification of the analysis reviewed,
- Participants in the review,
- Substantive comments, and
- Conclusions

Comments pertaining to the review of SAND92-0589 were checked to determine the adequacy of their resolution and implementation. Other documents checked in this evaluation included

memos from E. Ryder to file, dated 7/7/92 and 8/11/92. The comments appeared to be adequately resolved and implemented. However, not all of the comments were checked since some of the resolutions to the comments were not in SNL's files but still in the contractor's files.

The record package for PDM 75-25 is still being assembled because the analysis report is only in the draft stage and is currently still under review.

Record packages for PDMs 72-28, 72-29, 72-30, and 72-31 were reviewed. The documentation of the analyses governed by the PDMs was in compliance with procedural requirements. PDM 72-31 is still in process and an analysis file is not yet complete.

The above PDMs supported the development of SAND Reports SAND91-0791, SAND91-0790, and SAND91-0792. SAND Reports SAND84-1471 and SAND84-2642 were used as inputs to the first two reports. A problem with the traceability of data to the actual source of the data was discovered. The traceability deficiency was resolved during the audit.

The performance assessment work associated with the UZ-16 drillhole (PDM 72-30) was examined and found to be exceptionally well documented and considered many mitigating factors on the ability of the drilling and testing to impact waste isolation.

There were no deficiencies resulting from the review of this procedure and it is determined to be satisfactorily implemented.

4.0 DOP 3-3, Revision C, Analysis Definition Requirements (WBS 1.2.4.2.3.2)

All required approvals for PDM 75-25 were documented with dated signatures.

The transmitting letter to the organization performing the analysis was prepared by the Principle Investigator (PI) and contained instructions that the analysis organization perform the following as required:

- Review the PDM
- Accept or reject the task as described in the PDM
- If the task is accepted the analyst assigned to the task will prepare a Task Acceptance Memo (TAM) and send it to the PI including the following:
 - Name and signature of the assigned analyst
 - Name and signature of the analyst's supervisor
 - Proposed schedule
 - Reporting method(s) and schedule of reporting
 - The method of analysis and/or code(s) that will be used as well as the qualification of the method(s) and/or computer code(s)

The analysis report resulting from PDM 75-25 is SAND92-0589, "Yucca Mountain Site Characterization Project New Three Dimensional Far-Field Repository Thermomechanical Calculations". The comment resolution process has almost been completed on SAND92-0589.

No procedural implementation deficiencies were noted during the review of this procedure and it is considered to be satisfactorily implemented.

5.0 DOP 03-07, Revision B, Technical Data Base (WBS 1.2.1.3.1)

The Site and Engineering Properties Data Base (SEPDB) was examined and the process was found to be in compliance with procedural requirements. SNL work requests 158, 159, 170, and 290 were reviewed. A deficiency with the SEPDB was identified during the audit. All data was identified as TBD versus quality affecting or not quality affecting. SNL corrected this deficiency during the course of the audit.

There was one data modification observed during the audit. Work request DA-0005 was reviewed. The SEPDB staff caught a mistake within data submitted by Los Alamos National Laboratory. The staff referred to the reference submitted with the Los Alamos data and observed a discrepancy between the submitted data and the reference. Los Alamos was notified of the discrepancy and the data submittal was corrected.

A deficiency within the RIB was observed during the audit. The RIB contained two different thermal mechanical values for the same drillcore. CAR YM-92-073 was issued to the Project Office who is responsible for the RIB for corrective action. (This CAR was issued to the Project Office and has no impact on the audit of SNL)

6.0 DOP 3-10, Revision B, Routine Calculations (WBS 1.2.4.2.1.1)

Design Investigation Memos (DIMs) 260 and 261 were examined for compliance to this procedure.

Calculations have been documented by the analyst in Calculation Notebooks as required. The notebooks are in loose-leaf form. The pages are sequentially numbered and the different calculations segregated in the table of contents. The calculation entries are in black ink as required and suitable for reproduction.

The notebooks contained multiple violations of the records source requirements but due to their status as one of a kind records they were accepted by the SNL Local Records System and the Project Office Central Records System. Violations of corrections included obliteration of data, white-out, pencil and colored pen entries in the non-calculations segments, and corrections with no initials and date. (This condition was accepted by the closure of CAR YM-91-065 and the issuance of a Guidance Letter on the Requirements for Legibility and Completeness of Records by C.P. Gertz [letter YMP:CLC-5911, dated October 11, 1991]).

All the information required on the first page of the notebook was present although not necessarily on the first page. The required information was spread out over the first four pages. This was determined to be satisfactory due to the great amount of information called for and the limited space available on the first page as well as the close proximity of the information not included on the first page.

Each page of the notebooks contained the page number, the dated initials or signature of the analyst, and the dated initials or signature of the checker at the bottom of the page.

Units are included in calculations as required but were occasionally difficult to follow through lengthy calculations.

All computer outputs which were part of the analytical effort were included in the calculation notebooks.

The J.F.T. Agapito Division Supervisor for the relevant task signed and dated the calculation notebook as required.

No procedural implementation deficiencies were noted during the review of this procedure and it is considered to be satisfactorily implemented.

7.0 DOP 03-11, Revision A, Requirements for Submitting Data to the YMP Project Site and Engineering Properties Data Base (SEPDB) (WBS 1.2.1.3.1)

This procedure is currently undergoing revision to include AP-5.2Q requirements. Work request form DA-0046 was reviewed and the data submitted was in compliance with procedural requirements.

8.0 DOP 3-13, Revision C, Independent Technical and Management Review of Documents (WBS 1.2.4.2.1.1)

DIMs 260 and 261 were examined for compliance to this procedure. DIM 261 was used in the preparation of SAND92-0450 Report.

All the requirements of this procedure were satisfactorily implemented with the exception of the retention of relevant marked up pages from the document review of DIM 261. These pages could not be located to verify the inclusion of accepted comments. (See CAR YM-92-072)

9.0 DOP 03-17, Revision 0, Preparing Technical Information Documents

SAND91-0607 Report did not address QA levels of data as required by the procedure and CAR YM-92-071 was issued. SAND90-2491 Report was reviewed and found to be in compliance with procedural requirements.

10.0 QAIP 3-4, Revision 00, Design Investigation Control (WBS 1.2.4.2.1.1)

DIMs 260 and 261 were prepared which included the following information:

- An approval sheet
- Reference information with tabulated titles, work plan authority, a statement of whether it was quality affecting or not, Quality Assurance Grading Report(s), and Quality Assurance Control Specification Record(s)
- Purpose of investigation
- Definition of scope of work

The remainder of the requirements of this procedure were determined to be not applicable because DIMs 260 and 261 are not classified as design documents.

There were no deficiencies noted during the review of this procedure and to the extent that it is being implemented, it is determined to be satisfactory.

11.0 QAIP 3-2, Revision 01, Software Quality Assurance Requirements (WBS 1.2.4.2.1.1)

DIM 261 was examined for compliance with Section 6.7, "Application Verification", of this procedure and Section 4.1.7 of procedure DOP 3-10.

J.F.T. Agapito and Associates (SNL contractor) used a least squares curve fitting program called SIMPLEX to help develop a rock mass strength failure envelope. This is considered a routine calculation and must satisfy the DOP 3-10 requirement of verification.

Agapito and Associates used the benchmarking method of verifying SIMPLEX against two other codes named "GRAPHER" and "SIMA". Adequate documentation was found for the verification process.

No deficiencies were noted during the review of Section 6.7 of this procedure and it is considered to be satisfactorily implemented.

Overall, this Program Element appears to be satisfactorily implemented.

ENCLOSURE 4

OBJECTIVE EVIDENCE REVIEWED DURING THE AUDIT

The following is a list of supporting material evaluated for compliance with procedures:

Program Element 5.0, Instructions, Procedures, Plans, and Drawings

Procedures:

DOP 02-03, Revision A, ICNs 01 through 03, Work Plans
DOP 03-13, Revision C, ICNs 01 and 02, Independent Technical and Management Reviews of Documents
QAIP 05-01, Revision 01, Quality Assurance Implementing Procedures
QAIP 05-02, Revision 00, ICNs 01 through 04, Technical Procedure Requirements
QAIP 05-04, Revision 00, Use of Yucca Mountain Project Quality Related Administrative Procedures (AP-Q)

Record Packages Reviewed:

QA Implementing Procedures	Technical Procedures (TPs)	
05-01, Revision 01	090, Revision 0	095, Revision 0
05-02, Revision 00	091, Revision A	096, Revision 0
17-01, Revision 00	092, Revision 0	201, Revision 00
17-03, Revision 00	093, Revision 0	202, Revision 00
	094, Revision 00	207, Revision 00

Program Element 6.0, Document Control

Procedures:

DOP 06-01, Revision D, ICNs 01 through 03, Document Control System
QAIP 06-02, Revision 00, Reviewing, Approving, and Issuing Technical Information Documents

Controlled Document Holders Checked:

F. Check-Martin	R.H. Price
S.A. Edmund	C.A. Rautman
D. Hawkinson	R.E. Ryder
P.G. Kapan	Reference Notebooks
R.J. Martin	Supervisor 6319

SAND Report Record Packages

SAND91-0790	SAND91-0791	SAND91-0792
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Program Element 17.0, Quality Assurance Records

Procedures:

QAIP 17-01, Revision 00, Protecting, Preparing, and Submitting YMP QA Records
QAIP 17-02, Revision 00, ICN 01, Data Records Management System
QAIP 17-03, Revision 00, Processing, Storing, and Protecting YMP QA Records

Training, Qualification, and Certification Files Reviewed Per System 80

C.H. Barnes	J. Jung
T.E. Blejwas	B.D. Lewis
A. Brandstetter	R.H. Price
H.Z. Dokuzoguz	E.E. Ryder

Records Packages Reviewed

QA Implementing Procedures	Technical Procedures (TPs)	
05-01, Revision 01	090, Revision 0	095, Revision 0
05-02, Revision 00	091, Revision A	096, Revision 0
17-01, Revision 00	092, Revision 0	201, Revision 00
17-03, Revision 00	093, Revision 0	202, Revision 00
	094, Revision 00	207, Revision 00

SAND Report Packages

SAND91-0790	SAND91-0791	SAND91-0792
-------------	-------------	-------------

DRMS Record Packages

51/L02-03/01/80
51/L02-07/11/90
55/F13-05/15/87

Program Element 19.0, Computer Software

Procedure QAIP 3-2, Revision 1, Software Quality Assurance Requirements

Master Log Document Checklist, 8/21/92

Master Log of Software Used for Each Analysis, 8/25/92

Statements of Analysis-Specific Software Certification for nine analyses

EP 0038	PDM 75-13
PDM 72-28	PDM 75-23
PDM 72-29	PDM 75-24
PDM 72-30	PDM75-25
PDM 72-31	

Drafts of three Memos of Completion: PDM 72-29, PDM 72-30, PDM 72-31

Modification Log and Classification and Mod forms for modifications to:

- PPICKNTS (110.124) - one time
- NORIA-SP (110.128) - three times
- STRES3D (110.126) - one time

Software lifecycle documentation, including source code listings, for the following log numbers:

- 110.107 through 110.115 (applicable versions)
- 110.124, versions 1.0 and 1.1
- 110.126, versions 4.0 and 4.10
- 110.127, version 1.00
- 110.128, versions 0.00, 0.01, 0.02, and 0.10
- 110.130, version 3.00
- 110.133, version 1.00
- 110.135, version 1.0
- 110.138, version 1.0
- 110.142 through 110.153 (applicable versions)
- 110.160, version 1.00 (source code listing not yet available)

Program Element 20.0, Scientific Investigations

Procedures

- DOP 2-3, Revision A, Work Plans
- DOP 2-4, Revision A, Analysis Control and Verification
- DOP 3-3, Revision C, Analysis Definition Requirements
- DOP 3-7, Revision B, Technical Data Base
- DOP 3-10, Revision B, Routine Calculations
- DOP 3-11, Revision A, Requirements for Submitting Data to the YMP Project Site and Engineering Properties Data Base (SEPDB)
- DOP 3-13, Revision C, Independent Technical and Management Reviews of Documents
- DOP 3-17, Revision 0, Preparing Technical Information Documents
- QAIP 3-4, Revision 0, Design Investigation Control
- QAIP 3-2, Revision 1, Software Quality Assurance Requirements
- QAIP 6-2, Revision 0, Reviewing, Approving, and Issuing Technical Information Documents

Design Investigation Memos 260 and 261

Calculation Notebook for DIM 260

Calculation Notebook for DIM 261

Document review and comment sheets for the review of:

- PDM 75-25
- DIM 260
- DIM 261

Quality Assurance Grading Report S124232A

Memo from Ryder to file dated 8/11/92
Memo from Ryder to file dated 7/7/92
Memo from Bauer to Ryder dated 6/22/92

Work Plans

1. Supporting Calculations for Post Closure Performance Analysis
2. Development and Validation of Flow and Transport Models
3. Development and Verification of Flow and Transport Codes

Problem Definition Memos

72-28 72-29
72-30 72-31
75-25

Work Requests

158 159
170 290
DA-0005

SAND Reports

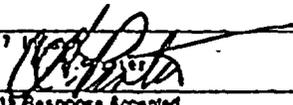
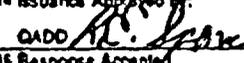
SAND91-0790 SAND91-0791
SAND91-0792 SAND84-1471
SAND84-2642 SAND91-0607
SAND90-2491

Data Bases

RIB SEPDB

ENCLOSURE 5

INFORMATION COPIES OF CORRECTIVE ACTION REQUESTS

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.		8 CAR NO <u>YK-92-070</u> DATE <u>9-1-92</u> SHEET <u>1</u> OF <u>1</u> CA								
CORRECTIVE ACTION REQUEST										
1 Controlling Document DCR 3-13		2 Related Report No. Audit YMP-92-22								
3 Responsible Organization DRL	4 Discussed With John Friend									
5 Requirement: DCR 3-13, Revision C, Section 5.3, paragraph 2, states "Ensure that completed DRC forms are included with records required by applicable procedures." Note: DRC forms are required to be part of the 77 record package.										
6 Adverse Condition: Contrary to the above requirements, there was no documented evidence that DRC forms were completed for the following Technical Procedure (77) Interim Change Notices (ICNs): <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">77-90, ICN 1</td> <td style="text-align: center;">77-91, ICN 1</td> <td style="text-align: center;">77-92, ICN 1</td> <td style="text-align: center;">77-93, ICN 1</td> </tr> <tr> <td style="text-align: center;">77-94, ICN 1</td> <td style="text-align: center;">77-96, ICN 1</td> <td style="text-align: center;">77-98, ICN 1</td> <td></td> </tr> </table>			77-90, ICN 1	77-91, ICN 1	77-92, ICN 1	77-93, ICN 1	77-94, ICN 1	77-96, ICN 1	77-98, ICN 1	
77-90, ICN 1	77-91, ICN 1	77-92, ICN 1	77-93, ICN 1							
77-94, ICN 1	77-96, ICN 1	77-98, ICN 1								
8 Does a significant condition adverse to quality exist? Yes ___ No <u>X</u> If Yes, Circle One: A B C	10 Does a stop work condition exist? Yes ___ No <u>X</u> ; If Yes - Attach copy of SWO If Yes, Circle One: A B C D	11 Response Due Date: 20 days after issue								
12 Required Actions: <input checked="" type="checkbox"/> Remedial <input checked="" type="checkbox"/> Extent of Deficiency <input checked="" type="checkbox"/> Preclude Recurrence <input type="checkbox"/> Root Cause Determination										
13 Recommended Actions: Identify the remedial action to be taken to correct the deficiency identified in Block 6. Identify the extent of the condition and the planned corrective action to prevent recurrence.										
7 Issued By:  Date: <u>8/21/92</u>	14 Issuance Approved by: QADD  Date: <u>9/2/92</u>									
15 Response Accepted QAR _____ Date _____	16 Response Accepted QADD _____ Date _____									
17 Amended Response Accepted QAR _____ Date _____	18 Amended Response Accepted QADD _____ Date _____									
19 Corrective Actions Verified QAR _____ Date _____	20 Closure Approved by: QADD _____ Date _____									

ENCLOSURE 5

INFORMATION COPIES OF CORRECTIVE ACTION REQUESTS

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.		6 CAR NO <u>YK-92-071</u> DATE <u>9-1-92</u> SHEET <u>1</u> OF <u>1</u> QA
CORRECTIVE ACTION REQUEST		
1 Controlling Document DCF 3-17, Revision 0		2 Related Report No. Audit TR-92-22
3 Responsible Organization DCL	4 Discussed With T. Blejvas, R. Richards	
5 Requirement: Procedure DCF 3-17, Revision 0, Paragraph 3.1.3, states that "The final results and outcome of all scientific investigations will be documented in one or more technical information documents. These documents will contain as a minimum, the identification of any and all data that is included in the technical information document, (including a specific reference to the origin of the data and the quality assurance level assigned to the activity which generated the data)."		
6 Adverse Condition: Contrary to the above requirement, Sandia Report SAND91-0607 "Preliminary Mapping of Surficial Geology of Midway Valley Yucca Mountain Project, Nye County, Nevada Interim Data Report" does not identify the quality assurance level of the report's resultant data.		
8 Does a significant condition adverse to quality exist? Yes ___ No <u>X</u> If Yes, Circle One: A B C	10 Does a stop work condition exist? Yes ___ No <u>X</u> ; If Yes - Attach copy of SWO If Yes, Circle One: A B C D	11 Response Due Date: 20 days after issue
12 Required Actions: <input checked="" type="checkbox"/> Remedial <input checked="" type="checkbox"/> Extent of Deficiency <input checked="" type="checkbox"/> Preclude Recurrence <input type="checkbox"/> Root Cause Determination		
13 Recommended Actions: Identify the remedial action to be taken to correct the deficiency noted in block 6. Identify the extent of the condition and the planned corrective action to prevent recurrence.		
7 Initiator Jerry Kearney <i>Jerry Kearney</i> Date <u>6-31-92</u>	14 Issuance Approved by: QADO <i>R.C. Linnell</i> Date <u>9/2/92</u>	
15 Response Accepted QAR _____ Date _____	16 Response Accepted QADO _____ Date _____	
17 Amended Response Accepted QAR _____ Date _____	18 Amended Response Accepted QADO _____ Date _____	
19 Corrective Actions Verified QAR _____ Date _____	20 Closure Approved by: QADO _____ Date _____	

ENCLOSURE 5

INFORMATION COPIES OF CORRECTIVE ACTION REQUESTS

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.		CAR NO <u>YH-92-072</u> DATE <u>9-1-92</u> SHEET <u>1</u> OF <u>1</u> GA
CORRECTIVE ACTION REQUEST		
1 Controlling Document DCP 3-13, Revision C		2 Related Report No. Audit YH-92-22
3 Responsible Organization SNL	4 Discussed With Joe Jung	
5 Requirement: Procedure DCP 3-13, Revision C, Paragraph 6.0, states in part "...the following QA records are placed by the author or resolver in the SNL YMR? Records Management System..." "... copies of the Document Review and Comment Form, RD-3, completed for the review plus any relevant marked-up document pages..."		
6 Adverse Condition: Contrary to the above requirements, the marked pages of the document reviewed (Rock Mass Mechanical Property Estimations for the Yucca Mountain Site Characterization Project, SAND92-0450) by J. Jung were not included in the review records package and cannot be located for verification of incorporation of accepted comments.		
8 Does a significant condition adverse to quality exist? Yes ___ No <u>X</u> If Yes, Circle One: A B C	10 Does a stop work condition exist? Yes ___ No <u>X</u> ; If Yes - Attach copy of SWO If Yes, Circle One: A B C D	11 Response Due Date: 20 days after issue
12 Required Actions: <input checked="" type="checkbox"/> Remedial <input type="checkbox"/> Extent of Deficiency <input checked="" type="checkbox"/> Preclude Recurrence <input type="checkbox"/> Root Cause Determination		
13 Recommended Actions: SNL locate the reviewed pages and change procedure DCP 3-13 to allow for the differentiation between major and minor comments and the different methods for dealing with them.		
7 Initiator Ren McFall <i>Ren McFall</i> Date <u>8/31/92</u>	14 Issuance Approved by: QADD <i>RC</i> <i>Yphve</i> Date <u>9/2/92</u>	
15 Response Accepted QAR _____ Date _____	16 Response Accepted QADD _____ Date _____	
17 Amended Response Accepted QAR _____ Date _____	18 Amended Response Accepted QADD _____ Date _____	
19 Corrective Actions Verified QAR _____ Date _____	20 Closure Approved by: QADD _____ Date _____	