

QA: QA

**U. S. DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
OFFICE OF QUALTY ASSURANCE**

**AUDIT REPORT BSC-ARP-01-04**

**OF THE**

**BECHTEL SAIC LLC, COMPANY**

**AT**

**LAS VEGAS, NEVADA**

**AUGUST 20-24, 2001**

Prepared by: \_\_\_\_\_

**Marilyn A. Kavchak  
Audit Team Leader  
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Date: \_\_\_\_\_

Approved by: \_\_\_\_\_

**Robert D. Davis  
Acting Director  
Office of Quality Assurance**

Date: \_\_\_\_\_

## 1.0 EXECUTIVE SUMMARY

A performance-based quality assurance (QA) audit was conducted on the processes and activities related to TDR-WIS-PA-000001, Revision 0, ICN 1, *Total System Performance Assessment For The Site Recommendation* (TSPA-SR) Technical Report (TR), at the Bechtel SAIC Company, LLC (BSC) offices in Las Vegas, Nevada, August 20-24, 2001. The purpose of the audit was to evaluate the overall defensibility of the TSPA-SR results/conclusions and effectiveness of the TSPA-SR TR, which is a culmination of the TSPA-SR results. The audit examined development/analyses of scenarios; performance of calculations and sensitivity analysis; incorporation of design changes; traceability/transparency of assumptions, uncertainties, and alternative conceptual models; data and other input; and software control. Note that the TSPA-SR process has been evaluated by the Office of Quality Assurance (OQA) in two phases. The first phase was audit M&O-ARP-00-13 conducted in July 2000 that focused on the products supporting TSPA including the 'draft' TSPA Model Report. Audit BSC-ARP-01-04 is the second phase of the TSPA-SR evaluation and assessed the quality of the associated TR as stated above.

Based on the review of the TR, interviews of personnel, and examination of the process and documentation, the audit team determined that the objective evidence reviewed during the audit met the Office of Civilian Radioactive Waste Management QA Program requirements and effectively implemented critical process steps except as identified in the following three Deficiency Reports (DR):

DR BSC-01-D-131 was written to address qualified software (ASHPLUME, V 1.4LV) used in the TSPA-SR TR, then modified as ASHPLUME V 2.0 but never re-qualified or approved for interim use. DR BSC-01-D-131 further identified that software used was not properly documented in the report, failed to identify the computer platforms and other documentation required by AP-SI.1Q, Revision 3, ICN 01, ECN 01, *Software Management*, and contained contradictions related to the software versions.

DR BSC-01-D-132 addresses the DOE/RW-0333P, Revision 10, *Quality Assurance and Requirements* (QARD) requirement that "data be identified in a manner that facilitates traceability to associated documentation." Data Tracking Numbers (DTN) associated with the sensitivity analysis documented in TSPA-SR TR, Appendix G, "Data Tracking Information for Total System Performance Assessment - Site Recommendation Analysis." Table G-1 could not be traced to the DTNs associated with the TSPA Model, MDL-WIS-PA-000002, Revision 00, *Total System Performance Assessment Model for the Site Recommendation*.

BSC-01-D-133 was written for failure to address QARD requirements in Section 3.2.3, "Design Analysis," whereby calculations are to be identifiable and traceable. Correspondingly, AP-3.12Q, Revision 0, ICN 4, *Calculations*, is specifically designed to meet this requirement but was not implemented for calculations listed in Table G-1 of the TSPA-SR TR.

During the audit, corrective actions resulting from Phase One of the TSPA-SR review were evaluated for status. Prior DRs were still in process of being corrected and will continue to be followed by the assigned Quality Assurance Representative (QAR).

## **2.0 SCOPE**

Auditors representing the U.S. Department of Energy (DOE) OQA conducted a performance-based audit to evaluate the adequacy and effectiveness of the BSC implementation of processes and activities related to the development of TSPA-SR TR. The BSC Science and Analysis Organization is responsible for the control and development of the TSPA-SR. The audit was conducted to evaluate the quality of the forenamed report, which is a culmination of the TSPA-SR results and to assess the defensibility of the TSPA-SR results/conclusions as well as the overall effectiveness of the report itself. This was accomplished by examining the development/analyses of scenarios; performance of calculations and sensitivity analysis; incorporation of design changes; traceability/transparency of assumption, uncertainties, and alternative conceptual models; data and other input; and software control. Note that the TSPA-SR process has been evaluated by OQA in two phases. The first phase was an audit conducted in July 2000 (M&O-ARP-00-13) focused on the identification/screening of features, events, and processes; traceability/transparency of assumptions, uncertainties, alternative conceptual models and data; impact review/analyses; software qualification; model abstraction; and the performance/documentation of the TSPA-SR model. The second phase of the TSPA-SR evaluation was the audit reported here, BSC-ARP-01-04 which addressed the quality of the associated technical report as stated above.

### **2.1 Process/Activities/End Product**

Activities involving development of the TSPA-SR TR were selected for evaluation. Performance of the following critical process steps were evaluated and are summarized in Attachment 2:

- Planning
- Change/Document Control
- Managing Technical Product Input
- Qualification and Control of Data/Software
- Calculations and Analysis
- Preparation & Checking of Technical Report
- Review of Technical Products
- Submittal of Data to Technical Data Management System
- Submittal of Records

**2.2** The performance-based evaluation of process effectiveness and product acceptability was based on:

- 1) Satisfactory completion of the critical process steps,
- 2) Documentation that substantiates quality of the product,

- 3) Implementation of the applicable QA program sections,
- 4) Effectiveness of related corrective actions, and
- 5) Performance of trained and qualified personnel.

**2.3** In addition, a sample of the applicable QA program requirements and controls as they applied to the Process/Activity/End Product were examined to evaluate compliance. The following QA program sections are directly related to development of the TSPA-SR TR. These sections were evaluated for compliance:

|                |   |
|----------------|---|
| 2.0            | Quality Assurance Program                     |
| 3.0            | Design Control                                |
| 6.0            | Document Control                              |
| 16.0           | Corrective Action                             |
| 17.0           | Quality Assurance Records                     |
| Supplement I   | Software                                      |
| Supplement III | Scientific Investigation                      |
| Supplement V   | Control of the Electronic Management of Data. |

#### **2.4 Technical Areas**

The audit included a technical evaluation. Details are included in subsection 5.4.

### **3.0 AUDIT TEAM MEMBERS AND OBSERVERS**

#### **Audit Team Members**

Marilyn A. Kavchak, Navarro Quality Services (NQS), Las Vegas, Nevada,  
Audit Team Leader  
Samuel E. Archuleta, NQS, Las Vegas, Nevada, Auditor  
F. Harvey Dove, NQS, Las Vegas, Nevada, Auditor  
William M. Nutt, Management and Technical Support (MTS)/Golder Associates,  
Las Vegas, Nevada, Technical Specialist  
Alf Wikjord, Atomic Energy of Canada, Limited/Yucca Mountain Site Characterization  
Office (YMSCO), Las Vegas, Nevada, Technical Specialist  
Frank M. Wong, MTS/Stone & Webster, Las Vegas, Nevada, Technical Specialist

#### **Observers**

Ted Carter, U.S. Nuclear Regulatory Commission (NRC), Washington, D.C.  
David W. Esh, NRC, Washington, D.C.  
Robert K. Johnson, NRC, Washington, D.C.  
Patrick LaPlante, Center for Nuclear Waste Regulatory Analysis (CNWRA),  
Southwest Research (SWR), San Antonio, Texas  
Michael A. Smith, CNWRA, SWR, San Antonio, Texas  
Tom Trbovich, CNWRA, SWR, San Antonio, Texas

#### **4.0 AUDIT MEETINGS AND PERSONNEL CONTACTED**

The pre-audit meeting was held on August 20, 2001, in Las Vegas, Nevada. Daily team/observer debriefing meetings were held by audit team members to evaluate the progress of the audit and to discuss any potential conditions adverse to quality. Daily management meetings were held to advise BSC management and staff on audit information as appropriate. The audit concluded with a post-audit meeting held on August 24, 2001, in Las Vegas, Nevada.

Personnel contacted during the audit, including those who attended the pre-audit and post-audit meetings are listed in Attachment 1, "Personnel Contacted During the Audit."

#### **5.0 SUMMARY OF AUDIT RESULTS**

##### **5.1 Program Effectiveness**

The audit team concluded that, overall, the Science and Analysis Organization did effectively implement process controls for activities identified in the scope of the audit and that overall defensibility and effectiveness of the TSPA-SR TR was sufficient, except as noted in subsection 5.5, "Summary of Conditions Adverse to Quality."

All process controls for performing the critical process steps were met except as noted. The results for each activity evaluated and the status are contained in Attachment 2, "Summary Table of Audit Results."

##### **5.2 Stop Work or Immediate Corrective Actions Taken**

There were no stop work orders or immediate corrective actions necessary as a result of the audit.

##### **5.3 Audit Activities**

Attachment 2, "Summary Table of Audit Results" provides the results for each process/activity/end product and related critical process steps and the results of the procedure compliance evaluations. Details of audit activities, including objective evidence reviewed, are documented in the audit checklist. The checklist is administered as a QA record in accordance with the directions of QAP 18.2, Revision 8, *Internal Audit Program*.

## 5.4 **Technical Audit Activities**

### **TSPA Simulations**

TSPA simulations documented in TSPA-SR TR were reviewed in detail, focusing on the transparency of the document and the traceability of calculations. A majority of the effort was focused on Appendix G, which contains Table G-1 that lists the sensitivity analysis (calculations) developed by modifying several key parameters or models used in the TSPA-SR Model. Table G-1 lists approximately 125 simulations contained in 16 DTNs. Information contained in Appendix G and Chapter 5, "Sensitivity Analysis" is sufficient to allow a technically qualified person to repeat an individual sensitivity analysis using a line-by-line comparison of DTNs to establish what was actually done. The information is also sufficient to allow a technically qualified person to understand and ensure its adequacy without recourse to the originator. Therefore, by the accepted project definition, the sensitivity analysis (calculations) listed in Table G-1 is transparent.

The TSPA-SR TR was acceptable in areas of traceability reviewed except as noted in DR BSC-01-D-132, which addresses the failure of data to be identified in a manner that facilitates traceability to associated documentation identified in Appendix G. DTNs associated with the sensitivity analysis documented in Appendix G, Table G-1 could not be traced to the DTNs associated with the TSPA-SR Model. Additionally, calculations in Table G-1 of the TSPA-SR TR were not identifiable and traceable. This deficient condition was documented in DR BSC-01-D-133.

The processing of the GoldSim results relative to graphics software for the ultimate inclusion into the TR was examined, including whether ancillary calculations were completed as part of the processing, and found satisfactory.

### **Technical Checking**

The audit team noted that when a TSPA process model is implemented into GoldSim, the technical personnel involved took steps to ensure that the implementation accurately represents the behavior of the process model. However, although these 'peer' checks are performed and recorded, the procedures used do not require this information to be submitted as part of the TSPA-SR TR.

Further evaluation of the checking process revealed that although technically adequate, there was not adequate documentation to verify that an adequate level of checking was completed. The difficulty in providing a technical check for a complicated computer simulation, such as the TSPA-SR TR, and associated sensitivity analysis therefore resulted in inadequate documentation. Although

AP-3.12Q requires that results of calculations be checked for reasonableness of computer outputs as compared to inputs, the work effort for TSPA requires that the checker be knowledgeable in the operation of code and familiar with the inputs to the TSPA-SR Model. The TSPA-SR Model is complex, and the skill level required for checking suggests that for an individual to perform an adequate documented review, the individual must come from within the TSPA group. While this was completed, according to those interviewed, it was not documented for the TSPA-SR TR. This condition adverse to quality is documented in DR BSC-01-D-133.

### **Scenario Development**

A technical review of the scenario development process, which is based on the screening arguments for features, events, and processes (FEPs) catalogued in REV 00 of the YMP FEPs Database (TDR-WIS-MD-00003) and associated FEP AMRs, was conducted during the audit. The process itself requires no computer codes, graphics packages, mathematical calculations or post-processing software to reduce or analyze data. FEPs are logically included in or excluded from potential exposure scenarios based on probability of occurrence, magnitude of consequence and regulatory guidance. Scenarios were found to be logically classified according to their probability of occurrence, i.e., a high-probability nominal scenario incorporating expected FEPs and low-probability potentially disruptive scenarios initiated by discrete, unexpected, events (such as volcanism, inadvertent human intrusion, and nuclear criticality). There have been no expert elicitation specifically on the scenario development process; it was noted that an International Atomic Energy Agency International (IAEA) Peer Review of the Biosphere Modeling Program and a current Joint National Energy Agency-IAEA International Peer Review of TSPA-SR Model have provided additional comment on aspects of the construction and implementation of scenarios. It was concluded that the scenario development process and external reviews continue to build a strong confidence that the set of significant scenarios adequately represents the potential performance of the proposed Yucca Mountain repository for the 10,000-year compliance period.

### **Waste Package Materials Degradation**

Waste Package Material Degradation exhibited traceability and transparency between the process models and GoldSim implementation and results. Extensive testing of the GoldSim implementation of the process models was evident, and there was communication and coordination between process modelers and TSPA personnel during the process model implementations and testing in GoldSim. It was noted during the review that the waste package degradation models are contained in a separate module, which is readily implemented in the TSPA. As a result of having WAPDEG as a “self-contained” software module, the development and debugging implementation in TSPA, and testing in TSPA is

adequate. The technical personnel conducted reviews to ensure that the module performed as intended after implementation into the TSPA. There was also post-processing coordination between the process modelers and TSPA personnel of the TSPA TR results. The post-processed methods are readily documented and accessible in the module. The audit team deemed that the documentation and accessibility of the post-processing methods demonstrated were exemplary. The audit team found no deficiencies in the waste package materials degradation area.

### **Waste Form Degradation**

Waste Form Degradation exhibited good traceability and transparency between the eight components of the waste form degradation process model and GoldSim implementation and results. Extensive testing of the GoldSim implementation of these components was evident, and there was good communication and coordination between process modelers and TSPA personnel during the process model component implementations and testing in GoldSim. The technical personnel made a very conscientious effort to ensure that these model components performed as intended after implementation into the TSPA. Unlike the Waste Package Materials Degradation area, the components of waste form degradation process model are implemented separately in the TSPA. There was also good post-processing coordination between the process modelers and TSPA personnel of the TSPA results. The post-processed methods are readily documented and straightforward. In the colloidal component, the post-processing methods are cited as an example where documentation of the logic and methods used to generate the result plots in the TSPA-SR TR are appropriately included. The audit team found no deficiencies in the waste form degradation area.

## **5.5 Summary of Conditions Adverse to Quality**

The audit team identified conditions adverse to quality addressed in three DRs.

### **5.5.1 Corrective Action Requests (CAR)**

None.

### **5.5.2 Deficiency Reports (DR)**

#### **BSC-01-D-131**

AP-SI.1Q, Revision 2, ICN 4, ECN 1, *Software Management*  
AP-3.11Q, Revision, ICN 2, *Technical Reports*

DR BSC-01-D-131 was written to address qualified software (ASHPLUME, ASHPLUME Version 1.4LV) used in the TSPA-SR TR, then modified as ASHPLUME V 2.0. V 1.4 LV is a qualified/baselined code, however the modified version (V2.0) was never re-qualified in

accordance with Section 5.9 of AP-SI.1Q, nor was it approved for interim use. This violation is similar to the condition described in DR BSC-01-D-068, which was referred by DIR to CAR BSC-01-C-002. The condition described in DR BSC-01-D-131 was not considered for DIR to the aforementioned CAR since the use of the software is considered different. DR BSC-01-D-131 further identified that the software used was not properly documented in the TR, failing to identify the computer platforms and not containing a statement that the software was appropriate for its intended use as required AP-SI.1Q. Also cited in the DR were several contradictions related to the software version numbers. Exemplified was Table 2.2-1 of the TSPA-SR TR, which indicated the used of ASHPLUME Version 1.4 Ld11 whereby the corresponding Appendix C, Table C-1 states that ASHPLUME V1.4LV was the version used. These are two separate, distinct versions of ASHPLUME.

**BSC-01-D-132**

QARD, Revision 10, Section III.2.3, “Data Identification”

DR BSC-01-D-132 documents the failure of the TSPA-SR TR to meet the QARD requirement specified in Section III.2.3 that “data be identified in a manner that facilitates traceability to associated documentation”. Data Tracking Numbers associated with the sensitivity analysis documented in TDR-WIS-PA-000001, Revision 00, ICN 1, Appendix G, Table G-1 could not be traced to the DTNs associated with the TSPA-SR Model. Rather, each sensitivity analysis uses as sources the DTNs associated with the abstraction model AMRs. Based on the objective evidence reviewed, it could not be determined if the sensitivity analysis began with the TSPA-SR Model. Relative to the DTN number scheme, it appears that each sensitivity analysis is a new model developed from data contained in the DTNs associated with each abstraction model.

**BSC-01-D-133**

QARD, Revision 10, Section 3.2.3, “Design Analysis”  
AP-3.12Q, Revision 0, ICN 3, BSCN 1, *Calculations*

BSC-01-D-133 was written for failure to address QARD requirements in Section 3.2.3, “Design Analysis,” whereby calculations are to be identifiable and traceable. Correspondingly, AP-3.12Q is specifically designed to meet this requirement but was not implemented for calculations listed in Table G-1 of the TSPA-SR TR but was not clearly referenced in AP-3.11Q, Revision 2, *Technical Reports*. Reviews of the TSPA-SR TR revealed that the sensitivity analysis (calculations) listed in Table G-1 were not identifiable by their subject, originator, reviewer, and date. The recorded information in Table G-1 does not sufficiently trace the history of the calculations. No objective evidence was available for

the audit team to verify implementation of AP-3.12Q for the development of calculations listed in Table G-1 of the TSPA-SR TR. Originators of the table indicated the initial intent was to perform and document the TSPA-SR Model sensitivity analysis (calculations) listed in Table G-1 in accordance with AP-3.12Q. This action was confirmed by reviewing the Technical Work Plan (TWP), TWP-MGR-PA-0000001, Revision 1, which confirmed that the calculations were to be performed in accordance AP-3.12Q. According to those interviewed the decision to deviate from the original plan seems consistent with the common root cause 'schedule versus quality' issue identified during the root cause analysis for both CARs BSC-01-C-001 and BSC-01-C-002. Further, no objective evidence was available for the audit team to verify the checking process for the calculations listed in Table G-1 of the TSPA-SR TR Appendix G. Members of the Science and Analyses Organization indicated that internal checks were made as a matter of good scientific practice; however no records were available to verify that checking had actually occurred.

### **5.5.3 Follow-up of Previously Identified Deficiencies**

During the audit, corrective actions resulting from Phase One of the TSPA-SR review were evaluated for status. Associated corrective actions were on schedule or effectively implemented. Prior DRs were still in process of being corrected and will continue to be followed by the assigned QAR.

## **6.0 RECOMMENDATIONS**

The audit resulted in three recommendations.

1. It is recommended that the storyboard concept for review of technical products be refined and attention to detail be strengthened. The storyboard concept for review of technical products with multiple checkers and numerous technical reviews is adequate. However, attention to detail is severely lacking and does not facilitate a clear, easily traceable picture of the review process. TR checklists were incomplete and individual comment forms did not identify the product/revision. In several cases, the required information (reviewer initials, comment number, section number, page number, line number, figure number or table number, as appropriate) was incomplete. Also, the TSPA-SR Checker Review form (an EXCEL spreadsheet) fails to require that the author's response (accept or reject) be on the same page as the comments.
2. It is recommended that a method to document the evaluation of error messages associated with software runs be developed and that more diligence to self-evaluation of compliance with AP-SIQ be applied.

These recommendations will be documented in Condition/Issue Identification and Reporting/Resolution System (CIRS). Likewise, CIRS will be used for the response and tracking of the recommendations.

## **7.0 LIST OF ATTACHMENTS**

Attachment 1 – “Personnel Contacted During the Audit”

Attachment 2 – “Summary Table of Audit Results”

**ATTACHMENT 1**

**PERSONNEL CONTACTED DURING THE AUDIT**

| <b>Name</b>        | <b>Organization</b>                            | <b>Pre-Audit Meeting</b> | <b>Contacted During Audit</b> | <b>Post-Audit Meeting</b> |
|--------------------|--|--------------------------|-------------------------------|---------------------------|
| Abernathy, Larry   | BSC/Quality Engineering Support                | X                        |                               | X                         |
| Allen, Cheryl      | BSC/Training                                   |                          | X                             |                           |
| Andrews, Robert    | BSC/Science and Analysis                       | X                        | X                             | X                         |
| Auer, Patrick      | NQS/QA Verification                            |                          |                               | X                         |
| Barish, Victor     | NQS/QA Verification                            |                          |                               | X                         |
| Beall, G. Ken      | BSC/Corrective Action Coordination             | X                        | X                             | X                         |
| Blaylock, James    | DOE/Office of Quality Assurance                | X                        | X                             |                           |
| Brady, Patrick     | BSC/USGS/Natural Analog Integration            |                          |                               |                           |
| Bryan, Debra       | BSC/LANL/Technical Issues                      |                          |                               | X                         |
| Burningham, Andrew | BSC/Compliance                                 | X                        | X                             | X                         |
| Carter, Ted        | U.S. NRC                                       | X                        | X                             | X                         |
| Cereghino, Stephen | BSC/License Application                        |                          | X                             | X                         |
| Cornell, Veronica  | BSC/Parallax/Science & Postclosure Engineering | X                        |                               | X                         |
| Dana, Stephen      | BSC/Quality Engineering Support                | X                        | X                             | X                         |
| Darnell, Sounia    | BSC/Corrective Action Coordination             | X                        |                               |                           |
| Derby, Shirley     | BSC/Correction Action Coordination             | X                        |                               | X                         |
| Doering, Thomas    | BSC/Waste Package                              |                          |                               | X                         |
| Doyle, John        | NQS/QA Verification                            |                          |                               | X                         |
| Esh, David         | U.S. NRC                                       | X                        |                               | X                         |
| Freeze, Geoff      | BSC/DESI/TSPA                                  | X                        |                               |                           |
| Gilkerson, Kenneth | BSC/Quality Engineering Support                | X                        | X                             | X                         |
| Graves, Norman     | BSC/DESI/TSPA Model                            |                          | X                             |                           |
| Hasson, Robert     | NQS/QA Verification                            | X                        | X                             |                           |
| Hess, Kennon       | BSC/General Manager                            |                          |                               |                           |
| Hodges, Kristi     | NQS/QA Verification                            |                          |                               |                           |
| Howard, Robert     | BSC/Projects                                   | X                        | X                             | X                         |
| Hudy, Edythe       | BSC/Document Control                           |                          | X                             |                           |
| Hunt, William      | BSC/DESI/Product Checking                      |                          | X                             |                           |
| Jenkins, Daniel    | BSC/DESI/ Data Qualification                   |                          | X                             |                           |

| Name                    | Organization                               | Pre-Audit Meeting | Contacted During Audit | Post-Audit Meeting |
|-------------------------|--|-------------------|------------------------|--------------------|
| Johnson, Robert         | U.S. NRC                                   | x                 | x                      | x                  |
| Kalinich, Donald        | BSC/DESI/TSPA Model                        |                   | x                      | x                  |
| Keller, David           | BSC/Analytical Support                     |                   | x                      |                    |
| Krishna, Donald         | BSC/Quality Assurance                      |                   |                        | x                  |
| Kunihiro, Dean          | BSC/Resource Management                    |                   |                        | x                  |
| LaPlante, Patrick       | CNWRA/SWR                                  | x                 | x                      | x                  |
| Latta, Robert           | U.S. NRC/On-Site Representative            | x                 | x                      |                    |
| Lee, Joon               | BSC/SNL/Natural Analog Integration         |                   | x                      |                    |
| Lee, Marco              | BSC/Performance Assessment                 |                   | x                      |                    |
| Lenz, Hugh              | BSC/IC Support                             |                   |                        | x                  |
| McCord, John            | BSC/DESI/TSPA Analysis Documentation       | x                 | x                      |                    |
| McDaniel, Mary          | BSC/Engineering Support                    |                   |                        | x                  |
| McNeish, Jerry          | BSC/DESI/TSPA                              | x                 | x                      | x                  |
| Mehta, Sunil            | BSC/DESI/TSPA                              |                   | x                      |                    |
| Mon, Kevin              | BSC/DESI/Model Abstraction                 |                   | x                      | x                  |
| Palay, Christian        | NQS/QA Verification                        | x                 | x                      | x                  |
| Pasupathi, Venkataraman | BSC/ Waste Package                         | x                 | x                      |                    |
| Pellitier, John         | BSC/SNL/Information Compliance             |                   |                        | x                  |
| Peters, John            | BSC/Product Checking                       | x                 | x                      | x                  |
| Rodgers, Thomas         | BSC/Resource Management                    | x                 |                        |                    |
| Saraka, Larry           | BSC/Program Integration                    |                   |                        | x                  |
| Siegmann, Eric          | BSC/DESI/Clad Degradation                  |                   | x                      |                    |
| Smith, Michael.         | CNWRA/SWR                                  | x                 | x                      | x                  |
| Spangler, Elaine        | BSC/Business Management/Technical Training |                   | x                      |                    |
| Splawn, Stephen         | BSC/Software Configuration Management      |                   | x                      |                    |
| Stockman, Christine     | BSC/SNL/Waste Form                         |                   | x                      |                    |
| Swenning, Steven        | BSC/Quality Engineering Support            | x                 | x                      | x                  |
| Swift, Peter            | BSC/SNL/Process Management                 | x                 |                        |                    |
| Thompson, Kathleen      | BSC/Customer Support                       |                   | x                      |                    |
| Trbovich, Thomas        | CNWRA/SWR                                  | x                 | x                      | x                  |
| Tynan, Mark             | DOE/YMSCO/Regulatory Interactions          | x                 |                        |                    |
| Wagner, Lester          | NQS/QA Verficaton                          | x                 |                        | x                  |

| Name              | Organization                        | Pre-Audit Meeting | Contacted During Audit | Post-Audit Meeting |
|-------------------|-------------------------------------|-------------------|------------------------|--------------------|
| Washington, B.    | BSC/Document Control                |                   | x                      |                    |
| Watson, William   | BSC/Integration Management          | x                 |                        | x                  |
| Weaver, Jeffrey   | BSC/Integration Management          | x                 |                        |                    |
| Wemhauer, Robert  | BSC/Integration Management          |                   |                        | x                  |
| Whitcraft, James  | BSC/Engineering                     | x                 |                        | x                  |
| Williams, Nancy   | BSC/Project Management              | x                 | x                      | x                  |
| Wisenburg, Mark   | BSC/Engineering and Preclosure      |                   | x                      |                    |
| Zimmerman, Robert | BSC/ Methods & Procedures           |                   | x                      |                    |
| Zinkevich, Fred   | BSC/ Corrective Action Coordination | x                 |                        |                    |

**LEGEND:**

|  |  |
|--|--|
| BSC - Bechtel SAIC Company, LLC                    | SWR – Southwest Research Laboratory                    |
| CNWRA-Center for Nuclear Waste Regulatory Analysis | SNL - Sandia National Laboratory                       |
| DESI - Duke Engineering & Services, Inc.           | U.S. NRC – United States Nuclear Regulatory Commission |
| DOE - Department of Energy                         | YMSCO – Yucca Mountain Site Characterization Office    |
| NQS – Navarro Quality Services                     | LANL – Los Alamos National Laboratory                  |

**ATTACHMENT 2**

**SUMMARY TABLE OF AUDIT RESULTS**

| <b>Critical Process Steps</b>   | <b>Implementing Documents</b>                  | <b>Details Checklist</b>                      | <b>Deficiency Reports</b> | <b>CDA</b>        | <b>Recommendations</b> | <b>Program Adequacy</b>  | <b>Procedure Compliance</b> | <b>Overall</b>             |
|---|--|---|---------------------------|-------------------|------------------------|--------------------------|-----------------------------|----------------------------|
| Planning  | AP-2.2Q<br>AP-2.21Q                            | Pgs 1, 25                                     | N/A                       | N/A               | N/A                    | SAT                      | SAT                         | SAT                        |
| Change/Document Control   | AP-3.4Q<br>AP-6.1Q                             | Pgs 4-7, 26                                   | N/A                       | N/A               | N/A                    | SAT                      | SAT                         | SAT                        |
| Managing Technical Product Input  | AP-3.15Q                                       | Pg 10   | BSC-01-D-132              | N/A               | N/A                    | UNSAT                    | SAT                         | SAT                        |
| Control/Qualification of Data   | AP-3.12Q<br>AP-SV.1Q<br>AP-3.19Q<br>AP-SIII.2Q | Pgs 2, 3, 9, 11,<br>12, 14, 15, 32            | BSC-01-D-133              | N/A               | N/A                    | SAT<br>SAT<br>SAT<br>SAT | UNSAT<br>SAT<br>SAT<br>SAT  | UNSAT<br>SAT<br>SAT<br>SAT |
| Calculations & Analysis   | AP-3.10Q                                       | Pgs 8, 14, 28,<br>35, 37, 38                  | N/A                       | N/A               | N/A                    | SAT                      | SAT                         | SAT                        |
| Transmittal of Input  | AP-3.14Q                                       | Pg 13   | N/A                       | N/A               | N/A                    | SAT<br>SAT               | SAT<br>SAT                  | SAT<br>SAT                 |
| Preparation & Checking of Technical Report<br>Managing Technical Products<br>Impact Reviews | AP-3.11Q<br>AP-3.15Q<br>AP-2.14Q               | Pgs 9, 10, 13,<br>16, 21-25, 34,<br>36, 39-50 | N/A                       | N/A<br>N/A<br>N/A | N/A<br>N/A<br>N/A      | SAT<br>SAT<br>SAT        | SAT<br>SAT<br>SAT           | SAT<br>SAT<br>SAT          |
| Review of Technical Products/Data   | AP-2.14Q<br>AP-7.5Q                            | Pgs 22-25, 27,<br>34                          | N/A                       | N/A               | N/A                    | SAT                      | SAT                         | SAT                        |
| Qualification of Software   | AP-SI.1Q                                       | Pgs 15-19                                     | BSC-01-D-131              | N/A               | #2 CIRS                | SAT                      | UNSAT                       | SAT                        |
| Submittal of Data /TDMS   | AP-SIII.3Q                                     | Pg 33   | N/A                       | N/A               | N/A                    | SAT                      | SAT                         | SAT                        |
| Submittal of Records  | AP-17.1Q                                       | Pgs 20, 29-31                                 | N/A                       | N/A               | #1 CIRS                | SAT                      | SAT                         | SAT                        |

**LEGEND:**

CIRS – Condition/Issue Identification and Reporting Resolution System

SAT – Satisfactory

UNSAT - Unsatisfactory