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April 2004

BECHTEL SAIC COMPANY LLC

Technical Work Plan For:

Regulatory Integration Evaluation of Analysis and Model Reports Supporting the TSPA-LA

Prepared for:
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
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Regulatory Integration Evaluation of Analysis and Model Reports Supporting the TSPA-LA

TWP-MGR-PA-000014 REV 00

April 2004

Bechtel SAIC Company, LLC

Technical Work Plan for:

REGULATORY INTEGRATION EVALUATION OF ANALYSIS AND MODEL REPORTS SUPPORTING THE TSPA-LA

TWP-MGR-PA-000014 REV 00

April 2004

Work Package Number(s):

ARTM01, ARTM02, ARTM03, ARTM04, ARTM05, ART001, ART002, ART003, ART004, ARTG01

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08 APRIL 04
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4/08/04
Date

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4/8/04
Date

CHANGE HISTORY

Revision Number	ICN Number	Date of Change	Description of Change
00	00	04/08/04	Initial issue

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CONTENTS

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FIGURE

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ACRONYMS

AMR	analysis and model report
BSC	Bechtel SAIC Company, LLC
DIRS	Document Input Reference System
DOE	U.S. Department of Energy
DTN	data tracking number
FEP	feature, event, or process
FEPs	features, events, and processes
LA	License Application
NRC	U.S. Nuclear Regulatory Commission
OCRWM	Office of Civilian Radioactive Waste Management
QARD	Quality Assurance and Requirements Description
PEF	parameter entry form
RIT	Regulatory Integration Team
TBD	Technical Basis Document
TDMS	Technical Data Management System
TSPA	total system performance assessment
TSPA-LA	Total System Performance Assessment for the License Application
TWP	technical work plan
YMRP	Yucca Mountain Review Plan

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1. WORK SCOPE

This technical work plan (TWP) describes work to be performed for a one-time comprehensive evaluation of the set of analysis and model reports (AMRs) that are currently identified (Appendix A) as supporting the Total System Performance Assessment for the License Application (TSPA-LA). The AMRs to be evaluated are those that provide either direct or indirect inputs to the TSPA-LA, and directly support the License Application (LA). Through implementation of this plan the reports will be integrated into a coherent and consistent description of the technical basis for the postclosure safety case, with improved traceability. This TWP was prepared in accordance with Administrative Procedure AP-2.27Q, *Planning for Science Activities*.

The Regulatory Integration Team (RIT) will conduct a comprehensive regulatory-focused evaluation of the identified AMRs, identify issues, and then revise the reports, as appropriate, to address the identified issues. This work is performed by a team within the Repository Development Organization of Bechtel SAIC Company, LLC (BSC).

The activities described in this TWP have been determined not to be subject to the requirements of the *Quality Assurance Requirements and Description* (DOE/RW-0333P). This plan controls a formal management evaluation of the content and scope of the LA reports. This work will be conducted in parallel with a review of data used as input to the LA reports. The data review will be conducted in accordance with the latest revision of the *Technical Work Plan For: Data Confirmation Project – Technical Product Review Process* (BSC 2004a). No scientific testing will occur as part of this work scope.

The RIT effort has been planned in two phases: Phase 1 (Evaluation Phase) will consist of the regulatory review, accounting of issues, and management decisions that will define the scope of report revisions to address the issues; and Phase 2 (Production Phase) will include all activities to revise the AMRs resulting from the Evaluation Phase. This TWP provides planning information for implementation of the Evaluation Phase only. Detailed planning for the Production Phase will be performed in accordance with AP-2.27Q, and changes or revisions to AMRs will be performed in accordance with AP-SIII.9Q, *Scientific Analyses,* AP-SIII.10Q, *Models,* and AP-3.12Q, *Design Calculations and Analyses,* as applicable. Separate TWPs will govern changes or revisions to these reports in the Production Phase.

1.1 OBJECTIVE

The objective of the RIT is to evaluate and subsequently to refine the AMRs that support the TSPA-LA and the LA, to improve integration, consistency, transparency, and traceability. The evaluation is to be performed using a regulatory perspective, facilitating eventual review of the supporting documents by the U.S. Nuclear Regulatory Commission (NRC) and its staff.

1.2 PRIMARY TASKS

The primary tasks to be carried out by the contributing teams that are part of the RIT (see Section 2.2) are listed below. The responsible contributing teams (i.e., Parameter Team, Features, Events, and Processes (FEPs) Team, or the five Analysis/Model Teams) are indicated parenthetically.

1.2.1 **TSPA Architecture**—Articulate the architecture or "wiring diagram" of the data, parameters, FEPs, models, analyses, calculations, and associated outputs that constitute the basis for the TSPA-LA (Integration Team).

1.2.2 **Risk Significance**—Develop documentation that ranks the AMRs and associated technical reports, calculations, and other products with respect to their relative contributions to the demonstration of compliance with regulatory requirements for waste isolation (Integration Team).

1.2.3 **Data Confirmation**—Assess the quality of data used as direct input to the AMRs, with regard to 1) traceability, 2) compliance with applicable data management requirements, and 3) suitability for use. This will be accomplished as part of the completion of data confirmation activities described in the TWP for the Data Confirmation Project (BSC 2004a) (Analysis/Model Teams).

1.2.4 **Parameter Evaluation**—Evaluate the traceability of technical parameters as they are developed in the AMRs and handed off among the AMRs, ultimately supporting definition of the parameters that are direct input to the TSPA-LA. Trace the parameter logic and the development of parameter values and uncertainty distributions. Evaluate parameters for consistency throughout the AMRs that directly support the TSPA-LA (Parameter Team).

1.2.5 **FEPs Evaluation**—Perform a comprehensive review of FEPs in the model reports starting from a designated master FEPs database, and accounting for where in the supporting AMRs each FEP is included or excluded. Review FEP treatment to assess consistency in the treatment of different FEPs, and consistency among documents that disposition FEPs (FEPs Team).

1.2.6 **Analysis/Model Evaluation**—Assess each assigned AMR (from the list in Appendix A) for the following (Analysis/Model Teams):

- Technical accuracy and validity of models and analyses
- Traceability of inputs and outputs among models and analyses, considering hand-offs within and between AMRs and other related documents
- Appropriateness of assumptions, and consistency of assumptions between associated AMRs
- Appropriate identification of applicable *Yucca Mountain Review Plan* (YMRP) criteria (NRC 2003), and appropriateness of statements or conclusions concerning how these criteria are addressed in the AMRs
- Traceability and transparency, including evaluation of whether model documentation adequately describes conceptualization, development of numerical and/or mathematical models, and model abstraction for use in downstream AMRs or in the TSPA-LA.

- Appropriateness of technical bases for FEPs that are excluded from the TSPA.

1.2.7 Documentation—Complete the checklists (see Appendix B) that document evaluation findings. Then summarize the checklists in action lists for each assigned AMR. The action list will include the following information: importance of each action; scope of activities that would be needed to address each action; and the resources that would be needed (i.e., quantity of effort and identification of key staff resources needed). The Technical Lead/Author should also prepare a consolidated markup of simple clarifications or documentation improvements, as appropriate (Parameter, FEPs, and Analysis/Model Teams).

1.2.8 Risk Prioritization—Categorize, rank, and prioritize items from the summary action lists (Integration Team).

1.2.9 Management Evaluation and Decision—Direct Analysis/Model Teams to initiate selected actions (Integration Team).

1.3 PRODUCTS OF THE REGULATORY INTEGRATION TEAM

Products to be produced by the Regulatory Integration Team are as follows:

- Checklists for each assigned AMR, prepared by the Analysis/Model Teams.
- Similar materials documenting the parameter traces and FEP consistency evaluations performed by the Parameter Team and FEPs Team, respectively.
- Summaries from each contributing team that list the evaluation findings in sufficient detail, with reference to specific AMRs, to support prioritization of the evaluation findings, and decisions as to what further remedial work may be needed (i.e., the summaries are action lists). For each action list item, the relative importance to the RIT objectives, and the estimated effort for the action, will be provided by the contributing team.
- A prioritized list of actions based on explicitly stated ranking and importance criteria.
- A management decision basis for selecting the prioritized actions for disposition in the Production Phase (Phase 2).

1.4 IMPLEMENTING ORGANIZATION

The newly formed Regulatory Integration Team will comprise nine contributing teams, which will be responsible for:

- Overall *integration* (Integration Team)
- Evaluation of *parameters* for traceability from the AMRs to TSPA (Parameter Team)
- Evaluation of the treatment of *FEPs* in the AMRs (FEPs Team)

- Regulatory, technical, and compliance evaluation of data, models, and analyses documented in AMRs, grouped into five topical areas (Analysis/Model Teams), categorized as follows:
  - Natural System
  - Near-Field Environment and Transport
  - Engineered System
  - Igneous Events and Consequences
  - Seismic Events and Consequences
- *Production* support, including editing, word processing, input to the Document Input Reference System (DIRS), review coordination, and records management support (Production Team).

The organization of these contributing teams is detailed in Appendix C.

The Integration Team will lead integration among the other contributing teams and with organizations external to the RIT, such as the Licensing and Design and Engineering organizations.

1.5 SCIENTIFIC TESTING AND PRE-TEST PREDICTIONS

This TWP does not govern any specific tests or pre-test predictions.

2. SCIENTIFIC APPROACH OR TECHNICAL METHODS

A systematic approach will be used for evaluating AMRs in the Evaluation Phase (Phase 1) of the Regulatory Integration Team. The list of AMRs to be evaluated is provided in Appendix A.

Figure 1 depicts the sequence and relationship of RIT activities. Initial efforts will involve several parallel reviews or evaluations for each document. As described in greater detail in Section 2.2.1, separate teams will conduct reviews on parameter usage, FEPs issues, regulatory topics, and the analyses/model technical elements. In addition, data confirmation evaluations and reviews of potentially relevant open condition reports will also be conducted. Results of each review will be documented in separate or combined checklists and, possibly, a document markup that will be submitted to the lead for the specific technical product.

Based on the findings, comments, and suggestions submitted by the review teams, the document lead will develop a consolidated action list and, as appropriate, a consolidated document mark up. The consolidated document mark up will identify straightforward revision requirements such as correction of spelling, typographical, and grammatical errors; improvements in text structure and format; and modifications needed to address clear cut review comments. The consolidated action list developed by the document lead will identify review comments that require management attention because of considerations such as the following:

- The nature, type, and/or extent of proposed document revision
- The impact of the proposed revision on other documents
- The type and amount of resources required to address the proposed revision.

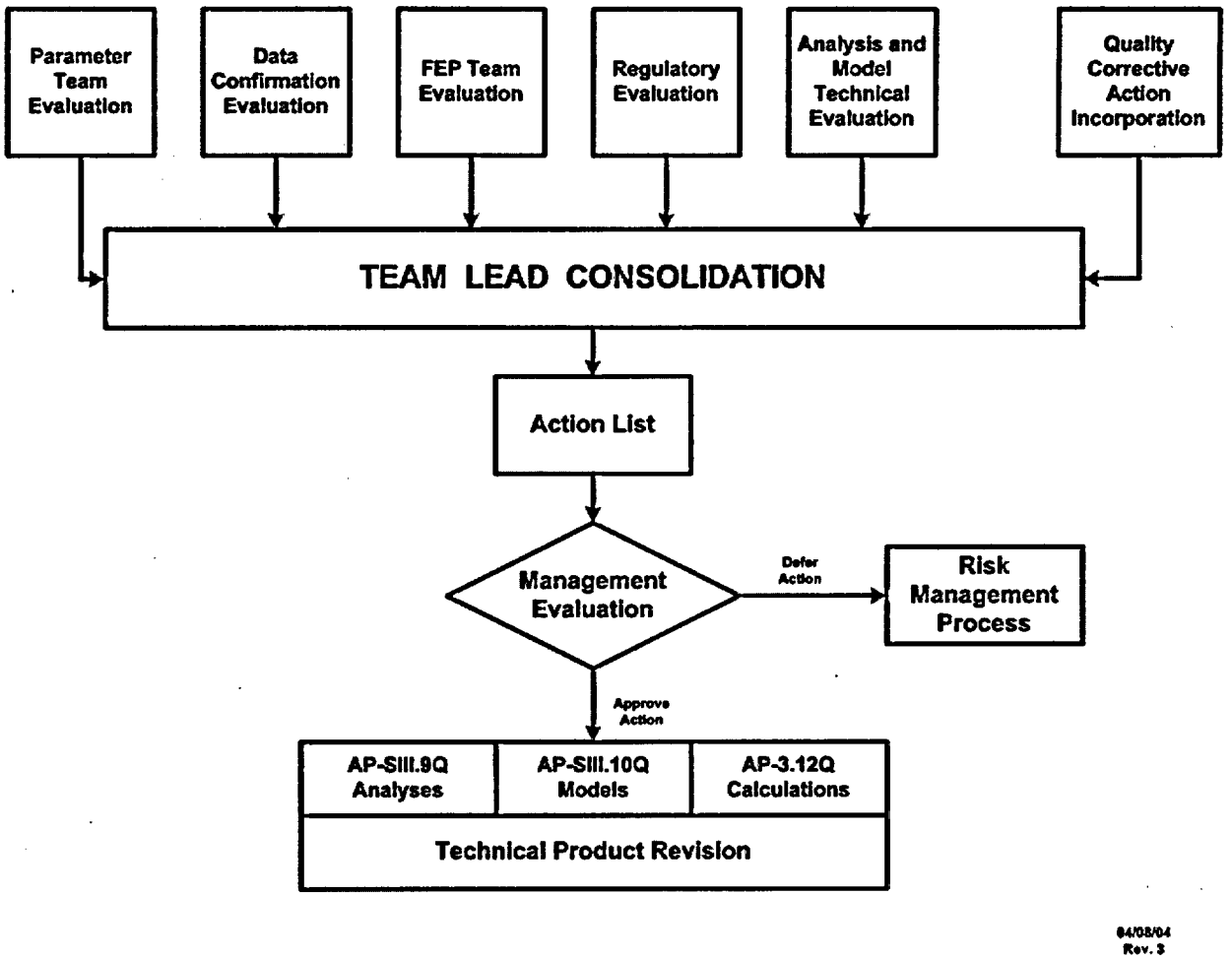

Figure 1. Phase 1 (Evaluation Phase) Process

The consolidated action list for each document will also identify actions required to address any findings from the data confirmation and condition report reviews.

The Management Team will review the document action lists and authorize specific changes for immediate implementation or for deferred action. Proposed changes accepted for immediate implementation will be provided to the document development/revision team who will ensure their incorporation into the next issue of the document. Document changes and revisions will be performed in accordance with current versions of AP-SIII.9Q, *Scientific Analyses,* AP-SIII.10Q *Models,* or AP-3.12Q, *Calculations,* and will be subject to the controls detailed in the governing procedure.

Improvement in these documents will be achieved by using different approaches and methods than were used to develop and review the AMRs, as discussed in the following sections.

2.1 DISCUSSION OF PURPOSE FOR KEY EVALUATION TASKS

2.1.1 TSPA Architecture—The TSPA architecture will be developed to enable traceability and transparency of all the products feeding the TSPA. This plan may be used to identify

extraneous material, data sets, or reports. It will facilitate an evaluation of those features important to waste isolation. This information will be subsequently used to prioritize issues when the various evaluations of the products are complete.

2.1.2 **Risk Significance**—Prioritizing the AMRs and other products with respect to their relative contributions to the demonstration of compliance with the regulatory requirements for waste isolation allows resources to be focused on those documents that are critical to the postclosure safety case.

2.1.3 **Data Confirmation**—Input data will be evaluated for quality; data that lack proper pedigree, adequate quality, traceability, or are inappropriate for use, could degrade the validity and utility of the product they support.

2.1.4 **Parameter Evaluation**—The parameter evaluation will trace parameter values and uncertainty distributions throughout the AMRs that directly support the TSPA-LA. Consistency and appropriateness are needed to establish TSPA credibility.

2.1.5 **FEPs Evaluation**—The FEPs evaluation is intended to uncover any FEPs that have not been adequately addressed, or have been addressed in an inconsistent manner.

2.1.6 **Analysis/Model Evaluation**—The model and analysis report evaluations will ensure the AMRs are integrated, consistent, transparent, and traceable, which will result in enhanced regulatory defensibility.

2.1.7 **Documentation**—Using checklists for the Evaluation Phase will help ensure that multiple reviewers performing reviews of multiple documents achieve consistency. The completed checklists will also enable leads to summarize key findings for the management decision process.

2.1.8 **Risk Prioritization**—The prioritization will enable available time and budget to be properly allocated to the Production Phase (Phase 2) of the project.

2.1.9 **Management Decision**—Management involvement is necessary to allocate resources appropriately and balance risks against scope and schedule constraints.

2.2 APPROACHES AND METHODS TO BE USED TO CONDUCT REGULATORY INTEGRATION

Staffing—The Evaluation Phase will use accomplished Project staff who are technically qualified, but who are generally new to the AMRs that they will be assigned to evaluate. This is more likely to result in challenges to the content of the AMRs than using staff who are already familiar with the products. In addition, off-Project staff will be used for evaluations that emphasize transparency, and regulatory evaluators (staff skilled in interactions with the NRC) will be used to evaluate whether the AMRs are written as regulatory documents. Where appropriate, staff will be assigned to perform horizontal or vertical evaluations of multiple AMRs, and to emphasize consistency, organization, and completeness.

Experience–Project experience with Condition Report 99 (model validation) and Condition Report 16 (data confirmation), and with related surveillances, such as *Self Assessment to Determine Upgrades Needed to Address Model Validation Implementation Problems* (BSC 2004b); *Independent Assessment of Model Development and Validation,* (BSC 2004c); and OCRWM Office of Quality Assurance model audit of 2003 (DOE 2003), has focused the RIT on certain types of technical and regulatory issues. In addition, the recent technical evaluations of three AMRs by NRC teams further focused attention on accuracy, transparency, and traceability.

Logistics—Staff performing the Evaluation Phase will be co-located at the Summerlin campus in Las Vegas to the extent possible. Evaluations will be performed concurrently in all areas, and regular interactions among the evaluators will help to achieve the RIT objectives. In addition, the timing of RIT activities (i.e., after AMR development but prior to LA), will help focus on the regulatory objectives.

Risk Informed Management Prioritization—The RIT evaluations will be prioritized on the basis of several factors. First, risk information related to the levels of model importance and validation found in Appendix B of the *Scientific Processes Guidelines Manual* (BSC 2002) will be used to bin documents on the basis of their impact on the demonstration of compliance with the postclosure public health and environmental standards in 10 CFR 63, *Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada.* Additional consideration will be given to the prioritization of AMR evaluations utilizing the NRC's internal risk ranking of Key Technical Issue agreements. AMRs will also be flagged when there is a potential need to update discussions on barrier capabilities. Finally, priority consideration will be given to those AMRs that are direct feeds to TSPA or that have model validation deficiencies related to Condition Report 99. Guidance as to the priority of AMR evaluations will be provided by the Integration Team acting independently from the AMR authors or the Analysis/Model Teams, and will be used to focus efforts during the Evaluation Phase. The preliminary Regulatory Integration Team evaluation priorities can be found in Appendix A of this TWP.

2.2.1 Regulatory Integration Team Roles and Responsibilities

An organizational chart for the team is shown in Appendix C. It comprises the following contributing teams: Integration; Parameters; FEPs; Analysis/Model evaluations (five teams representing topical areas), and Production. Regulatory evaluators will be assigned to each of the five Analysis/Model Teams to conduct regulatory evaluations of the reports and to consult with the technical staff.

The Integration Team will identify direct and indirect inputs to the TSPA-LA. It will develop a top-down architecture of parameters, FEPs, and AMRs that support exposition of the postclosure safety case in the LA, and support the TSPA-LA. Groupings of parameters, FEPs, and AMRs will be prioritized ("binned") by relative contributions to demonstration of waste isolation, and by how they may be used in the TSPA-LA. The Integration Team will identify extraneous material that is not required to support the LA or the TSPA-LA and could be removed from reports (or will identify entire reports for removal, as appropriate). The team will also evaluate Section 1, Purpose, of each AMR for completeness and consistency with the top-down architecture.

The Parameter Team evaluation will start from the TSPA Parameter database. It will trace the parameters and their development and evaluate the nominal values, uncertainty ranges, and distributions. It will evaluate parameters for consistency throughout the TSPA. This evaluation will be documented in the checklists in Appendix B. It will provide the list of TSPA parameter inputs to the Analysis/Models Team for searches in the DIRS to evaluate qualification status of source data.

After completing the preliminary evaluation of parameter documentation discussed above, the team will:

- Collectively prepare a consolidated list of identified issues
- Re-evaluate the parameter ranking based on importance to waste isolation (system or barrier performance)
- Evaluate issues from a regulatory perspective
- Meet with other RIT subject matter experts to finalize issues as appropriate with a regulatory and risk perspective.

The FEPs Evaluation Team will evaluate FEPs from the TSPA FEP list as taken from the most recent comprehensive FEPs database data file in the Technical Data Management System (TDMS). It will perform a comprehensive evaluation of FEPs in the model reports, accounting for where each FEP is included or excluded. It will evaluate FEP treatment to assess the level of rigor in the screening arguments and evaluation consistency or compatibility across all TSPA-LA products. The team will document its evaluation using checklists located in Appendix B.

After completing the preliminary evaluation of report documentation per the above requirements, the FEPs Evaluation Team will:

- Collectively prepare a consolidated list of issues
- Evaluate issues from a regulatory perspective
- Meet with other RIT subject matter experts to finalize issues as appropriate with a regulatory and risk perspective.

The Analysis/Model Evaluation Teams will be responsible for comprehensive, cross-cutting evaluations of the model and analysis reports and calculations. To facilitate integration, the analysis/model evaluation effort will be comprised of five sub-teams for the following topical areas: 1) the Natural System, 2) Near-field Environment and Transport, 3) Engineered System, 4) Igneous, and 5) Seismic. The evaluation of reports within each topical area will follow the architecture defined by the integration team to facilitate traceability and transparency from TSPA to the original source material in a way that feeds into the LA.

As part of the model report evaluations, the following supporting evaluations will be performed:

- Data evaluations for traceability, pedigree, and appropriateness

- YMRP criteria evaluation for appropriateness, completeness, and consistency
- Evaluation of assumptions for appropriateness, adequate justification, and consistency with the wider body of related reports
- Model evaluations for adequacy, validity, transparency of presentation, and traceability between upstream and downstream models, and related models
- Model validation evaluations for adequacy
- Evaluations of report conclusions for appropriateness and accuracy.

These evaluations will be documented using checklists in Appendix B.

After the evaluation and completion of checklists, the modeling teams will summarize the issues identified in each report and develop actions lists for management evaluation and prioritization. The summaries, referred to as action lists, will enable a determination of the scope of any subsequent revisions. Information contained in these executive-level summaries will include: 1) a distillation of the issues identified in the checklist, 2) a list of action items from condition reports, 3) a list of items to be verified that need to be addressed, 4) an estimate of work hours and skill type needed to address the issues, and 5) the impact to the overall quality of the reports and the TSPA-LA of either addressing or not addressing the issue.

2.2.2 Disposition of Actions Identified During Phase 1 Evaluation

A management forum will be convened at regular intervals during Phase 1 to disposition the actions identified during the Phase 1 evaluation. The RIT Project Manager will chair the forum and will have final and ultimate authority for all decisions. The RIT Deputy Project Manager will serve as co-chair and act for the Project Manager, as delegated. Other individuals who will participate regularly are the following:

- Quality Engineering Support Lead
- Integration Lead
- KTI Completion Lead
- Postclosure Safety Lead
- Operations Lead
- Total System Performance Assessment Lead (as necessary).

Action items identified by the evaluation teams will be categorized based on the potential impact the item has on the TSPA-LA. Depending on the results of the Phase 1 evaluation and the overall scope of items identified, management may choose any of several paths to disposition specific action items. High priority items will be recommended for action in Phase 2. Low priority items may be addressed in Phase 2, or, if resources are constrained or management judges the items to be not critical to the LA, the action may be modified or deferred.

Direction to not initiate the action, or to defer work, will be done with appropriate documentation using the risk management process described in AP-PMC-021, *Risk Management,* and/or AP-PMC-018, *Trend Identification, Monitoring, and Analysis.*

3. INDUSTRY STANDARDS, FEDERAL REGULATIONS, DOE ORDERS, REQUIREMENTS, AND ACCEPTANCE/COMPLETION CRITERIA

The high-level requirements that apply to the overall content of the AMRs that support the LA and TSPA-LA are found in 10 CFR Part 63. The RIT will use derivative acceptance criteria from appropriate sections of the YMRP (NRC 2003; sub-sections of Section 2.2.1) to define whether the AMR products provide the necessary content to comply with 10 CFR 63.

There are no high-level requirements or acceptance criteria for the work performed during the Evaluation Phase (Phase 1) or the informational products generated by the RIT in that phase.

Specific to the RIT, checklists (Appendix B) will be used to explicitly represent the acceptance and completion criteria for AMRs. The checklists will also help to ensure consistent evaluations, appropriately targeted to the scope and objectives of the RIT.

Separate TWPs not yet identified will govern Production Phase activities (Phase 2) of the RIT for improving AMRs.

The requirements and criteria applicable to the AMRs were established previously in the TWPs controlling development of the original AMR products. These requirements and criteria may be modified for Production Phase activities.

4. IMPLEMENTING DOCUMENTS

The following procedures, as appropriate to tasks within the work package, represent a listing that may be used to guide the evaluation in Phase 1. The Phase 2 planning will be governed by AP-2.27Q.

The most recent revisions of the procedures below will be used or referenced for work covered by this TWP.

- AP-3.12Q, *Design Calculations and Analyses*
- AP-6.1Q, *Document Control*
- AP-16.1Q, *Condition Reporting and Resolution*
- AP-17.1Q, *Records Management*
- AP-PMC-018, *Trend Identification, Monitoring, and Analysis*
- AP-PMC-021, *Risk Management*
- AP-SIII.9Q, *Scientific Analyses*
- AP-SIII.10Q, *Models*
- AP-SV.1Q, *Control of the Electronic Management of Information.*

5. EQUIPMENT

No special equipment will be used by the RIT to perform the Evaluation Phase (Phase 1).

6. RECORDS

Completed checklists generated during the Evaluation Phase (Phase 1), action lists compiled for each AMR, consolidated markups for each AMR (if this approach is used), and documentation of the basis for prioritization of the follow-on Production Phase (Phase 2) activities to address the Evaluation Phase findings, will be compiled and submitted to the Records Processing Center in accordance with AP-17.1Q.

An evaluation of requirements for management of the control of electronic data will be conducted (see Section 8.4 below) and will be submitted to the Records Processing Center.

Production Phase activities to revise AMRs will be controlled by separate TWPs that will specify the associated record management requirements.

7. QUALITY VERIFICATIONS

No quality assurance verification, other than regularly scheduled audits and surveillances, is required during the execution of this TWP. Self-assessments may be performed, with schedule and scopes to be determined.

8. PREREQUISITES, SPECIAL CONTROLS, ENVIRONMENTAL CONDITIONS, PROCESSES, OR SKILLS

8.1 QUALITY CLASSIFICATION OF ACTIVITIES

The work scope described in this TWP for the Evaluation Phase (Phase 1) of the RIT is not subject to the requirements of the *Quality Assurance and Requirements Description* because it is a management evaluation of existing technical products and prioritization of work scope.

8.2 NON-Q ACTIVITIES EVALUATION

None of the activities to be conducted under the auspices of this TWP are subject to the Integrated Safety Management Quality Assurance Program because they are unrelated to Yucca Mountain Site Operations, design, construction, or any waste handling or transportation operations.

8.3 PREREQUISITES

There are no prerequisites to conducting this comprehensive evaluation that are not evident in the plans discussed above. Draft AMRs may be evaluated in the Evaluation Phase (Phase 1), in lieu of approved versions, at the discretion of the RIT leads.

8.4 CONTROL OF THE ELECTRONIC MANAGEMENT OF INFORMATION

The work for Phase 1 will not be subject to requirements for management and control of electronic data described in AP-SV.1Q, *Control of the Electronic Management of Information.*

To ensure accuracy and completeness of the information generated by Evaluation Phase (Phase 1) of the RIT, and described in this TWP, access to information on the computer workstations used by all staff shall be controlled with password protection. Access privileges will be set to prevent unauthorized changes to files. Relevant files on computer workstations will be backed up network servers, which are periodically backed up.

8.5 SPECIAL ENVIRONMENTAL CONTROLS OR CONDITIONS

No special controls or processes are required for the analytical work. Personnel technical skills and experience are documented in Project training records, and will be matched to the products being evaluated. The work will be performed in the Summerlin office complex. No special environmental conditions are required.

8.6 TRAINING

Training requirements will be met for the RIT members in one of two ways. If the member is affiliated with one of the national laboratories currently working on the Yucca Mountain Project, their training requirements will be established by the national laboratory in accordance with the laboratory's management and business arrangements with BSC. Compliance with the training requirements will be met through the contractual mechanisms associated with the contract.

Training requirements will be established in the Repository Development training matrix for all RIT personnel, including BSC employees, personnel working temporarily for BSC using the ROS [Request for Off-site Services] contractual vehicle, or those employed through another subcontracting mechanism. The Repository Development Management Systems organization will verify compliance to the matrix assignments.

8.7 CONDITION REPORTING AND CORRECTIVE ACTIONS

Existing condition reports that pertain to the evaluated AMRs and to the scope and purpose of the Evaluation Phase (Phase 1) will be included in the issues lists that are compiled for prioritization of Production Phase (Phase 2) activities. Conditions adverse to quality that are identified during the Phase 1 evaluation will be documented in accordance with AP-16.1Q, and, as appropriate, will be included in the action list compiled for prioritization of Phase 2 activities.

8.8 ADDITIONAL PROCESS PREREQUISITES

During the Production Phase (Phase 2), managers and leads will conduct a "time out for quality" mentoring session with their employees at the critical process steps. The timing of these sessions will be dependent on the schedule and timing of the work flow, and the timing of the mentoring will be product dependent.

"Time out for quality" sessions will be held on the following occasions:

- Prior to initiating a change in a TWP prepared in accordance with AP-2.27Q, due to a significant change in work scope. This session should focus on common TWP errors with respect to model validation.
- Prior to initiating a review of a TWP changed to reflect new work scope.
- Prior to initiating work on an AMR prepared in accordance with AP-SIII.9Q or AP-SIII.10Q (whether a new model report, a complete revision, or an interim change notice).
- Prior to initiating checking of an AMR. This session should also focus on common issues identified in Surveillance BQA-SI-04-048 (BSC 2004c) *as well as* any software used in the analysis or model report.
- Prior to initiating an AP-2.14Q review of an AMR.
- Prior to submitting the DIRS report prepared in accordance with AP-3.15Q for either an analysis or model report at the AP-2.14Q review stage.
- Prior to signing the AMR.

In addition, managers should evaluate the duration and complexity of the activities involved in revision cycles for AMRs, and, as appropriate, institute additional quality sessions.

Managers should include the following types of information in their reviews at critical process steps:

- Summarize the purpose/objectives of the task to the licensing process.
- Summarize critical steps.
- Evaluate worker readiness.
- Identify likely errors that could occur and best work practices for self-checking to ensure quality work.
- Reinforce worker accountability for strict procedural compliance and resolution of content ambiguity.
- Promote prompt notification of procedural conflicts or ambiguity to appropriate levels of management.
- Promote self-identification of any conditions (whether adverse to quality or not) through the Corrective Action Program.

The evidence of a manager or lead completing these actions at the critical process steps will be documented by email to the staff involved and to RIT management.

9. ORGANIZATIONAL INTERFACES

The RIT Integration Team, as listed in Section 1.4, is dedicated to Project integration and to formulation of the decision basis for prioritization of follow-on work in the Production Phase (Phase 2). The Integration Team, at the direction of the Regulatory Integration Manager, will control organizational interfaces with other BSC elements such as the Licensing and Design and Engineering organizations.

10. PROCUREMENT

Subcontractor and national laboratory resources may be used for the Evaluation Phase (Phase 1) activities. The required support will be identified in the procurement and subcontract documents that are processed in accordance with BSC policies and procedures.

11. REFERENCES

10 CFR 63. Energy: Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada. Readily available.

BSC (Bechtel SAIC Company, LLC) 2002. *Scientific Processes Guidelines Manual.* MIS-WIS-MD-000001 REV 01. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20020923.0176.

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APPENDIX A
LIST OF MODELS AND ANALYSES

LIST OF ANALYSIS AND MODEL REPORTS

LA Products Evaluation Priorities Product Title	Document ID	Bins/Ratings					TBD Sec.	Resp.
		A	B	C	D	Sum		
21-PWR Waste Package Side and End Impacts	000-00C-DSU0-01000-000-00B	2	3	1		6	14	Board
Maximum Acceleration on the Fuel Assemblies	000-00C-DSU0-01100-000-00A	2		1		3	14	Board
Structural Calcs. of DS Exposed to Vibratory Ground Motion	000-00C-PEC0-00100-000-00A	0	3	1		4	14	Board
Drip Shield Loaded by Backfill and Loose Rock Mass	000-00C-TED0-00300-000-00A	0	3	1		4	14	Board
Drip Shield Structural Response to Rock Fall	000-00C-TED0-00500-000-00A	2	3	1		6	14	Board
Structural Calcs. of WP Exposed to Vibratory Ground Motion	000-00C-WIS0-01400-000-00A	2	3	3		8	14	Board
Characterize Framework for Seis./Struc. Deform.	ANL-CRW-GS-000003	2		1		3	14	Board
Probability Analysis Corrosion Rates for Waste Package Mat'ls	ANL-DSD-MD-000001	2		3		5	5	Brown
Effects of Fault Displacement on Emplacement Drifts	ANL-EBS-GE-000004	0		1		1	14	Board
Environment on Surfaces of DS/WP Outer Barrier	ANL-EBS-MD-000001	0		2		2	6	Hardin
Aging and Phase Stability of WP Outer Barrier	ANL-EBS-MD-000002	0		3		3	6	Brown
General and Localized Corrosion of WP Outer Barrier	ANL-EBS-MD-000003	3	3	3		9	6	Brown
Generalized & Localized Corrosion on Drip Shield	ANL-EBS-MD-000004	2	3	1	1	7	6	Brown
Stress Corrosion Cracking	ANL-EBS-MD-000005	2		3		5	6	Brown
Hydrogen Induced Cracking of Drip Shield	ANL-EBS-MD-000006	0		1		1	6	Brown
CSNF Waste Form Degradation Model	ANL-EBS-MD-000015	3		3	2	8	7	Brown
HLW Glass Degradation IED/Calcs	ANL-EBS-MD-000016	3		1	1	5	7	Brown
Early Waste Package Failure Analysis	ANL-EBS-MD-000023	0		3		3	6	Brown
Drift Degradation Analysis	ANL-EBS-MD-000027	2		1		3	3	Board
Ventilation Model	ANL-EBS-MD-000030	2		1		3	5	Hardin
Physical & Chemical Environment Model	ANL-EBS-MD-000033	3		2	2	7	5	Hardin
In-Package Chemistry Abstraction	ANL-EBS-MD-000037	3		1		4	7	Brown
In-Drift Microbial Communities	ANL-EBS-MD-000038	0		1		1	4	Hardin
Precipitates & Salts Analysis	ANL-EBS-MD-000045	2		2	2	6	5	Hardin
Initial Cladding Condition	ANL-EBS-MD-000048	0	3	1		4	7	Brown
Multiscale Thermohydrologic Model	ANL-EBS-MD-000049	3		2	2	7	5	Hardin
Invert Advection vs. Diffusion Analysis	ANL-EBS-MD-000063	3	3	1		7	9	Hardin
WAPDEG Analysis of WP & Drip Shield Degradation	ANL-EBS-PA-000001	3	3	3		9	6	Brown
FEPs Screening of Processes & Issues in DS&WP Degradation	ANL-EBS-PA-000002	1		0		1	6	Brown
Abstraction of Mdls for Pitting/Crevice Corrosion DS/WP	ANL-EBS-PA-000003	2	3	2		7	6	Brown

LIST OF ANALYSIS AND MODEL REPORTS

LA Products Evaluation Priorities Product Title	Document ID	Bins/Ratings					TBD Sec.	Resp.
		A	B	C	D	Sum		
Sampling of Stochastic Input Parameters	ANL-EBS-PA-000009	2		3		5	14	Board
Human Intrusion Analysis	ANL-EBS-PA-000010	2		0		2	4	Brown
Framework for Igneous Activity	ANL-MGR-GS-000001	3		3		6	13	Cline
Characterize Eruptive Processes	ANL-MGR-GS-000002	2		3		5	13	Cline
Number of Waste Packages Hit by Igneous Intrusion	ANL-MGR-GS-000003	3		3		6	13	Cline
Inhalation Input Parameters for Biosphere Model	ANL-MGR-MD-000001	2		1		3	12	Zhu
Disruptive Event BioS Dose Conversion Factor Analysis	ANL-MGR-MD-000003	3		3		6	12	Zhu
Characterics of Receptor for Biosphere Model	ANL-MGR-MD-000005	2		1		3	12	Zhu
Agricultural & Env Input Parameters for Biosphere Model	ANL-MGR-MD-000006	2		1		3	12	Zhu
Env Transport Input Parameters Analysis for Biosphere Model	ANL-MGR-MD-000007	2		2		4	12	Zhu
Nominal Perf BioS Dose Conversion Factor Analysis	ANL-MGR-MD-000009	3		3		6	12	Zhu
Evaluation of Applicability of Biosphere-Related FEPS	ANL-MGR-MD-000011	1		0		1	12	Zhu
Future Climate Analysis	ANL-NBS-GS-000008	3		1		4	1	Zhu
Heat Capacity and Thermal Expansion Analysis	ANL-NBS-GS-000013	2		1		3	3	Hardin
Insitu Field Testing of Processes	ANL-NBS-HS-000005	2		0		2	3	Zhu
Numerical Grids For UZ Flow & Transport Modeling	ANL-NBS-HS-000015	2		1		3	2	Zhu
Analysis of Geochemical Data for UZ	ANL-NBS-HS-000017	0		0		0	2	Zhu
Fault Displacement Effects on Transport in the UZ	ANL-NBS-HS-000020	0		1		1	10	Zhu
Geochemical & Isotopic Constraints on Groundwater Flow	ANL-NBS-HS-000021	2		2		4	11	Zhu
Modeling SubGridlock Scale Dispersion in 3D Hetero	ANL-NBS-HS-000022	2		1		3	11	Zhu
Analysis of Infiltration Uncertainty	ANL-NBS-HS-000027	3		1		4	1	Zhu
SZ Colloid-Facilitated Transport	ANL-NBS-HS-000031	2	3	2		7	11	Zhu
Simulation of Net Infiltration for Modern & Future Climate	ANL-NBS-HS-000032	2	3	1		6	1	Zhu
Hydrologic Framework Model	ANL-NBS-HS-000033	2		2		4	11	Zhu
Water-Level Data Anl for the SZ Site-Scale F&T Model	ANL-NBS-HS-000034	2		0		2	11	Zhu
In Situ SZ Testing	ANL-NBS-HS-000039	2		0		2	11	Zhu
Thermal Testing Data	ANL-NBS-HS-000041	0		0		0	4	Hardin
FEPs in UZ Flow and Transport	ANL-NBS-MD-000001	1		0		1	10	Zhu
FEPs in SZ Flow and Transport	ANL-NBS-MD-000002	1		0		1	11	Zhu
Probability Distribution for Flowing Interval Spacing	ANL-NBS-MD-000003	2	3	2		7	11	Zhu
Evaluate Soil/Radionuclide Removal by Erosion & Leaching	ANL-NBS-MD-000009	2		3		5	12	Zhu
Recharge & Lateral Grndwtr Flow	ANL-NBS-MD-000010	2		2		4	11	Zhu

LIST OF ANALYSIS AND MODEL REPORTS

LA Products Evaluation Priorities Product Title	Document ID	Bins/Ratings					TBD Sec.	Resp.
		A	B	C	D	Sum		
Boundary Conditions								
Uncertainty Distribution for Stochastic Parameters	ANL-NBS-MD-000011	0		2		2	11	Zhu
Biosphere Dose Conversion Factor Imp. And Sensitivity Analysis	ANL-NBS-MD-000014	0		1		1	12	Zhu
DSNF and Other WF Degradation Abstraction	ANL-WIS-MD-000004	3	3	1		7	7	Brown
Evaluate/Screen Tectonics FEPs	ANL-WIS-MD-000005	1		0		1	13	Cline
Clad Degradation-FEPs Screening Arguments	ANL-WIS-MD-000008	1		0		1	7	Brown
In WF FEPs Screening	ANL-WIS-MD-000009	1		0		1	7	Brown
Dissolved Concentrations of Radioactive Elements	ANL-WIS-MD-000010	3	3	2		8	7	Brown
Initial Radionuclide Inventory Analysis	ANL-WIS-MD-000020	3	3	2		8	7	Brown
Cladding Summary Abstraction	ANL-WIS-MD-000021	3	3	1		7	7	Brown
EBS Radionuclide Transport Abstraction	ANL-WIS-PA-000001	3	3	1		7	9	Hardin
EBS FEPs/Degradation Modes Abstraction	ANL-WIS-PA-000002	1		0		1	5	Hardin
Waste Package Early Failure	CAL-EBS-MD-000030	0		3		3	6	Brown
Geochem Model Abstraction - 21PWR	MDL-DSU-MD-000001	2		1		3	5	Brown
WF Igneous Intrusion	MDL-EBS-GS-000002	3		3		6	13	Cline
In-Drift Natural Convection & Condensation	MDL-EBS-MD-000001	3		1		4	5	Hardin
WF Colloid Source Term (Combines EBS-MD-42 & WIS-MD-12)	MDL-EBS-PA-000004	3		2		5	8	Brown
Atmospheric Dispersal and Deposition	MDL-MGR-GS-000002	3		3		6	13	Cline
Seismic Design Ground Motion Inputs	MDL-MGR-GS-000003	3		1	3	7	14	Board
Dike/Drift Interactions	MDL-MGR-GS-000005	0		3	3	6	13	Cline
Biosphere Model Report	MDL-MGR-MD-000001	2		1		3	12	Zhu
Geologic Framework Model	MDL-NBS-GS-000002	2		1	2	5	4	Zhu
Mineralogic Model	MDL-NBS-GS-000003	2		1	3	6	3	Zhu
Rock Properties Model	MDL-NBS-GS-000004	2		1	3	6	11	Zhu
Thermal Conductivity	MDL-NBS-GS-000005	2		1	3	6	3	Hardin
Thermal Conductivity of Non Repository Lithostratigraphic Layers	MDL-NBS-GS-000006	2		1	1	4	3	Hardin
Drift Scale Coupled Process Model	MDL-NBS-HS-000001	2		1	2	5	3	Hardin
Seepage Model for PA Including Drift Collapse	MDL-NBS-HS-000002	3	3	1	1	8	3	Zhu
Calibrated Properties Model	MDL-NBS-HS-000003	3		1		4	10	Zhu
Seepage Calibration Model & Testing Data	MDL-NBS-HS-000004	2		1		3	3	Zhu
Conceptual & Numerical Models for UZ Flow &Transport	MDL-NBS-HS-000005	2		2		4	3	Zhu
UZ Flow Model & Submodels	MDL-NBS-HS-000006	3	3	1		7	2	Zhu
Mtn-Scale Coupled Process (TH/THC/THM)	MDL-NBS-HS-000007	2		1	2	5	5	Hardin

LIST OF ANALYSIS AND MODEL REPORTS

LA Products Evaluation Priorities Product Title	Document ID	Bins/Ratings					TBD Sec.	Resp.
		A	B	C	D	Sum		
Radionuclide Transport Models under Ambient Cond.	MDL-NBS-HS-000008	3	3	2		8	10	Zhu
SZ Transport Method and Component Integration	MDL-NBS-HS-000010	2		2		4	11	Zhu
Calibration of the Site-Scale SZ Flow Model	MDL-NBS-HS-000011	2		2		4	11	Zhu
UZ Flow Patterns and Analysis	MDL-NBS-HS-000012	2		1		3	3	Zhu
Analysis of Hydrologic Properties Data	MDL-NBS-HS-000014	2		1		3	2	Zhu
DS Coupled Processes (DST&TH Seepage) Mdls	MDL-NBS-HS-000015	2		1	2	5	3	Hardin
Drift-Scale Radionuclide Transport	MDL-NBS-HS-000016	2	3	2	2	9	10	Zhu
DS THM Coupled Process	MDL-NBS-HS-000017	2		1	2	5	3	Hardin
Drift Scale THC/THM Abstraction	MDL-NBS-HS-000018	2		1	2	5	4	Hardin
Abstraction of Drift Seepage	MDL-NBS-HS-000019	3	3	1		7	3	Hardin /Zhu
Particle Tracking Model/Abstraction of Transport Process	MDL-NBS-HS-000020	3	3	2		8	10	Zhu
Saturated Zone Flow & Transport Model	MDL-NBS-HS-000021	3		2		5	11	Zhu
Zirconium Alloyed Cladding Pitting Model	MDL-WIS-MD-000001	0		3	2	5	7	Brown
Seismic Consequence	MDL-WIS-PA-000003	3		3		6	14	Board

Binning Categories

A - TSPA-LA feeds

B - Barrier Capability

C - Waste Isolation - based on Relative Importance of Model Validation

D - Model Surveillance Issues – Condition Report 99

Sum = sum of ratings in A through D

Significance ratings

3 - Most significance

2 - Moderate significance

1 - Least significance

0 - Not applicable

Notes

TSPA-LA ratings

3 = direct feeds to TSPA-LA

2 = second level feeds to TSPA-LA

1 = FEPs Analysis

0 = Not Direct Input

Model Validation Levels applied to ratings

3 = Validation Level 3

2 = Validation Level 2

1 = Validation Level 1

0 = FEPS and data reports

APPENDIX B

CHECKLISTS

B.1 ANALYSIS AND MODEL CHECKLIST

Review Team:

☐ Natural System ☐ Near Field Environment/Transport
☐ Engineered System ☐ Igneous ☐ Seismic

Document Identifier: _____

Document Title: _____

Evaluator (Name): _____ **Date:** _____

Note: The Evaluator may expand on any comments, since the checklist cannot cover every contingency.

Chapter 4, Inputs

1. Are the data references specific to the actual data, i.e., section, page number, etc.? ☐ Yes ☐ No

Comment _____

2. Are the applicable YMRP criteria described in Section 4.2? ☐ Yes ☐ No

Comment _____

Chapter 5, Assumptions

3. Are the assumptions and their bases and impacts clearly presented and cited or otherwise explained? ☐ Yes ☐ No

Comment _____

4. Where an assumption is characterized as "conservative" or "bounding", is the basis clearly explained? ☐ Yes ☐ No

Comment _____

5. Are assumptions and simplifications consistent between analyses/models that are coupled or that impact each other? ☐ Yes ☐ No

Comment _____

Chapter 6, Model or Analysis Discussion
Note: Some items may be N/A for Scientific Analyses.

6. Are the objectives and use of the analysis/model clearly explained and described in context with other analyses/models? ☐ Yes ☐ No

Comment _____

7. Is the analyses/model properly documented with cited references including appropriate regulations? ☐ Yes ☐ No

Comment _____

8. Are different versions of the analysis/model used to accommodate different scenario classes (i.e., nominal scenario class vs. disruptive events) adequately discussed? ☐ Yes ☐ No

Comment

9. Is there a statement that a single analysis/model version applies to all scenario classes? ☐ Yes ☐ No

Comment

10. Is a discussion of the alternative conceptualizations of the system provided? ☐ Yes ☐ No

Comment _____

11. Is a clear discussion provided of the key uncertainties and their impacts on calculated results? ☐ Yes ☐ No

Comment _____

12. Is a clear discussion provided of the limitations? ☐ Yes ☐ No

Comment _____

13. Is the analysis/model coupled to other analysis/models supporting the TSPA clearly described? ☐ Yes ☐ No

Comment _____

14. For Scientific Analyses, does the text provide adequate justification for: a) use of a previously validated model, or b) use of accepted scientific practice, approach, or methods? ☐ Yes ☐ No

Comment _____

Chapter 7 Model Validation
Note: Go to Conclusions, items 17–22, for Analyses.

15. Does Chapter 7 identify and provide a justification for model validation activities that will extend beyond document preparation? ☐ Yes ☐ No

Comment _____

16. Are the validation criteria consistent with the appropriate TWP and is the model validated for its intended purpose to the level of confidence required by the model's relative importance to the potential performance of the repository system? ☐ Yes ☐ No

Comment _____

Chapters 7 or 8, Conclusions
Note: Some items may be N/A for Scientific Analyses.

17 Do the conclusions clearly summarize the work completed and documented with supporting references? ☐ Yes ☐ No

Comment _____

18. Are there any statements in the conclusion that could be interpreted to introduce new technical issues not discussed in the AMR? ☐ Yes ☐ No

Comment _____

19. Do the conclusions explicitly state that the analysis/model is adequate for it intended use? ☐ Yes ☐ No

Comment _____

20. Is every conclusion supported by the technical basis provided in the body of the report? ☐ Yes ☐ No

Comment _____

21. Can any conclusion be construed as requests for additional work? ☐ Yes ☐ No

Comment _____

22. Are all applicable YMRP criteria demonstrated to be met? ☐ Yes ☐ No

Comment _____

Chapter 1 or Chapter 6, Features, Events, and Processes

23. Is there a list or table of included FEPs in Section 1 or Section 6? ☐ Yes ☐ No

Comment _____

24. Does the list or table of Included FEPs contain the same FEPs that are identified in the "map" of LA FEPs to AMRs? ☐ Yes ☐ No

Comment _____

25. If not, identify any differences:

Comment _____

26. Is the TSPA disposition consistent with the TSPA disposition in the current FEPs reports? ☐ Yes ☐ No

Comment _____

27. For each included FEP, is a FEP number identified, and is it identical to the FEP Number in the LA FEP list? ☐ Yes ☐ No

Comment _____

28. For each included FEP, is a FEP name identified, and is it identical to the FEP name in the LA FEP List? ☐ Yes ☐ No

Comment _____

29. For each included FEP, is a "Section Where the Disposition is Described" identified? ☐ Yes ☐ No

Comment _____

30. Does the "Section Where the Disposition is Described" point to a section or sections in this AMR? ☐ Yes ☐ No

Comment _____

31. Is the "Section Where the Disposition is Described" identified with sufficient detail so that the relevant supporting text can be easily located (i.e., Section 6.3.2 rather than just Section 6)? ☐ Yes ☐ No

Comment _____

32. For each included FEP, is a "Summary of Disposition in TSPA-LA" provided? ☐ Yes ☐ No

Comment _____

33. Does the "Summary of Disposition in TSPA-LA" provide an adequate summary of the information presented in the "Section Where the Disposition is Described"? ☐ Yes ☐ No

(Note that in cases where the supporting information has been recently updated (i.e., in response to RIT reviews), these updates must be reflected, where appropriate, in the Summary of Disposition.)

Comment _____

34. Does the "Summary of Disposition in TSPA-LA" describe the full or partial implementation of the FEP in the TSPA-LA model? ☐ Yes ☐ No

Comment _____

35. If not, does it describe the full or partial implementation of the FEP in a supporting process model? (This may be the case for some AMRs that do not provide a direct feed to TSPA-LA.) ☐ Yes ☐ No

Comment _____

36. Does the "Summary of Disposition in TSPA-LA" identify models used and/or model input parameters and/or model outputs? ☐ Yes ☐ No

Comment _____

37. If the "Summary of Disposition in TSPA-LA" states that the FEP is only partially addressed in this AMR, does it provide a reference to another AMR(s) where it is also addressed? ☐ Yes ☐ No

Comment _____

NOTE: The evaluator may provide additional comments not covered by the questions above, but relevant to regulatory integration.

Additional Comments

_____

_____

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B.2 CALCULATION CHECKLIST

Review Team:

☐ Natural System ☐ Near Field Environment/Transport
☐ Engineered System ☐ Igneous ☐ Seismic

Document Identifier: _____

Document Title: _____

Evaluator (Name): _____ **Date:** _____

Note: The Evaluator may expand on any comments, since the checklist cannot cover every contingency.

1. Are the data references specific to the actual data, i.e., section, page number, etc.? ☐ Yes ☐ No

Comment _____

2. Is the basis for selecting a particular input described when multiple inputs are appropriate and applicable? ☐ Yes ☐ No

Comment _____

3. Are the assumptions and their bases and impacts clearly presented and cited or otherwise explained? ☐ Yes ☐ No

Comment _____

4. Where an assumption is characterized as "conservative" or "bounding", is the basis clearly explained? ☐ Yes ☐ No

Comment _____

5. Are assumptions and simplifications consistent with other calculations and those analyses/models that are impacted? ☐ Yes ☐ No

Comment _____

6. Are the objectives and use of the calculation clearly explained and described in context with other calculations? ☐ Yes ☐ No

Comment _____

7. Is the calculation properly documented with cited references including appropriate regulations? ☐ Yes ☐ No

Comment _____

8. Is a clear discussion provided of the key uncertainties and their impacts on calculated results? ☐ Yes ☐ No

Comment _____

9. Is a clear discussion provided of the limitations? ☐ Yes ☐ No

Comment _____

10. Is there an adequate justification for the use of accepted practices, approaches, or methods? ☐ Yes ☐ No

Comment _____

11. Do the results or conclusions clearly summarize the work completed and documented with supporting references? ☐ Yes ☐ No

Comment _____

12. Are there any statements in the results or conclusions that could be interpreted to introduce new technical issues not discussed in the calculation? ☐ Yes ☐ No

Comment _____

13. Do the results or conclusions explicitly state that the calculation is adequate for its intended use? ☐ Yes ☐ No

Comment _____

14. Is every result or conclusion supported by a technical basis described in the calculation? ☐ Yes ☐ No

Comment _____

15. Can any conclusion be construed as requests for additional work? ☐ Yes ☐ No

Comment _____

16. Are all applicable YMRP criteria demonstrated to be met? ☐ Yes ☐ No

Comment _____

17. Does the calculation clearly demonstrate that the outputs are reasonable compared to the inputs? ☐ Yes ☐ No

Comment _____

NOTE: The evaluator may provide additional comments not covered by the questions above, but relevant to regulatory integration.

Additional Comments

_____

_____

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B.3 PARAMETER REVIEW CHECKLIST

The Parameter Team reviews will use a separate checklist for each document reviewed. Each AMR can include multiple parameters, and also multiple inputs. Hence, the format for the checklist was developed with the capability of expanding the form to fit the size of each review. The checklist (with no entries) is one page long in Excel, but 4-5 pages wide, depending on the font size selected. With entries, the checklist could be longer than it is wide.

This appendix shows the content of the checklist in outline format, for ease of communication to affected parties. The checklist is also subject to modification based on the initial results of its implementation. The checklist uses the TSPA Parameter Entry Forms (PEFs), the TSPA Parameter Database, the AMRs, and the TDMS. The DIRS database can be used to determine navigation paths among these sources, but is not directly cited within the checklist.

1. **Document and Evaluator Information Row**
   A. **Form ID**: This is the name of the review file, e.g., UZ01a-P1.xls is the first AMR in the UZ column of the AMR hierarchy chart developed by the RIT Integration Team (the assignment of numbers to the documents is marked on the posted chart in the RIT Integration Team area of Bldg 10, and also in a review log spreadsheet available upon request). The "a" indicates the first version of the document reviewed. It will be incremented if a revision, interim change notice, or errata is subsequently reviewed on a new form. "P" designates a Parameter Team Review. The final "1" designates the first such review; since some AMRs will be reviewed by other Parameter Team members following a different TSPA parameter to its source. If the review form needs to be modified after it is finalized, an additional letter will be appended between the "P1" and the decimal before the "xls" extension.
   B. **Document Identifier, Revision, ICN, Errata**: These columns will be populated with the OCRWM Program Documents Database assigned identifier of the AMR.
   C. **Document Title**: The title of the AMR.
   D. **PEF Number**: The identification number (currently in the 1 to 60 range) for the Parameter Entry Form that documents the implementation of the AMR Parameter in the TSPA model. The PEF groups parameters in the TSPA Parameter Database by their AMR source, and also documents the agreement for the implementation between the TSPA analyst, Process Model analyst, and TSPA Parameter Lead.
   E. **Evaluator**: The name of the RIT Parameter Team reviewer.
   F. **Date**: The date the review was initiated.
   G. **AMR Type**: Pull down menu designating Analysis/Model/Both/Other/?.
   H. **Related Model Review**: If a model review checklist has been completed by one of the RIT Model Teams, its designator will be entered.
   I. **Evaluator Comments**: A cell for recording or summarizing any issues found during the review.
   J. **Evaluator Requested Actions**: A cell for identifying any actions recommended by the evaluator, to the Parameter Team Manager.
   K. **Review Status**: Includes subcolumn groups (name, date, status) for the Evaluator, "Czar" (Rechard or Tierney), and Manager (Blink or Jaeger). The status is a number, with 1 as the first time entry. An Evaluator can return to the form to add to it as many times as necessary. Any reviews by Czars or Managers will use the same status number

as in the Evaluator subcolumn. When the form is complete, the Evaluator should input status "99".

L. **A hot button to Enter Row 1**: This button converts the pull down menu indices to text. **Alt-1** can also be pressed without clicking on the button.

2. **TSPA (input) and AMR (output) Parameter Review Row**

A. **Parameter Item Number**: Begins with 1 on each review, and is incremented to the total number of parameters included in the review. If the correlation between the TSPA and AMR parameter is known, the information for each is on the same row (same Parameter Item Number). If the correlation is not known by the evaluator, the TSPA parameter(s) and AMR parameter(s) are on separate rows, with separate Parameter Item Numbers. These item numbers are used in the third and fourth segments of the form, so that the association between the segments is clear.

B. **Parameter Identification in TSPA**

(1) **TSPA Parameter Number**: From the TSPA Parameter Database (currently between 1 and about 1700).

(2) **TSPA Parameter Name**: From the TSPA Parameter Database and the PEF.

(3) **Units**: The **Generic** subcolumn uses symbols (e.g., L/T for velocity), and the Specific subcolumn uses the actual units (e.g., m/s).

C. **Parameter Identification in AMR**

(1) **AMR Parameter Name**: This is usually different than the TSPA name

(2) **Other Names for the Parameter**: Known aliases within the AMR chain, TDMS, etc.

D. **RIT Parameter Team Conclusion**: This section can be drafted by the evaluator, but will be completed by the Parameter Team Czar(s) and Managers(s)

(1) **Defensibility**: Includes **Technically Defensible** (Yes/No/? pull-down) and **Comments** subcolumns.

(2) **Significance**: Includes **Significance to Dose** (High/Medium/Low/? pull down) and **Comments** subcolumns.

E. **TSPA Details**

(1) **TSPA Status**: Pull down Final/Preliminary/?.

(2) **TSPA Distribution Number and Name** subcolumns: From the TSPA Parameter Database. The number is 100 for a constant, 2100-3200 for various types of distributions, 5100 for a 1-D table, 52nn for a 2-D table, and 6000 for a file element. The PEFs include a legend of names vs. numbers.

(3) **TSPA Scenario Class**: Pull down Nominal/Volcanic-Eruption/Igneous-Intrusion/Seismic/Other/?.

(4) **TSPA Submodel Name**: Pull down based on the submodels listed in Figures 5-2 through 5-5 of the TSPA MAD. Once the Scenario Class is selected, this pull-down menu adjusts to the appropriate submodel list.

F. AMR Details

(1) **Page/Figure/Table**: The location in the AMR at which the parameter feed to TSPA (or a downstream AMR) is specified. This may be obtained from the **Verification_1_Comment** field in the TSPA Parameter Database table **GS_Parameter,**

(2) **Output DTN**: Subcolumn include the **Data Tracking Number (DTN)**, the **Quality Status** (pull down Q/UNQ/Tech-Info/Superceded/?), **Verified** (pull down Yes/No/?),

and **Location** (for the pathway through the TDMS to the actual data values – this could include a link within Automated Technical Data Tracking, a zip file name, an unzipped directory name(s), and unzipped file name(s)).

G. **QA Issues**
   (1) **CR(s)**: Subcolumns for pull down **yes/no/?** and **CR Number(s).**
   (2) **TBV(s)**: Subcolumns for pull down **yes/no/?** and **TBV Number(s).**

H. **AMR Details (continued)**
   (1) **Parameter Development Method**: Pull down Model-Output/ Literature-Citation/Field-Measurement/Lab-Measurement/ Other.
   (2) **Conservatism**: Pull down Conservative/Bounding/Reasonable/Mean/Median/ Unconservative/Uncertain/Preclosure/?.
   (3) **Goodness of Fit**: Identify any chi-squared values or qualitative/ quantitative conclusions in the AMR about how well the parameter value/distribution reflects the model or measurement results.
   (4) **Uncertainty**: Subcolumns for pull down **yes/no/?** and **Describe Issues.** The intent is to identify any uncertainty discussion of the parameter in the AMR, for comparison to the TSPA treatment of the parameter
   (5) **Assumptions**: Subcolumns for pull down **yes/no/?**, pull down (yes/no/?) for **Reasonable**, and **Describe Deficiencies.**
   (6) **Statistical Correlation with Other Parameters**: Pull down **yes/no/?** and **Describe Below.** The intent is to identify any parameters that the AMR author intended to be correlated within TSPA runs. Issues with the AMR author conclusions should be identified in the top row of the review.

I. **Other Sources**: Identify any Technical Information Center, Records Information System, or other sources not identified in the Document or DTN sections.

J. **A hot button to Enter Row 2**: This button converts the pull down menu indices to text, shifts the remaining rows downward, and provides a new blank row in this area (in case an additional set of entries is needed in any of the cells in the row). **Alt-2** can also be pressed without clicking on the button.

3. **Parameter Input Row**

A. **Parameter Item Number**: Uses the system in the first column of the second row. However, if the correlation is between a group or (output) parameters and the AMR inputs, then this field can be a list of the output parameters so correlated (e.g., 1-2, 4-5).

B. **Input Item Number**: A sequential number assigned to each input entered on the form (it could be a group of inputs with a single item number if the entire group is characterized by the entries in the row).

C. **Input Description**: This is words, rather than a pointer.

D. **Parameter Inputs**
   (1) **DTN**
      (a) **Source DTN**: The DTN number.
      (b) **Quality Status**: Pull down Q/UNQ/Tech-Info/Superceded/?
      (c) **Comments**:
      (d) **CR(s)**: Subcolumns for pull down **yes/no/?** and **CR Number(s).**
      (e) **TBV(s)**: Subcolumns for pull down **yes/no/?** and **TBV Number(s).**
   (2) Document

(a) **Source Document Identifier**: The document that the (input) DTN is output from.
(b) **Rev/ICN/Errata**: The rest of the document identifier
(c) **Status**: Pull down Final/Draft
(d) **Comments**

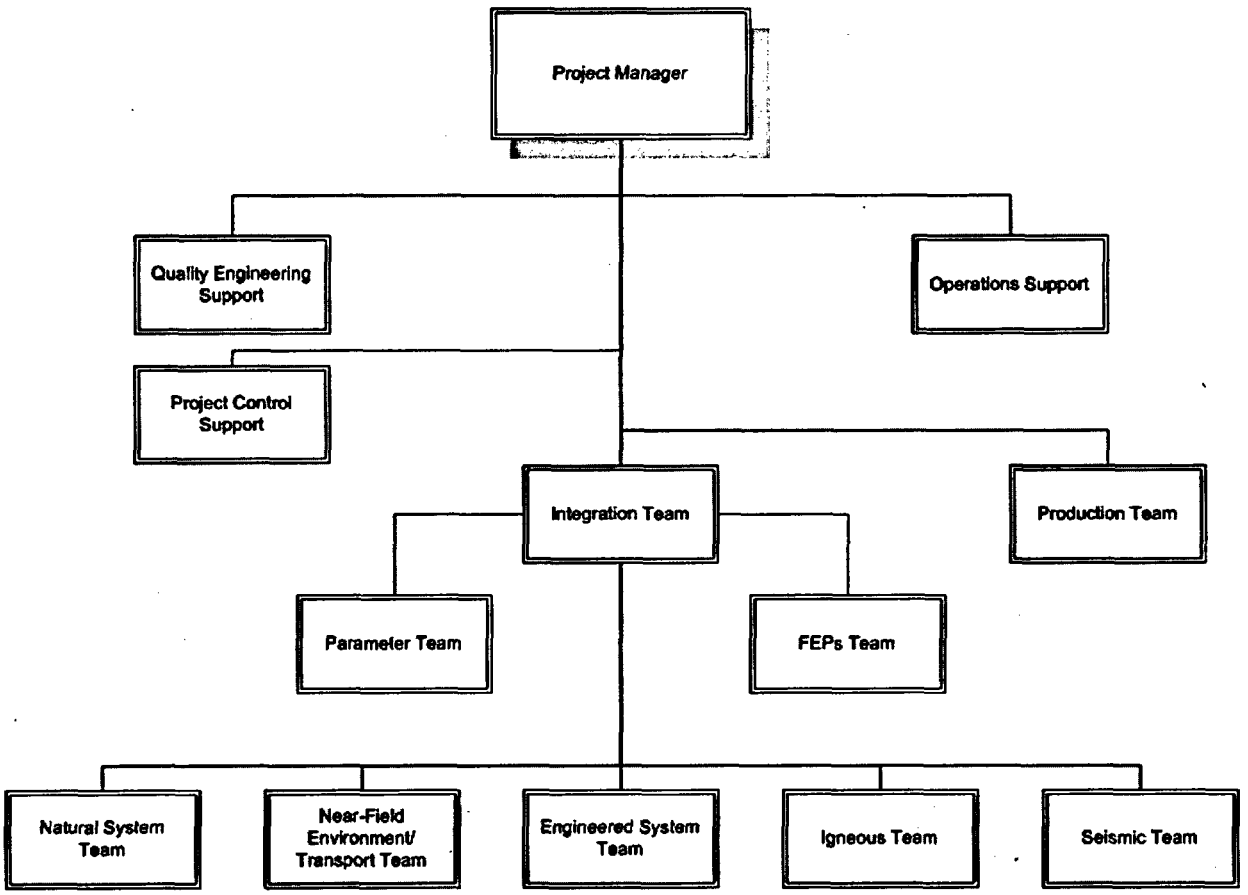
E. **Data Source**: Pull down YMP-Measured/YMP-Model-Output/YMP-Database/Literature-Citation. If the entry is YMP-Model-Output, the review string will continue to that AMR on a separate review form. The other pull down choices are "bottom-level" items.
F. **Other Sources**: Identify any Technical Information Center, Records Information System, or other sources not identified in the Document or DTN sections.
G. A **hot button to Enter Row 3**: This button converts the pull down menu indices to text, shifts the remaining rows downward, and provides a new blank row in this area (in case an additional set of entries is needed in any of the cells in the row). **Alt-3** can also be pressed without clicking on the button.

4. **Secondary AMR Details Row**: If the AMR feeds a downstream AMR in addition to (or instead of) directly feeding the TSPA, this row will be populated.
   A. **Parameter Item Number**: Uses the system in the first column of the second row.
   B. **AMR DI Number**: This is for the downstream AMR using the parameters identified in Row 2.
   C. **Rev/ICN/Errata**: The rest of the DI.
   D. **Title**:
   E. **Model Review Form**: If a model review checklist has been completed by one of the RIT Model Teams for the downstream AMR, its designator will be entered.
   F. **Parameter Review Form**: If a parameter review checklist has been completed by the RIT Parameter Team for the downstream AMR, its designator will be entered.
   G. There is no Enter Row 4 or hot button for this section, since no rows need to be pushed downward. The evaluator simply goes to the next row.

APPENDIX C

ORGANIZATIONAL STRUCTURE

REGULATORY INTEGRATION TEAM ORGANIZATIONAL STRUCTURE



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APPENDIX D

DEFINITIONS

DEFINITIONS

Abstraction-The process of purposely simplifying a mathematical model (component, barrier, or subsystem process model) for incorporation into an overall system model of the geologic repository. The products of model abstractions may represent reduction in dimensionality, elimination of time dependence, tables obtained from more complex models, response surfaces derived from the use of more complex models, representations of a continuous process or entity with a few discrete elements, etc. [Source: Office of Civilian Radioactive Waste Management (OCRWM) Procedure AP-SIII.10Q, *Models*]

Aleatoric (Aleatory) Uncertainty-Uncertainty involving the occurrence of events that take place in the future. Such occurrences are assumed to have a random character in the sense that their likelihood of taking place over various intervals of time can be estimated, but it is not possible to determine whether or not they will actually occur. Examples of aleatory uncertainty include the occurrence of seismic events, igneous events, and particular spatial patterns of corrosion. Alternative designations for aleatory uncertainty include Type A, stochastic, irreducible, and objective uncertainty. [Source: *TSPA-LA Methods and Approach*]

Assumption-A statement or proposition that is taken to be true or representative in the absence of direct confirming data or evidence. [Source: OCRWM Procedure AP-SIII.10Q, *Models*]

Completeness-Capturing of all applicable FEPs of item 1 of the definition of "performance assessment." [Source: *TSPA-LA Methods and Approach*]

Design bases-Information that identifies the specific functions to be performed by a structure, system, or component of a facility and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be constraints derived from generally accepted "state-of-the-art" practices for achieving functional goals or requirements derived from analysis (based on calculation or experiments) of the effects of a postulated event under which a structure, system, or component must meet its functional goals. The values for controlling parameters for external events include: (1) Estimates of severe natural events to be used for deriving design bases that will be based on consideration of historical data on the associated parameters, physical data, or analysis of upper limits of the physical processes involved; and (2) Estimates of severe external human-induced events to be used for deriving design bases, that will be based on analysis of human activity in the region, taking into account the site characteristics and the risks associated with the event. [Source: 10 CFR 63.2]

Epistemic Uncertainty-Uncertainty involving the degree of appropriateness or validity that can be assigned to the assumptions and quantities used in the TSPA model. Epistemic uncertainty arises from a lack of knowledge about a parameter because the data are limited or because there are alternative interpretations of the available data. [Source: *TSPA-LA Methods and Approach*]

Feature, Event, or Process (Features, Events, and Processes)-Features are physical, chemical, thermal, or temporal characteristics of the site or repository system. Examples of features are the waste package and fracture systems. Processes are typically phenomena and activities that have gradual, continuous interactions with the repository system or subsystem. An example of a process is percolation of water into the unsaturated rock above the repository. Events may be

interrelated with processes, but in general, events are discrete occurrences. An example of an event is volcanism. [Source: *TSPA-LA Methods and Approach*]

Important to waste isolation-With reference to design of the engineered barrier system and characterization of natural barriers, those engineered and natural barriers whose function is to provide a reasonable expectation that high-level waste can be disposed of without exceeding the requirements of § 63.113(b) and (c). [Source: 10 CFR 63.2]

Model, Conceptual-A set of hypotheses consisting of assumptions, simplifications, and idealizations that describes the essential aspects of a system, process, or phenomenon (*Quality Assurance and Requirements Description* [QARD]). Such a model may consist of concepts related to geometrical elements of the object (size or shape); dimensionality (one-, two-, or three-dimensional); time dependence (steady-state or transient); applicable conservation principles (mass, momentum, energy); applicable constitutive relations, significant processes, natural laws, and boundary conditions; and initial conditions. Conceptual models may be implemented into mathematical models. [Source: OCRWM Procedure AP-SIII.10Q, *Models*].

Conceptual model-A set of qualitative assumptions used to describe a system or subsystem for a given purpose. Assumptions for the model are compatible with one another and fit the existing data within the context of the given purpose of the model. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Model, Mathematical-A mathematical representation of a conceptual model (system, process, or phenomenon) that is based on established scientific and engineering principles and from which the approximate behavior of a system, process, or phenomenon can be calculated within determinable limits of uncertainty (QARD). [Source: OCRWM Procedure AP-SIII.10Q, *Models*]

Model, Numerical-An approximate representation of a mathematical model that is constructed using a numerical description method such as finite volumes, finite differences, or finite elements. A numerical model is typically represented by a series of program statements that are executed on a computer. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Parameter-Data, or values, such as those that are input to computer codes for a total system performance assessment calculation. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Performance Assessment-An analysis that (1) identifies the features, events, processes (except human intrusion), and sequences of events and processes (except human intrusion) that might affect the Yucca Mountain disposal system and their probabilities of occurring during 10,000 years after disposal; (2) examines the effects of those features, events, processes, and sequences of events and processes upon the performance of the Yucca Mountain disposal system; and (3) estimates the dose incurred by the reasonably maximally exposed individual, including the associated uncertainties, as a result of releases caused by all significant features, events, processes, and sequences of events and processes, weighted by their probability of occurrence. [Source: 10 CFR 63.2]

Retrievability-Capability of permanently removing radioactive waste from the underground location at which the waste had been previously emplaced for disposal. [Source: 10 CFR 63.2]

Risk Dilution-Lowering of the risk, or dose, from an unsupported parameter range and distribution. [Source: NUREG-1804, *Yucca Mountain Review Plan*; *TSPA-LA Methods and Approach*]

Risk-informed, performance based-A regulatory approach in which risk insights, engineering analysis and judgments, and performance history are used to (1) focus attention on the most important activities; (2) establish objective criteria based on risk insights for evaluating performance; (3) develop measurable or calculable parameters for monitoring system and licensee performance; and (4) focus on the results as the primary basis to regulatory decision making. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Safety question-A question regarding the adequacy of structures, systems, and components important to safety (preclosure) and engineered or natural barriers important to waste isolation (postclosure). [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Total System Performance Assessment-A risk assessment that quantitatively estimates how the potential Yucca Mountain repository system will perform in the future under the influence of specific features, events, and processes, incorporating uncertainty in the models and uncertainty and variability of the data. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

Traceability-The ability to trace the history, application, or location of an item, data, or sample using recorded documentation (QARD). [Source: OCRWM Procedure AP-SIII.10Q, *Models*]

Transparency-The attribute of producing documents that are sufficiently detailed as to purpose, method, assumptions, inputs, conclusions, references, and units, such that a person technically qualified in the subject can understand the documents and ensure their adequacy without recourse to the originator. [Source: OCRWM Procedure AP-SIII.10Q, *Models*]

The ease of understanding the process by which a study was carried out, which assumptions are driving the results, how they were arrived at, and the rigor of the analyses leading to results. A logical structure ensures completeness and facilitates in-depth review of the relevant issues. Transparency is achieved when a reader or reviewer has a clear picture of what was done in the analysis, what the outcome was, and why. [Source: NUREG-1804, *Yucca Mountain Review Plan*]

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Status of Condition Reports (CRs) Related to the NRC Technical Evaluation

May 18, 2004

CR #	Description	Level	Status
785	Audit-2: Differences between values contained in Summary Table 8.1-3 of AMR ANL-EBS-MD-000015, Revision 01, *CSNF Waste Form Degradation: Summary Abstraction*, and corresponding entries in the model output Data Tracking Number (Identified prior to Audit-2).	B	Closed
903	Audit-2: Missing signatures and dates in record packages for AMR ANL-EBS-MD-000015, Revision 01, *CSNF Waste Form Degradation: Summary Abstraction* (Identified prior to Audit-2).	B	Closed
1137	Audit-1: "FishTank" Software Control and Qualification Issues (Identified prior to Audit-1)	B	Closed
1138	Audit-1: AMR Checking Process Ineffective. Models shall be transparent (Identified prior to Audit-1).	B	Closed
1207	Audit-1: Software problems not reported within the CAP program (Identified prior to Audit-1).	D	Closed
1303	Audit-1: AMR ANL-EBS-MD-000003, Revision 01, *General Corrosion and Localized Corrosion of Waste Package Outer Barrier* records package error.	B	Closed
1305	Audit-1: Failure to identify the Quality Engineering Representative (QER) back-check copy in the records package of AMR ANL-EBS-MD-000003, Revision 01, *General Corrosion and Localized Corrosion of Waste Package Outer Barrier.*	D	Closed
1307	Audit-1: Lack of procedures for CR screening team activities and for qualification of team members	D	Closed
1309	Audit-1: Problems with documentation of software checking for Gamry Echmen Analysis Software, Version 1.0.	C	Closed
1369	Audit-2: Technical Work Plan (TWP) *for Waste Form Degradation Modeling, Testing, and Analysis in Support of SR and LA*, TWP-WIS-MD-000008, Revision 02, did not discuss alternative conceptual models, nor did it explain why alternative conceptual models or approaches were not considered (Identified prior to Audit-2).	B	Closed
1425	Audit-2: Procedure AP-SIII.10Q, *Models*, currently allows product output to be documented in tables and lists rather than only Data Tracking Numbers. This violates the QARD requirements for data traceability and the determination of data qualification status.	B	Closed
1439	Audit-2: A QA review of AMR ANL-EBS-MD-000015, Revision 01, *CSNF Waste Form Degradation: Summary Abstraction*, indicated a lack of explicit model validation criteria, in that, TWP-WIS-000008 Rev. 02 did not establish a tolerance for matching published data with model predictions. (Identified prior to Audit-2)	D	Open Due 08/31/04*

CR #	Description	Level	Status
1469	Audit-2: For clarity, the last paragraph on page 13 of AMR ANL-EBS-MD-000015, Rev. 01, *CSNF Waste Form Degradation: Summary Abstraction*, should include the temperature range for the applicability of the model.	D	Open Due 09/07/04*
1483	Audit-1: Addresses NRC Conclusions from Audit-1 of the model report ANL-EBS-MD-000003, Revision 01, *General Corrosion and Localized Corrosion of Waste Package Outer Barrier.*	D	Open Due 08/31/04*
1497	Audit-2: CR Written in response to NRC issue regarding improper Level assessment of CR 1291. CR 1497 written to supersede CR 1291 and change assessment Level from "D" to "B".	B	Closed
1629	Audit-3: Errors in Fracture Data Contained in the *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02).	C	Open Due 09/07/04*
1647	Audit-3: *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02) Phase II Data Confirmation Issues.	B	Open Due 08/31/04*
1660	Audit-3: Data Transparency and Traceability in the *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02).	B	Closed
1661	Audit-3: Data Uncertainty and Variability in the *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02).	D	Open Due 06/30/04
1663	Audit-3: The transfer of data from FracMan to 3DEC is not clearly stated in the *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02).	D	Open Due 09/30/04
1667	Audit-3: Use of Unqualified Software in the *Drift Degradation Analysis* AMR (ANL-EBS-MD-000027 Rev 02).	B	Closed
1816	Supersedes CR 1307: Lack of Procedures for CR screening team activities	B	Closed

* Completion contingent to an AMR Change by the Regulatory Integration Team (RIT)